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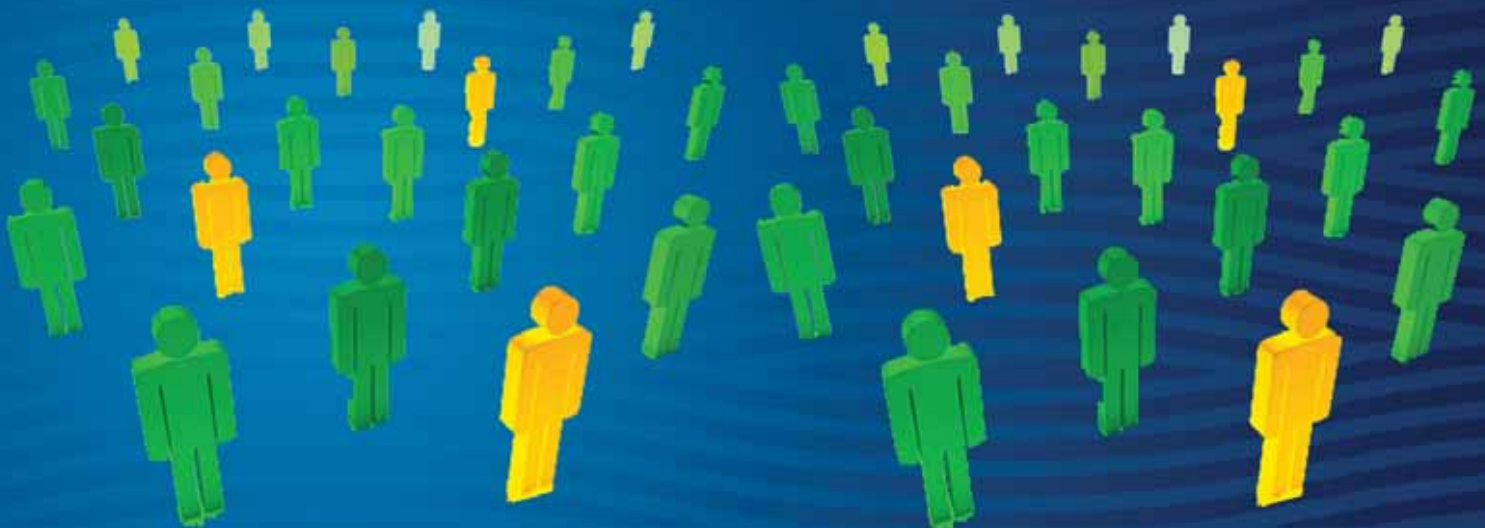


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International Journal of Human Capital in Urban Management (IJHCUM) is an open access, peer-reviewed journal affiliated with Municipality of Tehran focusing on employment and allocation of human capital for urban management, including urban multidisciplinary themes. IJHCUM is an integral partner with the scientific and technical communities, delivering superior Information products and services that foster communication, build insights and enables individual and collective advancement in urban management. Providing human capital information to the general public administration with description of contemporary advances in urban issues to be used in improving protection and management.



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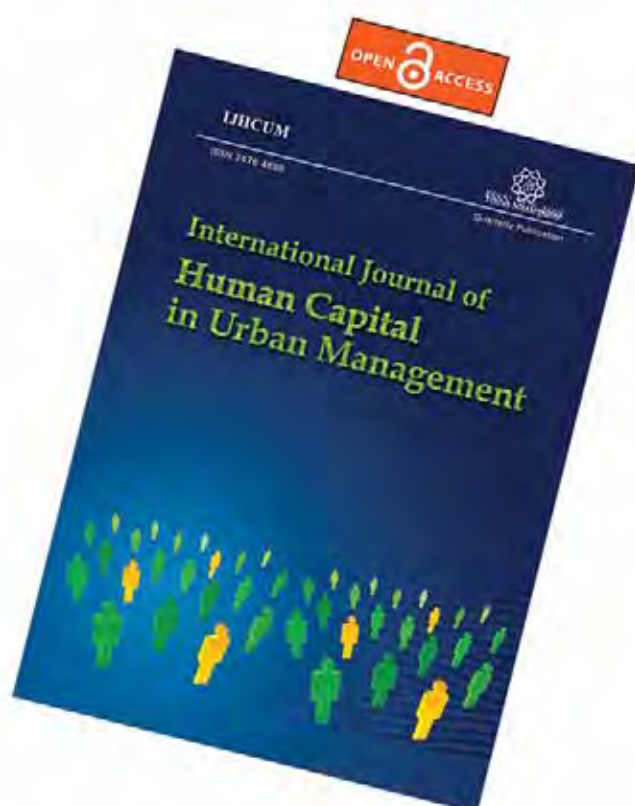
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CASE STUDY

Evaluation of 'guanxi' concept between Chinese supervisors and workers in hydropower projects: conflicts and safety perspectives

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ABSTRACT

BACKGROUND AND OBJECTIVES: The duality of Chinese management style called guanxi might have a potential difference between Chinese and African ideologies, and may give rise to injustice in some overseas contracting projects leading to conflicts, fights and safety issues. Therefore, effective action is needed in improving Chinese contractors-local workers relationships on project sites. Hence, assessing the extent to which Chinese managers practice guanxi on African workers, and how guanxi is affecting conflict and safety standards shows the extent of hope in mitigating risks and improving management. Specifically, this case study attempted to sort out and rank all difficulties Chinese managers encounter while undertaking hydropower projects in Cameroon, to find out whether or not there is a supervisor-worker guanxi relationship on dam construction sites and whether or not guanxi is implicated in Sino-Cameroonian workers conflict and safety.

METHODS: SWARA method was used to analyze and rank difficulties, qualitative and quantitative assessments were undertaken for theories studies. After a workshop and semi-interview with Decision Makers a first survey was designed to gather scores of difficulties that ended to a ranking from most to least important using SWARA method. Then two questionnaires were structured and sent to local workers and Chinese project engineers, to gather all information about guanxi, conflicts and safety score. After a consistency study on 526 local workers and 40 Chinese manager's responses selected from three different hydropower projects, the overall Cronbach's alpha was 0.93 for supervisors and 0.88 for workers.

FINDINGS: The results of SWARA ranking showed that the problem areas giving rise challenges to Chinese contractors are mainly related to the language barrier (W=47.7%) and interpersonal issues (w=13.35%). The findings of hypotheses testing suggest that guanxi is not applied on local workers by Chinese managers with statistics $X=4.36<26$ and $X=2.3514$ respectively, thus, hypotheses H21 and H22 were both supported; yet workers do have conflict relationship and do not feel safe working with Chinese managers stated with statistics 27.4 and 24.9 respectively. However, the application of guanxi may play an important role in positively affecting the conflicts and safety management in Chinese overseas megaprojects. Using these results, recommendations were thrown on project, conflict, and safety management.

CONCLUSION: As the number of Chinese investments in infrastructures in Africa keeps increasing, the findings in this research may provide all parties with crucial information for better understanding of local workers they might hire for their numerous projects. This study has shown that Chinese managers do not practice guanxi on the local workers, yet it may help in improving safety and conflict management. Therefore, there is need for practical language and safety training leading to improve behaviors, reduce risks, and increase effectiveness.

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INTRODUCTION

The Belt and Road initiative launched by China will need huge efforts in matters of international exchange and management. Chinese Companies in charge of undertaking overseas infrastructures will have either to adapt to new environments or implement their own management style to locals. This will come with high risks in every domain, especially safety and conflicts management. It is commonly recognized that the practice of *guanxi* is prevalent and important in Chinese society (Chen et al., 2011) and management style. A good definition of *guanxi* would be "the very fundamental connections amongst human beings that Chinese cultivate daily in all their interactions, including those with family, friends, acquaintances and business partners" (Yen et al., 2017). Instead, many researchers see *guanxi* as a cliché of Chinese business behavior and management style. Critics see *guanxi* as fueling the country's rampant corruption and as an obstacle to China's becoming a modern society based on the rule of law. Those who see it in a more favorable light contend that *guanxi* adds an element of humanity to otherwise cold transactions, and comes to the rescue in the absence of consistent regulations or guidelines for social conduct (Gold et al., 2002). Coster and Heimer (2001) argued that *guanxi* practices may be beneficial to the individuals involved, in organizational settings; such particularistic rules may conflict with universal norms, which stress treating people similarly regardless of one's relationship with them. The potential difference between these two ideologies gives rise to injustice in some Chinese overseas organizations that might lead to conflicts, fights and safety issues. In the other side, *guanxi* helps mitigate aggressive feelings and encourages the development of kindness in business relationships (Yen et al., 2017). Many researchers have studied the relationship of *guanxi* with conflicts and safety management in the construction industry. Tashi and Peansupap (2013) evaluated conflict issues between Chinese and locals in public construction projects in Bhutan and came out with a series of recommendations for their country, Sun et al. (2019) developed a scale which can directly assess Chinese project manager interpersonal competence avoiding conflicts and Yang et al. (2019) evaluated the role of *guanxi* in carrier adaptability of construction workers, but very few took cases on hydropower projects. Analysis of the focus construction group transcripts

for major themes often suggests a wide range of different skills, attitudes and behaviors required by management to positively influence site culture (Biggs et al., 2005). Using the criteria that depends upon: (a) having working experience of more than five years, (b) having at least one hands-on experience in high-rise building projects, and (c) possessing good knowledge of BIM and its related technologies, Manzoor et al. (2021) revealed an existing relationship between management, conflicts and safety. Osei-Asibey et al. (2021) worked on improving health and safety at construction sites, especially in developing countries like Ghana; in this research, the study was focused on Cameroon's Chinese hydropower projects. After a relationship study between *guanxi*, conflicts and safety is done, the purpose of this study is to sort out and rank all difficulties Chinese managers encounter while undertaking hydropower projects in Cameroon, to find out whether or not there is a supervisor-worker *guanxi* relationship on dam construction sites and whether or not *guanxi* is implicated in Sino-Cameroonian workers conflict and safety. To achieve these objectives, some research questions were raised. 1. What are the main difficulties that Chinese project managers (supervisors) face when they manage Cameroon's local labor on a hydropower construction site? 2. Do Chinese supervisors practice the actual *guanxi* while managing Cameroon's local labor on a hydropower construction site? 3. Is *guanxi* implicated in sino-cameroonian conflicts and safety? Along with the questions and using the literature review, four NULL hypotheses were stated and tested based on contingency and the extent to which participants provided information. The current study has been carried out in Cameroon between July and October 2021. The survey was conducted in Bini-Warak hydropower project, Memvele hydropower project, and Mekin hydropower dam, all three conducted by Chinese companies.

Background and hypothesis

Use of SWARA method for ranking difficulties: different methodologies are available for ranking of numerous subjects. While relative importance index methods needs higher number of decision makers, Delphi processes may need a double screened survey. As the current process represents a single criteria decision making and experts playing important role on evaluations and calculating weights, SWARA

method would do a better job. Many researchers singularly used the method or combined with other methods for ranking; The equations used in this study follow the methodologies used by Boubba *et al.* (2021) who combined SWARA and TOPSIS methods to rank project risks, or Zolfani and Saparuskas (2013) who used the method in prioritizing sustainability assessment indicators of an energy system and Cao *et al.* (2019) who used the method for contractors ranking of floating solar panel energy systems.

Guanxi indicators: Two important components of *guanxi* are *renqing* and *mianzi*. *Guanxi* requires a reciprocal relationship with the implication of an exchange of favors. Good *ganqing* improves the positive role of *guanxi* in social communication. Besides, *mianzi* is translated, literally, as “face” in English. It is an important cultural value in Chinese culture (Padilla-Meléndez *et al.*, 2017). Some other researchers such as Yen *et al.* (2017) defined *guanxi* as a three diamond measures such as *ganqing*, *renqing* and *xinren* these were the indicators used to assess *guanxi* in this research. *Ganqing* here reflects the sense of a social relationship between two people or two organizations. In this case a relationship tenor between the manager and local worker was evaluated. *Renqing* here is defined as the treatment level on the project site whereas *xinren* refers to the trust between people. In this research, *xinren* were evaluated between local workers and Chinese managers by testing the two following NULL hypothesis.

H21: *Cameroon local workers do not believe Chinese supervisors cultivate “guanxi” while managing them.*

H22: *Chinese supervisors do not believe they cultivate “guanxi” while dealing with local workers.*

Guanxi and construction conflict: Investigating the importance of conflicts has become one of the influencing factors in a given project (Park *et al.*, 2017). The impact of *guanxi* on the reduction and management of conflict in business relationships is evident because Chinese people are reluctant to hurt (Yen *et al.*, 2017). Considerable research has suggested that goal interdependence can affect perceived relational and task conflicts (Chen, 2005). Several theorists have proposed that trusting relationships are vital for managing inter-organizational collaboration (Tjosvold *et al.*, 2014) and it could even be argued that factors influencing trust can be divided into personal,

propensity, ability, benevolence and integrity (Wang *et al.*, 2018). This may lead one to argue that a high level of *guanxi* management can be in line with the cooperative approach to conflict management and reduce disputes. In this study, the points such as lack of requirements, non-compliance and failure on one side, disagreements, misunderstanding, frustrations and breakdown of relationships between parties as shown by Tashi and Peansupap (2013) were evaluated using the following hypothesis.

H31: *There isn't a conflict relationship between Chinese supervisors and local labor.*

Construction conflicts and safety: According to Jin *et al.* (2021), factors such as conflicts and wars can not only affect the success of projects but also pose a great threat to the personal safety of Chinese employees in Africa. Chen *et al.* (2017) argued that construction workers conflicts had a direct positive impact on job stress and unsafe events, respectively, and an indirect positive impact on physical injuries. In Cameroon, many newspapers reported deadly fights between Chinese managers and local workers on construction sites. In some few cases, these conflicts led to strikes and even terrorist attacks. All these reported conflicts may lead one to test the following NULL hypothesis.

H32: *Local workers are not safe to work on Chinese projects.*

Guanxi and safety: Wu *et al.* (2018) proved the existence of a close relationship between trust, social incentives and safety behaviors of workers on a construction project site. They provided an axial coding in related to “manager behaviors” (including support, attention, punishment, orders, and regulation), “construction worker safety behaviors” (including obey, participate, help), and social relationships (including communicate, trust, feelings, and goals) which are *guanxi* elements presented earlier. Also, Xu *et al.* (2020) proved that *guanxi* HRM practice was negatively related to employees’ occupational well-being and safety on project sites. According to Liu *et al.* (2020), both LMX (Leader–member exchange) and LMG (Leader–member *guanxi*) have a negative impact on the two dimensions on workers’ unsafe behavior whereas Liao *et al.* (2014) explained a positive safety climate could be associated with higher communication density and degree centrality. This suggests an implication of *guanxi* management in workers and managers safety on a construction

project site. In this study, these results will be verified using an analogy and comparison of the results of all the hypothesis testing.

MATERIALS AND METHODS

The overall research methodology used is presented on Fig. 1.

A review of literature was performed from open data, data from Chinese contractors. This review led to the identification of management issues that could come up while Chinese engineers deal with local labor. After a workshop and semi-interview with Decision Makers (DMs), a first survey was designed to gather scores of difficulties that ended to a ranking from most to least important using SWARA method. Then two surveys were structured and sent to local workers and Chinese project engineers, to gather all information about *guanxi*, conflicts and safety score. Fig. 2 shows a conceptualized model between parties evaluated in this research. The model was

adapted from previously developed by Gao *et al.* (2016), Arnol *et al.* (2018) and Sureda *et al.* (2018) models. The results were obtained using the software SPSS and after discussions with experts, some recommendations were thrown.

Research strategies

For the first research question: *what are the main difficulties that Chinese project managers (supervisors) face when they manage Cameroons local labor on a hydropower construction site?* To answer this research question, based on previous researches and a first interview with experts, a first questionnaire was designed. Nine difficulties were found and sent back to seven selected Chinese Decision Makers (the DMs were selected from three Chinese projects undertaken in Cameroon) for ranking, added to one opened question for suggestions. The ranking strategy used SWARA method to compute weights of each difficulty and provide a final ranking. The expert

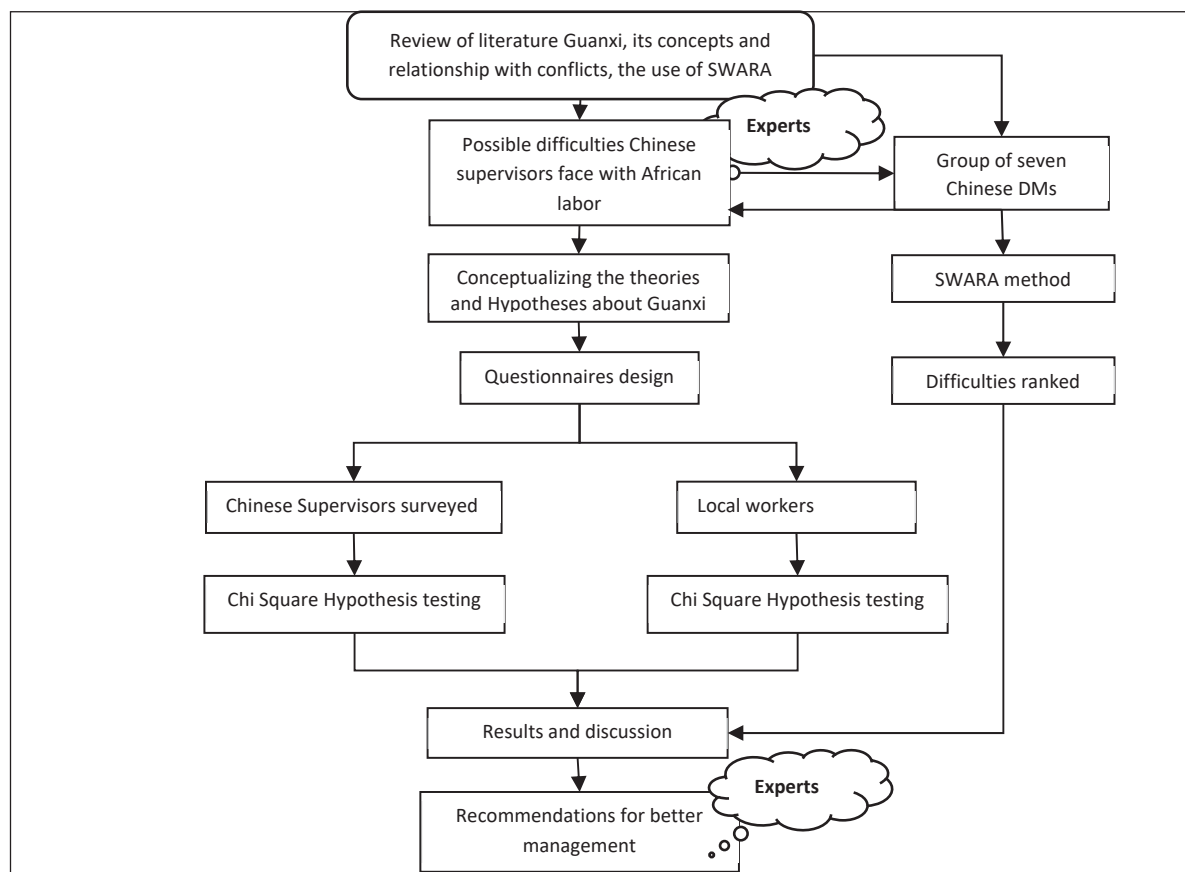


Fig.1: Adopted research framework

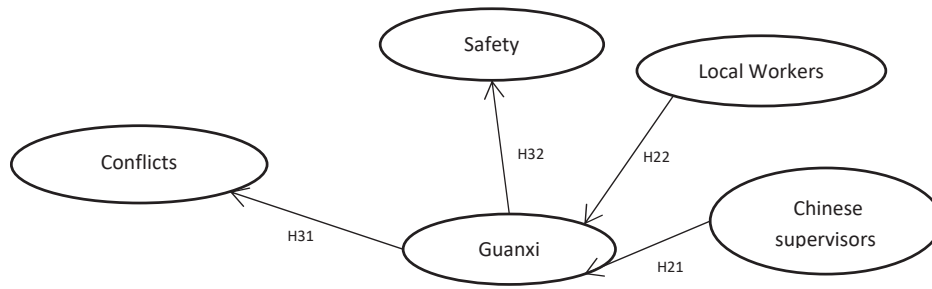


Fig. 2: Conceptual hypotheses stated on hydropower projects in Cameroon

Table 1: Questions statements mapping

Measures	Local workers questionnaire	Chinese Supervisors questionnaire
Treatment	S1,S2,S3,S4,S5	CQ1,CQ3,CQ6
Relationships	S6,S7,S10,S14,S15	CQ2,CQ4
Task giving/trust	S8,S9,S11,S12,S13,S16,S17	CQ7,CQ8
Conflicts	S18 to S23	
Safety practices	S24 to S27	

Table 2: Respondent's demographics

Sex	Chinese Managers(N=40)	Local Workers (N=526)
Male	35(87.5%)	443(84%)
Female	5(12.5%)	83(16%)
Age		
Less than 20	0	32(6%)
Between 20 and 30 years	2(5%)	385(73.2%)
Between 30 and 40 years	23(57.5)	82(15.6%)
More than 40 years	15(37.5)	27(5.2%)
Level of education		
Zero level	0	140(26.7%)
High School	0	365(69.4%)
BSC	10(25%)	21(3.9%)
MS	30(75%)	0
Years of Experience on International Projects		
Less than 2 years	0	75(14.25%)
Between 2 and 5 years	0	260(49.42)
Between 5 and 10 years	32(80%)	110(21%)
More than 10 years	8(20%)	81(15.4%)

managers were all working with African labor for at least 10 years and have a master degree or above. Among the seven experts, just two of them were women. *For the second and third research questions*, the two samples selected for the study were: 1- local workers in Chinese hydropower projects.2- Chinese hydropower engineers and managers working in Cameroon. Questionnaires were first sent to a sample of 526 local workers finding whether or not they are threatened based on the *guanxi* concept or not, then to a sample of 40 Chinese supervisors to identify if they naturally apply *guanxi* while managing

hydropower projects. From these two questionnaires, respondents were asked to rate each behavior they think is happening. Each group of behavior will represent one measure (personal relationship, treatment support, task giving) that was tested using a Chi-square goodness of fit and a t-test. For these surveys, the questions were mapped per factor such that the results would be analyzed per statement and per group. Table 1 shows a mapping chosen for the questions given to Chinese supervisors and local workers whereas Table 2 represents demographic representations of Chinese and local respondents

respectively.

For H22, the questionnaire items were developed as a result of an analysis of previous researches reports, and experts help. The questionnaire originally written in English was translated into Chinese, and then checked by being translated back into English to ensure conceptual consistency. The Chinese supervisors were first asked to give information about their age, level of education and international project experience. Secondly the participant had to answer questions about the behavioral and working routines dealing with local workers. For H21, H31 and H32 after getting basic information about the workers (age and experience with Chinese companies), they were asked to give their level of agreement on 1 to 5 scale level with all the proposed questions (17 statements for *guanxi* and 10 statements for conflicts and safety) that could define the *guanxi* practices in their respective working environment, and statistical information about conflicts and safety. To collect data for all surveys mentioned above, “wechat” questionnaires were used for Chinese supervisors and in person interviews were used for local workers. After a consistency study, the overall alpha was 0.88 for the workers and 0.93 for Chinese supervisors.

RESULTS AND DISCUSSION

Research question 1

The results in Table 2 show a very low participation of women in international projects, both from local workers (16%) and Chinese managers (12.5%). It can also be seen from Table 2 that most of the local

workers are young (79.2% less than 30) and relatively low education background (96.1% having just high school degree or less). Chinese managers are also young (57.5% between 30 and 40) but very well educated; They all have a university degree. As the sample selected was random and every respondent was asked freely to answer the questions, the answers can be assumed to be convergent.

As mentioned above, the nine difficulties that were returned from previous pilot survey were grouped by type and ranked using SWARA method. Table 3 shows the average values of the linker scale for each Decision Maker while rating the difficulties. The results on Chinese Experts opinion recorded in Table 4 suggest that the difficulty on establishing a friendly relationship with local workers on a project site is the most important difficulty encountered ($W=47.7\%$), followed by the fact of asking for leave or quitting suddenly ($W=25.7\%$) explained either by working conditions or malaria, that leads managers to recruit and waste time on training and finances. The language and cultural barriers difficulty is ranked third ($W=13.35\%$); Even if there are translators, Chinese managers believe that, most of the time, the task asked is different from the one received. Instead according to the experts, the last three ranked difficulties are, the fact of striking about getting what is on their contract (which should be explained by the low level of education), then involving family matters (which should be explained by the location of the project sites in remote areas) and finally assiduity. The experts believe that assiduity is not a very important

Table 3: DMs Averaged Matrix

Difficulty	E1	E2	E3	E4	E5	E6	E7	Exp. Scoring
D1 it's very hard to establish a friendly relationship with them;	5	4	5	4	5	4	4	4.42
D2 Family matters, they always place family before work deadline;	4	3	2	2	3	3	2	2.71
D3 The language barrier, even though we understand each other, still sometimes the task I ask, is different from task I receive;	3	3	4	3	4	3	4	3.428571
D4 They are trying to make a good impression about themselves, expressing that as gift giving, compliment saying or pointing out their work progress;	3	4	3	1	5	4	3	3.285714
D5 They are trying to get every benefit out of their contract;	4	2	3	2	4	3	3	3
D6 They ask for leave or quit suddenly;	3	4	5	3	4	3	4	3.714286
D7 They are often late, for work or for meetings;	2	3	1	3	3	2	1	2.142857
D8 They speak “between flowers”, they don't say directly what's on one's mind;	4	3	3	3	4	3	3	3.242857
D9 They like to play with phone in work time, as Wechat etc. social media sites	3	2	4	3	3	3	4	3.142857

Table 4: SWARA weight calculation

Difficulty	Expected Significance (S_j)	Coefficient $K_j = S_j + 1$	Calculated weight $Q_j = Q_{j-1} / K_j$	Scale Weight $W_j = Q_j / \sum Q_j$
D1	-	1	1	47.7%
D6	0.84	1.84	0.54	25.7%
D3	0.92	1.92	0.28	13.35%
D4	0.96	1.96	0.14	6.7%
D8	0.98	1.98	0.07	3.33%
D9	0.97	1.97	0.035	1.7%
D5	0.95	1.95	0.017	0.81%
D2	0.9	1.9	0.009	0.4%
D7	0.79	1.79	0.005	0.23%

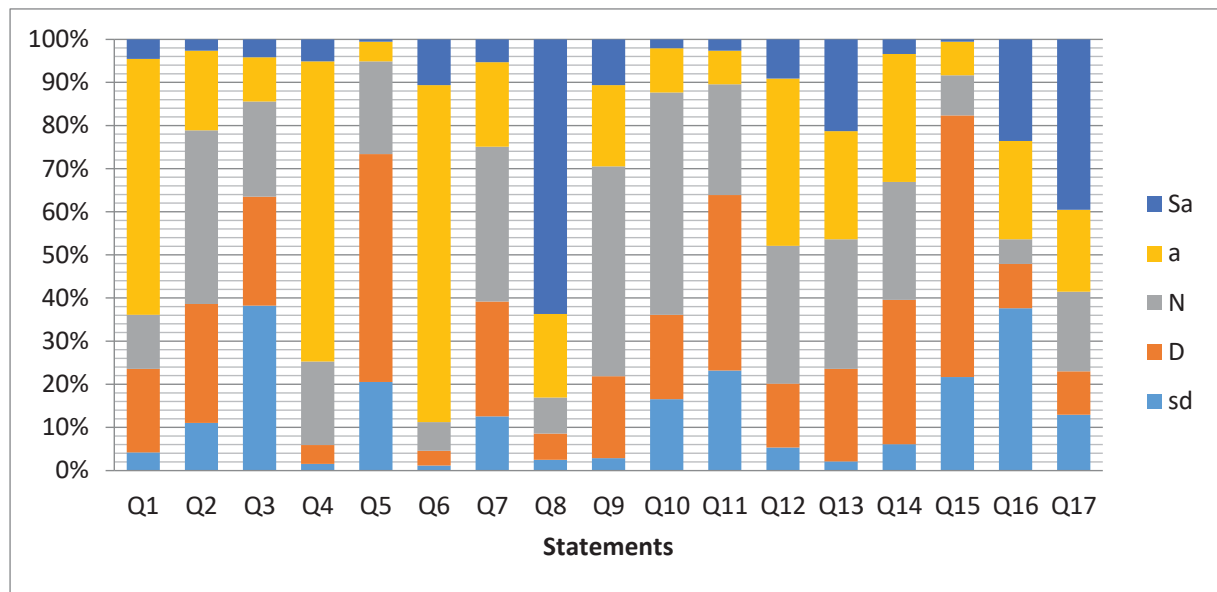


Fig. 3: Level of agreement of local workers on guanxi practices

issue as all local workers actually live on project site.

The rank of nine difficulties that are affecting the leader and employee relationship is revealing high involvement of all guanxi criteria (Interpersonal relationship difficulties, task giving and trust, working attitude) with D1, D6 and D3 topping the rank. It can be noted that, even the interpersonal issues are important in this cross cultural working environment, the language barrier, has its place and both parties should be involved, local workers should learn mandarin and Chinese managers as well should improve their English. D6, that deals with quitting and asking for leave frequently should be intrinsic to another issue such as conflicts or other external factors that will be undertaken by the workers survey.

Research question 2: Local workers survey

While performing the hypothesis testing on a Chinese foreign based working environment, the practices agreement for each factor measurement was generated. Before testing the hypothesis, it would be interesting to specify the quality or rates of agreements generated by the local labor working with Chinese contractors. From the graph on Fig. 3, it can be seen that not all the agreement factors on these management practices chosen through secondary data have been approved by participants. The most important management factors to take care of should be the Q8 and Q4 factor statements as they have the huger rate of agreement from the workers. The complexity of answers and possible inadequacies in the structuring

of agreement package may be a very good reason for the generation the final conclusion on *guanxi* practices. Therefore, a hypothesis testing on central tendencies of every agreement statement and factor is needed to make all the categories easy to handle and decide.

Hypothesis testing

To test H21: *Cameroon local workers do not believe Chinese supervisors cultivate “guanxi”*

while managing them,¹⁷ statements taken from the three mentioned *guanxi* criteria were tested according to the Likert answers recorded from the local workers survey. Table 5 shows the Kolmogorov normality values for each of the statements, allowing performing the t-test as all the distributions could be assumed to be normal.

The closest P_Value for Df=16 gives Xcrit =26 and a calculated statistic of X=4.35, so Xcrit>Thus, there

Table 5: hypothesis testing for local workers

Survey Statements	T value	χ^2	Mean	Kolmogorov Normality	Lower boundary	Upper boundary	Decision
S1 My manager treats me differently from other employees	1.956		105.2	0.129	-44.10	254.50	Reject
S2 My manager treats all the employees really bad	3.062		105.2	0.2	9.82	200.58	Retain
S3 My manager treats me very bad	3.360		105.2	0.2	18.26	192.14	Retain
S4 I often to invite my manager to lunch or dinner or give him a small gift to express my gratitude	1.565		105.2	0.2	-81.41	291.81	Reject
S5 Sometimes my manager invites me for lunch, dinner or gives me small gifts to express his gratitude	2.171		105.2	0.132	-29.35	239.75	Reject
S6 My relationship with my manager can be called friendship	1.368		105.2	0.097	-108.34	318.74	Reject
S7 My manager and I are just a professional relationship	3.751		105.2	0.134	27.32	183.08	Retain
S8 My manager knows which tasks I am good at, so he/she will arrange that kind of work for me	1.773		105.2	0.2	-59.55	269.95	Reject
S9 My manager gives me different tasks each time, depending on our project/goal	2.576	4.3 R E T A I N	105.2	0.2	-8.20	218.60	Reject
S10 My manager respects all points my contract	2.373		105.2	0.13	-17.91	228.31	Reject
S11 Sometimes I feel I can't fully trust my manager	2.949		105.2	0.065	6.16	204.24	Reject
S12 I am not satisfied with the relationship with my manager	3.058		105.2	0.163	9.67	200.73	Retain
S13 My manager will help me completely, if I have any professional or personal problems, I can seek his help	4.210		105.2	0.2	35.83	174.57	Retain
S14 My manager strongly demonstrated to employees that the relationship between supervisor and worker can only be a professional relationship	3.168		105.2	0.071	12.99	197.41	Retain
S15 My manager is very emotional, so we are not afraid to be emotional in the workplace and say everything as we want	1.867		105.2	0.187	-51.26	261.66	Reject
S16 Sometimes I feel I can't fully trust my manager	3.560		105.2	0.09	23.16	187.24	Retain
S17 We often have issues with the manager	3.871		105.2	0.12	29.75	180.65	Retain

is not enough evidence at 95% level of confidence to reject H21. This result means local workers actually believe Chinese Managers do not apply the traditional *guanxi* management on them. At 95% level of confidence, a t-test was also performed on all the seventeen statements presented to the workers about *guanxi*. The results on Table 5 reveal a rejection by the workers of statements such as: S1: “my managers treat me differently” with value =1.95 (which means Chinese managers actually treat every local worker equally). Statements S4, S5 and S6 with T_Values 1.565, 2.171 and 1.368 respectively were rejected, suggesting a very little friendly environment between the Chinese manager and the worker. This result is actually supported by S7: “My manager and I are just a professional relationship”, strongly retained with a T_Value =3.75. S13 “My manager will help me completely, if I have any professional or personal problems, I can seek his help” was strongly supported (T_value=4.21) suggesting that even the relationship between Chinese managers and workers is purely professional, there are regulations in the project contracts that is facilitating the help of workers if they had any difficulty while working on the dam project. Instead, S10: “My manager respects all points my contract” is rejected, explaining the conflict issues between Chinese managers and local workers. Table 7 explains the statements tested about conflicts and safety on hydropower project sites.

Chinese Supervisors survey

To test H22: *Chinese supervisors do not believe*

they cultivate “guanxi” while dealing with local workers. Eight statements taken from the three mentioned *guanxi* criteria were tested according to the Likert answers recorded from the Chinese Supervisors survey. As recorded in Table 6, the closest value for Df=7 and $X_{cal} 2.35 < X_{crit} =14$ shows that there is not enough evidence to reject the general null Hypothesis, and conclude that Chinese managers do not actually believe they practice *guanxi* on hydropower project sites. Table 6 also shows the T_Values for each statement; for example, some similarities such as equal treatment of workers is observed (CQ1 is supported with a T_Value of 4.55); Instead, Chinese managers believe they adopt friendship relationship with local workers, whereas the workers did not believe so. Also, the managers believe they know their team very well (CQ4 strongly supported (T_Value=9.85)) whereas Table 5 showed that the workers think oppositely. Following the difficulties ranking presented in Table 4, these results also support the fact that cultural barriers may create some issues with workers, though the managers think that leading Chinese workers is different from managing African workers. Finally, the results also reveal that all the “treatment” statements passed the approval and agreement from managers, whereas one statement about relationships and task giving were rejected.

Research question 3

As mentioned in the above sections, ten statements were given to local workers to test

Table 6: Hypothesis testing for Chinese Supervisors

Statements	Mean	T_value	Standard deviation	Component	Decision	X^2
CQ1 believe that as a leader of team I have to treat each team member equally	3.92	4.55	1.06	0.282133	Retain	2.3509
CQ2 I manage a team, where some of team members I see more loyal than others	4.07	10.6	0.53	0.381633	Retain	
CQ3 Me and my employees we have only professional relationship, we are not friends	2.97	-0.22	0.95	0.0003	Reject	
CQ4 When I receive new project or task, I know my team so well, that I know exactly which task give to whom	4.07	9.856	0.57	0.381633	Retain	
CQ5 I think that each of my team members have similar abilities, and I can trust with anything (professional or personal) each member equally	2.07	-4.7	1.06	0.2883	Reject	
CQ6 There are some team members I cannot get along with, because of cultural differences	3.83	5.173	0.84	0.229633	Retain	
CQ7 I think that I am adopting more to western culture in workplace than showing them mine	3.77	5.51	0.73	0.197633	Retain	
CQ8 To lead Chinese workers is the same as African workers	1.67	-0.800	8.87	0.589633	Reject	

Table 7: Hypothesis testing on conflicts and safety

Conflicts statements DF=16,P=.05	Strongly disagree 1	Disagree2	Neither agree or disagree 3	Agree 4	Strongly Agree 5	<i>X</i> ²
S18 I often disagree with my manager	31(6%)	15(3%)	157(30%)	123(23%)	200(38%)	27.4
S19 The way the manager is handling human relationship is frustrating me	13(2.5%)	23(4.5%)	57(11%)	234(44.5%)	199(37.5%)	
S20 There are many disputes among local workers	312(59%)	189(36%)	5(1%)	17(3.5%)	3(0.5%)	
S21 There are many disputes between local workers and Chinese managers	4(0.76%)	11(2%)	145(27%)	167(32.7%)	199(37.5%)	
S22 I feel compatible working with European rather than Chinese contractors	222(42%)	112(21%)	132(25%)	35(7%)	25(5%)	
Safety assessment DF=16,P=.05						
S23 I feel safe while working on Chinese projects	135(25.7%)	202(38%)	184(35%)	1(0.3%)	4(1%)	24.9
S24 There is safety training before working on the project site	167(32%)	145(27%)	110(21%)	54(10.3%)	50(9.7%)	
S25 I work with EPI	0(0%)	1(0.3%)	170(32%)	199(37.5%)	156(30.2%)	
S26 The manager brings us to hospital for care after a reported injury	133(25%)	245(47%)	140(26%)	4(1%)	4(1%)	
S27 There are worker death cases because of managers negligence	88(17%)	198(38%)	154(29%)	63(12%)	23(4%)	

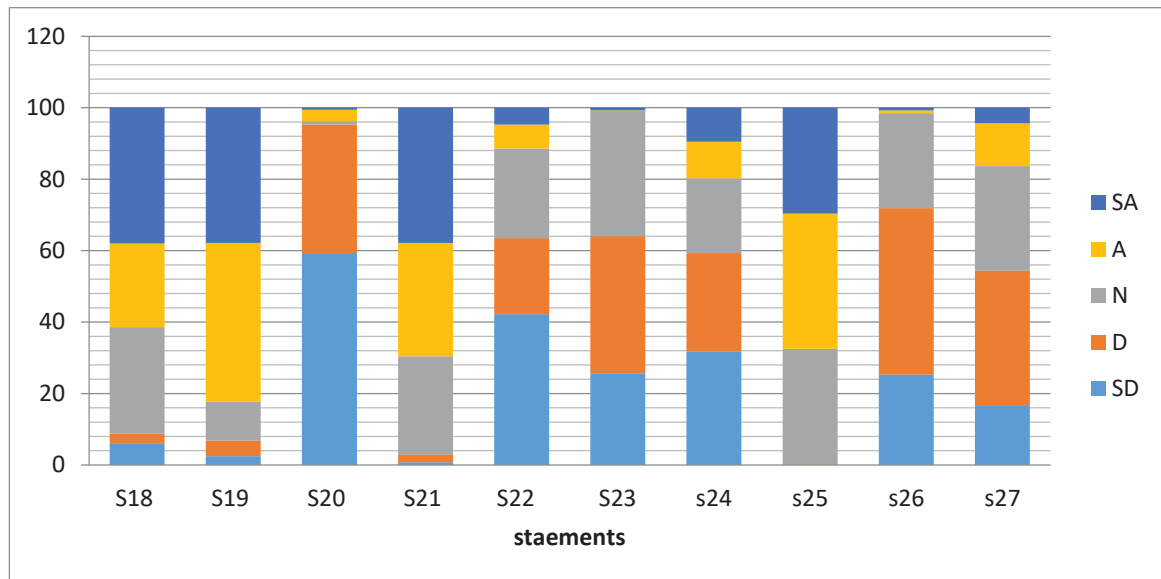


Fig. 4: local workers agreement level on conflicts and safety statements

the level of conflicts and safety standards. Fig. 4 shows the agreement level of workers on safety and conflicts statements. The result of hypothesis H31 recorded in Table 7 showed that $X_{calc}=27.4$, $X_{crit}=26.29$, $Df=16$, $P=0.05$. Therefore the null hypothesis was rejected ($X_{calc}>X_{crit}$). This result revealed that there is significant conflict relationship between Chinese contractors and local workers on

hydropower projects in Cameroon. Similarly, the result of hypothesis H32 showed that $X_{calc}=24.90$, $X_{crit}=26.29$, $Df=16$, $P=0.05$. Therefore the null hypothesis was retained ($X_{crit}>X_{calc}$). The result suggests that there is a lack of safety standards of local workers on Chinese hydropower projects in Cameroon. The results in Fig. 4 show a very high rate of disagreement between Chinese managers

and local workers while undertaking tasks on project sites (S18: 38% strongly agreed and 23% agreed that they often disagree with their managers). Also, more than 80% of workers agreed to S19, suggesting a high rate of frustration of local workers on Chinese international hydropower projects. More than 95% of workers disagreed having disputes among them (S20) whereas around 70% agree having disputes with Chinese contractors (S21); this should be the result of lack of trust reported in the previous parts. Fig. 4 also shows through S23 that at least 25% of local workers do not feel safe working on Chinese projects and not less than 60% disagreed with the fact that they have safety training before or while working on project sites. What is most crucial is the fact that more than 71% of the workers disagreed with the fact that the Chinese manager brings local workers to hospital after a reported injury (S26) and around 15% believe that there are worker death cases because of managers' negligence on project sites either related to tropical diseases or accidents on site. The analysis further reveals that the high scoring is mostly related to: (1) interpersonal relation; (2) communication; and (3) project management. Implementation of human-related aspects will help to improve the trust among all parties. As showed before, neither Chinese contractors, nor local workers believe that Chinese traditional business style of "*guanxi*" is applied on hydropower projects in Cameroon.

Discussion

As the results have shown, the hypothesis "H21: Cameroon local workers do not believe Chinese supervisors cultivate "*guanxi*" while managing them." And "H22: Chinese supervisors do not believe they cultivate "*guanxi*" while dealing with local workers." Were both supported, suggesting that Chinese engineers do not apply *guanxi* management concept on local workers on hydropower projects in Cameroon. This finding follows the results of Tchumtcha (2021) who found in practice that the Chinese only use *guanxi* management approach when certain stakeholders such as project owners and sponsors but never with African local workers, creating unhappiness, also (Wang and Huang (2006) showed in their research that Chinese engineers use "relation/*guanxi*" among the key stakeholders as the most important criterion of project success while neglecting local workers. Similarly, "H32: Local

workers are not safe to work on Chinese projects." was also support whereas

"H31: There isn't a conflict relationship between Chinese supervisors and local labor" was rejected, showing conflicts relationship between Chinese managers and local workers that has developed an unsafe feeling from the workers point of view, highly influenced by the lack of trust and decent communication explained earlier. As a consequence, there is a lack of safety climate standards on hydropower project sites undertaken by Chinese companies in Cameroon. This result follows the discussion made by Sun *et al.* (2019) who proved a positive relationship between competence related to handling interpersonal relationship conflicts and project success and Shepherd *et al.* (2021) who proved the influence of communication and trust in the safety of workers in a construction industry. Hence, Chinese foreign investors in Africa must use their "*guanxi* knowledge" to establish better institutional connections with locally owned partners, workers and government (Peter, 2006), thus, there is a need for involving "*guanxi*" in the network management, and improving safety practices on project sites. Thus, involving *guanxi* in the network management and improving safety practices is imperative. It will not only help stakeholders become able to make efficient policies and preparedness for response plans that will protect their safety and security (Bouba and HongXia, 2022), but also improve project management and workability.

Recommendations

Some recommendations would help Chinese contractors to handle the current scenario and improve both management and safety on construction sites, especially hydropower projects. The results proved that both local labor and Chinese contractors pay attention to work engagement and profit more than building a relationships and trust. Chinese contractors have to make deeper research about local customs, language, religion and traditions that might lead to basic compromise, or changes. Otherwise friendly and successful team membership might be at risk. Also, the '*guanxi*' concept of human resource management is specific for the Chinese economy. When trying to implement this concept in international projects, the Chinese face certain difficulties. For example, in European countries,

some principles of this management concept border on criminal liability, especially in terms of conspiracy, up to financial fraud. In Africa, where projects usually deal with their own issues of corruption, Chinese companies will have to resale their overseas project management and tend to treat local workers as they treat more important stake holders. For that including every leg of “guanxi” in manager-worker relationship is imperative.

Interpersonal relationship: People who spend time together at work, at home, in towns, in public institutions, in sales outlets, can be considered a social network which boundaries are determined by its members. That’s why in work environment, it is important to be part of a guanxi network. In this case, Chinese managers working in Africa especially should think how guanxi can be useful and what service it can offer. *Guanxi* ways are flexible, efficient, and accessible and can provide security, avoid confrontation, reduce transaction costs, provide the necessary resources, increase the business network and get significant commitments. Local workers might change their conflict behavior leading to unsafe situations, they can change links and networks based on the opportunities offered, the complexity, the circumstances in the personal or professional area, and not subject to externally imposed terms. On the contrary, they want this mutual obligation to enjoy and make them more attractive to the work they perform.

Gift giving: From an ethical perspective, it is very difficult to predict when to give a gift and what kind of gift to choose. Based on the amount of demand and recipient’s social status, the gifts that are expected can range from a simple fruit basket or chicken roast to a common meal. There are some rituals that characterize the guanxi gift process. The most important thing is that a gift can be rejected from one to three times. A Chinese delegation traveling abroad often comes with a huge amount of gifts. Large parts of the Chinese accept gifts without even wanting to engage in relationships, and would rather not go through difficulties that come with an obligation for at least three reasons. First of all, any type of refusal has the risk of losing reputation or importance. Second, it shows that a person does not want to enter into relationships and help. Thirdly, most people are open to new offers, because it means that their guanxi network will be replenished,

with the same knowledge that they engage in debt by engaging in relationships, so others will be indebted to them. So this is why Chinese contractors can apply the same method with their African workers. Cheap but meaningful gifts such as soap, used clothes, medicine, or mosquito nets would be appreciated.

Involving safety training: before starting to work on a project site, local workers, whose education level is proven to be relatively low, would need training on ethics and safety. Safety tools videos and lessons can be taught, methods to fight against malaria and other tropical diseases can be spread. This will not only reduce unsafe behaviors leading to accidents but also improve the project atmosphere.

Review employment Contracts: Chinese contractors should review their employment agreements for fairness, thoroughness, and legal compliance towards local workers. Healthcare programs and death handling should be integrated.

CONCLUSION

In a culturally diverse environment, improving project and safety management in Chinese infrastructure construction in Africa is imperative so that projects become less risky for contractors and help local governments to make efficient policies and response plans that will protect the local workers on project sites. As many conflict situations leading to dispute and safety issues were reported, as *guanxi* is rooted in Chinese society and management styles, this research attempts to sort out and rank all difficulties Chinese managers encounter or if they apply the actual guanxi while undertaking hydropower projects in Cameroon, and whether or not *guanxi* is implicated in Sino-Cameroonian workers conflict and safety. As the results of this study revealed, the language barrier and interpersonal issues happen to be the highest ranked difficulties, explained by the fact that *guanxi* management style is not applied on Chinese hydropower projects. To reduce the proven conflict relationship and the lack of safety on project sites, there is need for involving *guanxi* in the network management, and improving safety practices on project sites. The findings deepen understanding on both the positive and negative effects of *guanxi* in hydropower project management. Given the importance and the prevalence of guanxi practice in the Chinese context, this study has direct implications on how Chinese managers should interact with local

workers. One of the limitations of this study is the lack of direct relationship study between guanxi, safety and conflicts indicators.

AUTHOR CONTRIBUTIONS

A. Bouba Oumarou performed the literature review, questionnaire design, analyzed and interpreted the data, prepared the manuscript text, and manuscript edition. L. HongXia performed the corrections, results explanations and software tutoring. C.A. Mbom performed the review of the paper.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors.

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ABBREVIATIONS

%	Percentage
<i>DF</i>	Degrees of freedom
<i>DMS</i>	Decision makers
<i>HRM</i>	Human resource management
<i>LMG</i>	Leader-member-guanxi
<i>LMX</i>	Leader member exchange
<i>N</i>	Population size
<i>n</i>	Sample size
<i>NGO</i>	Non-Governmental Organization
<i>p-value</i>	Probability value
<i>SWARA</i>	Stepwise Weight Assessment Ratio Analysis
<i>T_Value</i>	Value of the t test statistic
<i>TOPSIS</i>	Technique for Order Preference by Similarity to Ideal Solution
<i>X² calc</i>	Calculated value of statistic in chi-square goodness of fit test
<i>X² crit</i>	Critical value of statistic in chi-square goodness of fit test
<i>Z</i>	Value of the statistic

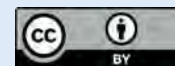
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ORIGINAL RESEARCH PAPER

Designing and explaining the improvisation model in the organizational entrepreneurship process

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ABSTRACT

BACKGROUND AND OBJECTIVES: Improvisation befalls during work and one cannot relieve the response to the challenge and take action after thinking and planning. Improvisation can also enable organizations to be flexible and adapt to complex and turbulent conditions. Extensive researches have been conducted in the field of organizational entrepreneurship, but as far as experts have examined, the design of organizational entrepreneurship model with an improvisational approach has not been considered by researchers in this field, so the issue has remained largely unknown among researchers. Therefore, the objective of the current study is to design and illustrate the improvisation model in the organizational entrepreneurship process in 22 districts, organizations, and companies affiliated with the Municipality of Tehran.

METHODS: The present study is an exploratory study using a mixed approach (qualitative-quantitative). A semi-structured and in-depth interviews were conducted with 9 experts in The Municipality of Tehran and university professors. Next, through the implementation of the coding process and expert approval, four dimensions were identified, including human, facilitator, behavioral and environmental factors. In the quantitative part, the statistical population consists of 63,000 managers and experts employed in 22 districts, organizations and companies affiliated to the Municipality of Tehran. The sample size was estimated through Cochran's formula of 381 people and to validate the model, a 47-item researcher-made questionnaire was designed and distributed to the available sample members. The data were statistically analyzed in a quantitative section to analyze the path and test the hypotheses by PLS3 software.

FINDINGS: In the qualitative part, four main components and the related matrixes of human factors, facilitating factors, behavioral factors, and environmental factors, were identified. Indicators of facilitating factors including support and motivational policies, human factor indicators including strategy and personality traits, behavioral factor indicators including communication and culture, and environmental factor indicators including internal and external organizational factors. The results in the quantitative section also showed that environmental factors with 0.324 and behavioral factors with 0.249 had the highest and lowest impact on organizational entrepreneurship with improvisation approach, respectively. Finally, the native model is obtained by explaining the coefficients of the path in each section.

CONCLUSION: Local government managers need to create a creative environment in which employees can come up with ideas and participate in decision-making. In short, organizations respond quickly and dynamically to environmental and critical situations. Hence and according to the results, it turned out that not everyone can be a successful entrepreneur or make an improvised decision, and not all organizations can implement their entrepreneurial spirit with an improvisational approach, because these cases require different capabilities that the people in question must have.

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INTRODUCTION

In recent years, organizations have undergone rapid transitions, including changes and increasing risk, forcing their environment to adapt and make selective choices. Under these conditions, organizations succeed in surviving a turbulent business environment that is more flexible and able to adapt to the environment (Dana et al., 2021). Due to changes in the environment and the uncertainty of today's environmental conditions, large organizations have been unable to develop flexibility, speed and creativity (Tajpour and Salamzadeh, 2019). In particular, the managers of these organizations want to gain a competitive advantage over other organizations that need to make the right decisions to achieve a high competitive advantage for growth (Hosseini et al., 2020). In the past decades, to operate in such an environment, most organizations have chosen the strategy of reconstruction and reengineering in response to the challenges of environmental change, but now other approaches and solutions of the past have not the ability to meet organizational challenges and lost the external environment which is better to replace them with new approaches and perspectives (Latif et al., 2020). Researchers believe that management and organizational behavior thinkers attribute the success of today's organizations to a large amount of creativity, innovation and entrepreneurship (Liu, 2021). In order to achieve this, entrepreneurial activities should be promoted in organizations to create an entrepreneurial spirit in employees and ultimately create an entrepreneurial environment in the organization (Hassani et al., 2016). Companies that demonstrate organizational entrepreneurship, when they emerge, are often identified as dynamic, flexible, and ready units to gain competitive advantage and new business opportunities (Kuratko, 2012). These organizations explore new areas of business as well as new ways of doing business in existing areas. In other words, entrepreneurship grows in the organization when individuals are free in their actions and initiatives regardless of the rules (Kuratko et al., 2014). This inquires about contributes to the organizational business writing in three primary ways. To begin with, it illustrates the victory of the organization by supporting the act of spontaneity of business visionaries. In this approach, valuable concepts from the specified writing are

considered, since it puts vital knowledge within the suitable setting of the organization, which reinforces the ability of entrepreneurial behavior within the victory of the organization. Second, it shows that entrepreneurial behavior helps to promote the theories of senior managers. Third, explains the relationship between entrepreneurship and improvisational behavior in organizational success. From a practical point of view, the main purpose is to show that improvisation as a new skill and method is at the top of decision-making and in order to formulate and expand and solve problems related to the subject or area under study, which is to increase organizational entrepreneurship to be designed and implemented in the organization. The Municipality of Tehran is a public non-governmental organization which the main share of its revenue is from the sale of building density for real estate and construction. The Municipality of Tehran is a self-governing organization which has no government budget other than a small portion of its financial resources, which are exclusively allocated by the government to the public transportation (Moradi et al., 2022). In the Municipality of Tehran, the environment faces various changes and challenges for various reasons that make managers and decision makers to promptly reduce the impacts. To do so, challenges such as lack of access to consultants and educational institutions with effective function in training municipal staff, lack of management and even the employees themselves from supporting the working groups, lack of attention to entrepreneurial capacity, insufficient financial and legal facilities, force managers to be able to respond to them without wasting time. Covid19 also changed the mindset of each person overnight. Organizations were forced to make many decisions in a short period of time. Decisions on how to respond to environmental challenges and how to prevent crises. In this situation, Covid 19 has created a collective stress and has caused the whole organization to be involved and disrupt its activities. Also, it seems that if the organization is not responsive in time, its persistence in the environment is disturbed. Therefore, managers and members of this organization should be able to not only make improvised decisions about the organization but also to strengthen this ability in themselves. Therefore, in such situations, organizations may implement deregulation to reorganize their operations to increase transparency, openness, and credibility so

that they can improve better in such situations. In fact, this is a mechanism that can guarantee both customer satisfaction and compatibility with Covid 19. For this reason, it is necessary to identify the factors affecting organizational entrepreneurship with an improvisation approach in the Municipality of Tehran, and through this, by using brainstorming with experts and reviewing solutions and strategies for implementing improvisation in the organization be identified. From a theoretical point of view, the goal is to increase scientific knowledge about events and phenomena in the environment inside and outside the organization and react to them simultaneously during the action, which will be achieved by examining the factors affecting improvisation in the organization. And from a fundamental point of view, by applying theories in the field of experience and practice of experts (through field research), in fact, the designed model in the field of practice will be tested and the extent of its application in an organization like the Municipality of Tehran will be examined. From a developmental point of view, due to the use of improvisation in responding quickly to problems and issues, rapid use of opportunities and waste of financial energy and human resources in the organization will be minimized and will lead to the development of organizational performance and organizational entrepreneurship growth. Extensive researches have been conducted in the field of organizational entrepreneurship, but as far as experts have examined, the design of organizational entrepreneurship model with an improvisational approach has not been considered by researchers in this field, so the issue has remained largely unknown among researchers. Thus, this research can help improve decision makers' understanding of the appropriate organizational context under which entrepreneurial improvisational behaviors increment the probability of new venture capital success. Therefore, the purpose of this study is to prepare a model to explain the improvisation approach in the organizational entrepreneurship process in the municipality. The following paragraphs concern the theoretical foundation and the background of the improvisation model in the organizational entrepreneurship process. After that, the research method and hypotheses will be presented along with the analysis of the effect of the improvisation model in the organizational entrepreneurship process.

Then, the research design, the data set, as well as the measures are presented, and following that, the survey results will be provided. The discussion and conclusions will be presented in the final section.

Background research theories

Organizational entrepreneurship

Today, entrepreneurship development is recognized as an important part of the tasks of any organization in any society and have a key role in improving the entrepreneurial skills of employees (Davey *et al.*, 2016). Organizations have to make economic and environmental changes to foster their entrepreneurial environment in order to attain and ensure worldwide competition, growth and development of relationships as well as its survival (Bolton and Lane, 2012). Research and identification of factors that could potentially contribute to the development and growth of entrepreneurial organizations is essential. Business leaders often fail to identify the factors that can enhance business performance. In this manner, to develop a business entrepreneurial environment, it is essential to practice entrepreneurial behaviors and processes in order to urge more comprehensive understanding of related behaviors (Bakytgul *et al.*, 2019). Given that changing the organization requires changing the behavior of its members, this will not be very effective and sustainable without identifying and finding an accurate picture of its current state (Tajpour and Hosseini, 2020). Wales and Engen (2006) state that the need of organizations for the phenomenon of entrepreneurship and the dependence of the survival of an organization depends on this phenomenon, creates a specific area of this concept called organizational entrepreneurship. Organizational entrepreneurship is a series of activities that leverage competitive advantage to enable organizational innovation and is an approach for institutionalizing organizational innovation (Soini *et al.*, 2018). One of the desirable mechanisms for organizations to respond quickly and appropriately to the ever-increasing changes in the business environment, is to establish entrepreneurial organizations. Entrepreneurial organizations, through institutionalizing entrepreneurship within themselves, enable the implementation of organizational entrepreneurship dimensions (Tajpour and Hosseini, 2021 a). Organizational entrepreneurship is the process of

activating organizational performance. In fact, the benefits of organizational entrepreneurship include innovation in product and service design, innovation in organizational processes, and improvement in organizational efficiency and effectiveness (Baron and Hannan, 2021), it also plays an important role in economic development and wealth creation (Hartley *et al.*, 2013).

Improvisation

Organizational improvisation, inspired by jazz, which has entered the organizational theories in the late 1990s, is still in its development stages (Hassani *et al.*, 2016). Cunha *et al.* (1999) state that businesses operating in changing and turbulent environments can use organizational improvisation as their competitive advantage and in the case of emerging problems in the organization, improvisation can be the answer to going back to normal. Santos and Garcia (2007) believe that if an opportunity is identified in the environment, improvisation can be used to take advantage of change and improvement. Most successful organizations use improvisation when their strategic plans fail to meet expectations. (Mannucci *et al.*, 2021). Organizational improvisation, introduced in the mid-1990s, was an attempt to extend the scientific findings of music (especially jazz) and theater (especially Comedy Theater) to the organizational realm, in order to offer new solutions to actions appropriate to the new organizational era (Hassani *et al.*, 2016). Improvisation emphasizes the need for innovation, creativity, adaptability and management in turbulent situations (Klein *et al.*, 2015). Improvisation can be considered as a tool by which organizations can use the resources (emotional, cognitive, and social) available in critical situations at the right time to advance their goals (Arend, 2020). Therefore, researchers have considered the most important features of organizational improvisation to be urgency, utilization of all available resources, without planning or prior plan and intention, spontaneous and appropriate to the situation and considered the lack of time as the most important dimension of organizational improvisation (Boyer, 2009). Sawyer and DeZutter (2009) believe that space is created for collective improvisation in the interactions between the people involved, which fosters a culture of collaboration. Such interaction can create positive and enjoyable experiences,

feelings of worthiness, independence and pleasure, all of which are important and vital for individuals to participate in creative collective activities (Treffinger *et al.*, 2021). In general, proper use of improvisation can protect the survival of many organizations in the face of crises. The main reason improvised decision-making succeeds or fails in organizations is that managers differ in their perceptions of the situation, so two managers can make different decisions in the same situation (Smith and Grimm, 1987). This is because managers have greater freedom of decision-making and are able to make decisions at their own discretion, especially in crisis situations where there is no opportunity for planning and consultation (Tajpour and Hosseini, 2021b). Cunha and Clegg (2019) also consider improvisation to require minimization of organizational structure and processes. Therefore, for improvisation, there must be a safe and reliable environment in the organization and people must have various skills. In changing circumstances, the importance of predetermined goals fades quickly. To this end, for an organization to improvise successfully and effectively, the organization's goals must not have a high degree of certainty. Because in improvisation, the goal changes in the process (Akgün and Lynn, 2002). As a result, having appropriate information and not having complexity and changing them in a short period of time can be a great help to decision makers (Sayegh *et al.*, 2004). Capability of financial resources represents an entrepreneurs' perception of the availability of financial capital involved in making decisions related to the enterprise (Wiklund and Shepherd, 2005). Obviously, achieving entrepreneurial success requires resources (Mousa *et al.*, 2013). Lack of access to financial resources for open strategic options is prohibited for entrepreneurs (Tushman and Anderson, 1986) and this can undermine the opportunity to reap the benefits of improvised behavior performance. Entrepreneurs usually need to remain flexible to implement new strategic decisions in order to develop and improve their efficiency (Mullins *et al.*, 2009). Access to larger financial capital allows entrepreneurs to pursue new opportunities for growth (Penrose and Penrose, 2009), which in turn support resource growth strategies. Thus, access to more resources facilitates improvisational behaviors, as entrepreneurs are likely to take new action unexpectedly that could improve performance (Dickson, 1997). Conversely,

improvisation with limited resources may lead to negative strategic choices (Baker and Nelson, 2005). Hence, improvising is a smart choice, not a random act. In a research, Moradi *et al.* (2021) concluded that organizations operating in a dynamic environment, lead to entrepreneurial activities through improvisation and gain a competitive advantage in critical situations. In an article entitled Teaching Creativity and Innovation, Treffinger *et al.* (2021) concludes that these interactions can create positive and enjoyable experiences, feelings of competence, independence, and fillings of joy, all of which are essential to individuals to participate in creative collective. Dana *et al.* (2021) in a study entitled the impact of entrepreneurship education on business development showed that successful organizations survive in the business environment, that have the ability to adapt to the environment and provide entrepreneurial training to employees to provide knowledge, the skill and motivation to enhance the success of entrepreneurs. Mannucci *et al.* (2021) in an article entitled developing improvisation skills concluded that when successful organizational plans fail to meet expectations, most successful organizations use improvisation. The results of Arend (2020) research showed that improvisation can be considered as a tool by which an organization can use the appropriate opportunities to do things in critical situations. The results of Latif *et al.* (2020) study entitled the effects of entrepreneurial leadership on project success, also mention improvisation as a tool to meet environmental challenges. Fisher and Bart (2019) stated, that improvisation causes fear as well as experiences of aimless performance. A study by Charoensukmongkol (2019) investigated the effects of mindfulness to improvised behavior and its implications for business performance and entrepreneurial stress during recessions. The results of this study showed that mindfulness related to the amount of improvisations behavior exhibited by entrepreneurs with higher levels of improvisation have better job outcomes and less stress. Hu *et al.* (2018) in a study entitled Supervisory focus, environmental turmoil and entrepreneurs improvisation, concluded that the emphasis on promotion rather than focus on prevention was strongly associated with improvisational entrepreneurship and environmental anxiety between the two methods focused on prevention

Nisula and Kianto (2018), in an article titled fostering organizational creativity through improvisation, found that learning to improvise, can break patterns and habits and it can create both individual and collective creativity in the organization, as the improvisation leaves no room for self-criticism. Hassani *et al.* (2016) in their article entitled the relationship between transnational leadership and organizational identity with organizational entrepreneurship states, that managers use of transnational leadership styles and organizational identities by managers will enhance participants' entrepreneurial behavior. Therefore, it can be said that the purpose of this study was to develop an organizational entrepreneurship model in 22 districts, organizations and companies affiliated to the Municipality of Tehran, taking into account the improvisation in the decisions of this organization, which was conducted in Tehran in 2020.

MATERIALS AND METHODS

The present study is developmental, goal based and mixed (qualitative-quantitative) in terms of data collection. For this reason, researchers seek to answer the question of how to develop and account for ad hoc model in organizational entrepreneurship process? The first part of this study was extracted from library sources related to the concepts of organizational entrepreneurship and improvisation, and the selection criteria for written texts were the terms and derivatives of organizational entrepreneurship and improvisation. The second part was an interview with 9 managers of the Municipality of Tehran, which was conducted in September and October 2020. The statistical population includes scientists from academic (having at least two articles in the related fields) and executives (all the managers of Tehran Municipality with more than 10 years of experience in the organizational entrepreneurship). The interviews were intentionally continued until researchers reached theoretical saturation. A semi-structured interview using the 5w1h technique to answer questions such as how, why, what, where, who, and when were conducted. The code extracted from interview 9 was saturated and no further interviews added new code to the old code. This number of samples was sufficient for the interview section. In order to analyze the data and perform the coding, Atlas ti version 8 software was used. To validate the utilized tools, three methods were used,

Table 1: Cronbach's alpha, combined reliability and Average Variance Extracted (AVE)

Variables	Questions	Cronbach's alpha	combined reliability	(AVE)
Facilitating factors	1-10	0.751	0.889	0.800
Behavioral factors	11-20	0.734	0.883	0.790
Human Factors	21-29	0.855	0.932	0.873
Environmental factors	30-43	0.930	0.966	0.935
Organizational entrepreneurship with an improvised approach	44-47	0.939	0.950	0.705

including two questionnaire writing tools, editing the questions by the experts, and finally reviewing the questions by conducting two preliminary interviews. The reliability of this research has been achieved by reaching the theoretical saturation stage up to sample 9 have been done. The reliability coefficient was 76% based on the agreement between the two coders. The strategy of the present study was based on the coding process of [Strauss and Corbin \(2008\)](#). In the quantitative part of the data collection, the researchers made questionnaire with 47-item on a 5-point Likert scale (1. Strongly disagree, 2. Agree, 3. No comments, 4. Agree. 5. Strongly agree) was used. The statistical population includes 63,000 employees of 22 districts, organizations, companies and institutions affiliated to the Municipality of Tehran. Based on Cochran's equation, the number of samples examined for structural equations with 95% confidence level and 5% error level using available samples was 381. Data analysis was performed using Smart PLS 3 software with partial least squares method to study the relationship between hidden and explicit variables. The reason for using this software was the lack of need for normal distribution. The reliability of the questionnaire was assessed and verified through the reliability of its content and structure. The views of supervisors and consultants were used to measure the reliability of the structure, the model of the structural equation, and the reliability of the tool contents. If there is agreement between different people about the validity of the test, the test is valid in terms of content. To verify the validity of the questionnaire it has been sent to 13 experts from the university who had at least two articles in the field of entrepreneurship and were familiar with the subject of improvisation and research project and the executive part includes all managers of the municipality who have more than 10 years of work experience and long-term acquaintance with

the topic of entrepreneurship in the organization. Finally, with some minor modifications, a 47-item questionnaire was developed using the Press Line website and a link to the questionnaire was sent to the statistical sampling. In the measurement model, the model's internal consistency or confidence level is measured by calculating the combined reliability and Cronbach's alpha coefficient. The reliability coefficients are shown in [Table 1](#). In the current research model, all structures have high composite reliability and are greater than the standard index of 0.7. Indeed, compound reliability demonstrates the high internal reliability of research data. Cronbach's alpha values above 0.7 are also acceptable reliability.

The current study have been carried out in Tehran in 2020.

RESULTS AND DISCUSSION

The authors reached the theoretical saturation point after conducting nine interviews. Briefly, the interviews were conducted by asking questions about the "organization's ability to improvise in the entrepreneurship process" (open interview) and also used two stages of open coding and central coding.

The questions posed in the interview were as follows: What the most important context for creating organizational entrepreneurship with an improvisational approach is? What factors will drive the entrepreneurship of the organization with its impromptu approach in the Municipality of Tehran? What will be the consequences of an organized startup with an improvisational approach in the Municipality of Tehran? Which executives enter the organization's business with an impromptu approach? To facilitate analysis, interviews have been implemented and tabulated. After reviewing the recorded interviews and notes, the overall concept of the interview was developed. Then each respondent was assigned codes A1 through A9. After research and refinement,

all concepts fit into 15 categories and 211 codes. Extracted summaries, simplifications, and duplicates have been removed. Thus, 4 main dimensions, 8

components and 43 selected codes were counted. Finally, the basic themes were categorized using the software presented in [Table 2](#).

Table 2: Encoding process results

Dimensions	Components	Selected codes
Facilitating factors	Supportive policies	Direct access to competent educational institutions Leaders support working groups Organizational Rules and Regulations Facilitate personal development of employees Ensure organizational employment Holding training workshops
	Motivational policies	Acquiring specialized skills Service compensation system Flexible organizational structure Encouraging change as employee motivation
Behavioral factors	Communications	Information exchange between employees Trust and integrity between employees of the organization External and internal communication of the organization Mass media
	Cultural	Contact with successful entrepreneurs Employee Work Culture Positive Behavior Feedback in Failure Belief in Growth through Work Process Innovation Focusing on Organizational Results Entrepreneurship Culture
Human Factors	Individual characteristics	Ability to work with limited resources in critical situations Employee skills and abilities Positive values and beliefs about entrepreneurship Improvement in decisions Making the right decisions when improvising Strategic Insights Strategic Alliances
	Individual strategies	Paying Attention to Perspectives Opportunities to Plan at the Right Time
Environmental factors	Intra-organizational	Access to organizational financial resources Working capital Entrepreneurial orientation of the organization Technical infrastructure How to measure performance Labor cost Existence of non-financial resources for innovative activities
	Extra-organizational	Understanding the current and future needs of customers Acknowledge competitors Existing workforce Changing and coordinating the capabilities and strategic resources of the organization with the environmental conditions Existence of entrepreneurial opportunities Market heterogeneity and market turmoil Legal infrastructure of the organization

According to Table 2, which shows the dimensions and elements of the questionnaire, the following research four hypotheses were formulated:

1. Facilitating factors have a significant influence on entrepreneurship and improvisational performance;
2. Behavioral factors have a significant impact on entrepreneurship and improvisational performance;
3. Human factors have a significant influence on entrepreneurship and improvisational performance;
4. Environmental factors have a significant influence on entrepreneurship and improvisational performance.

To evaluate the reliability of the questionnaire, two criteria of Cronbach's alpha and combined reliability were used. Studies show that the value of the Cronbach alpha coefficient and the combined reliability of all variables exceed the minimum acceptable (0.7); Therefore, the variables in this study are optimally reliable. Likewise, the Average Variance Extracted (AVE) of all variables is higher than the acceptable minimum (0.5); therefore, the variables in this study have the desired convergent validity. According to the results of Table 1, convergent validity is found in all indices because all indices have mean values of the extracted variance greater than 0.5. The extracted mean variance index is used to measure divergence validity. In addition, since the mean root values of the extracted variance are greater than the correlation of the variable with other variables, divergent validity is acceptable if the numbers of the original diameter are greater than their lower values.

The results of the SMART PLS 3 software output in Tables 2 and 3 confirmed that the measurement models (convergent and divergent) and the reliability (combined reliability coefficient and Alfa Cronbach) are suitable. Several criteria are used to assess the

fit of the structural model of the research using the least squares method. R2 is a criterion that indicates the effect of exogenous variables on an endogenous variable and three values of 0.19, 0.33 and 0.67 are considered for weak, medium and strong values of R2 (Fornell and Larcker, 1981).

For the structural model of this research, as shown in Fig. 2, the criterion R2 is higher than 0.33 (criterion of strong values), so the structural model from the perspective of this criterion also has a good fit.

The second criterion for fitting the model is the values of t-statistic. The fit of the structural model using T-coefficients is such that these coefficients must be greater than 1.96 to be able to confirm their significance at the 95% confidence level.

Goodness Of Fit (GOF)

The general model includes both the measurement model and the structural parts, and by checking the suitability, the fit of the complete model is verified. Hence, the overall fit of the model is possible using the Goodness Of Fit criterion (GOF). According to the value obtained 0.681 for GOF, the overall fit of the research model is very appropriate and approved. Looking at the three values of GOF, weak, moderate and strong, 0.01, 0.25 and 0.36, this criterion value of 0.681 indicates a strong fit for the entire study model. Based on the results, the adaptation of the proposed model is confirmed both in measurement and in structure. (Eq. 1)

$$\text{Formula 1. } GOF = \text{vaverage (Commonality)} \times \text{average (R2)} \quad (1)$$

Another indicator is the standardized root mean residual index (SRMR). According to Byrne (1998) the value of 0.05, according to Hu and Bentler (1999) the value of 0.08 and according to Ringle (2016) the value

Table 3: Divergent validity in variables

Variables	Human Factors	Facilitating factors	Behavioral factors	Environmental factors	Organizational entrepreneurship with an improvised approach
Human Factors	0.935				
Facilitating factors	0.695	0.895			
Behavioral factors	0.704	0.746	0.889		
Environmental factors	0.819	0.853	0.786	0.967	
Organizational entrepreneurship with an improvised approach	0.813	0.630	0.413	0.630	0.939

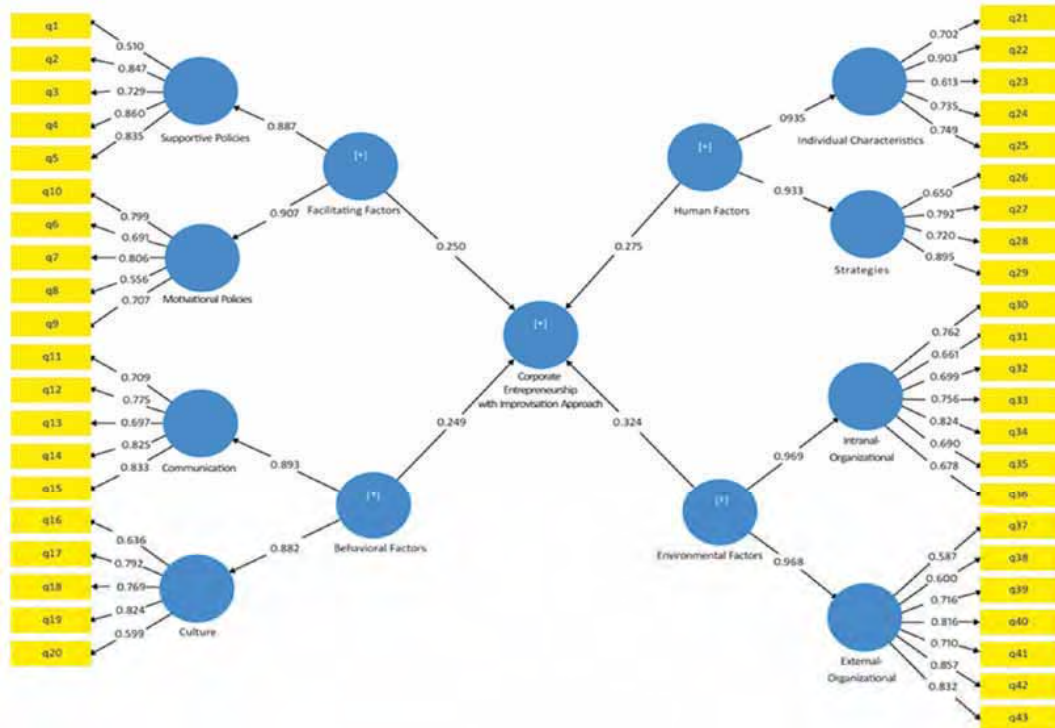


Fig. 1: Model in standard factor load mode

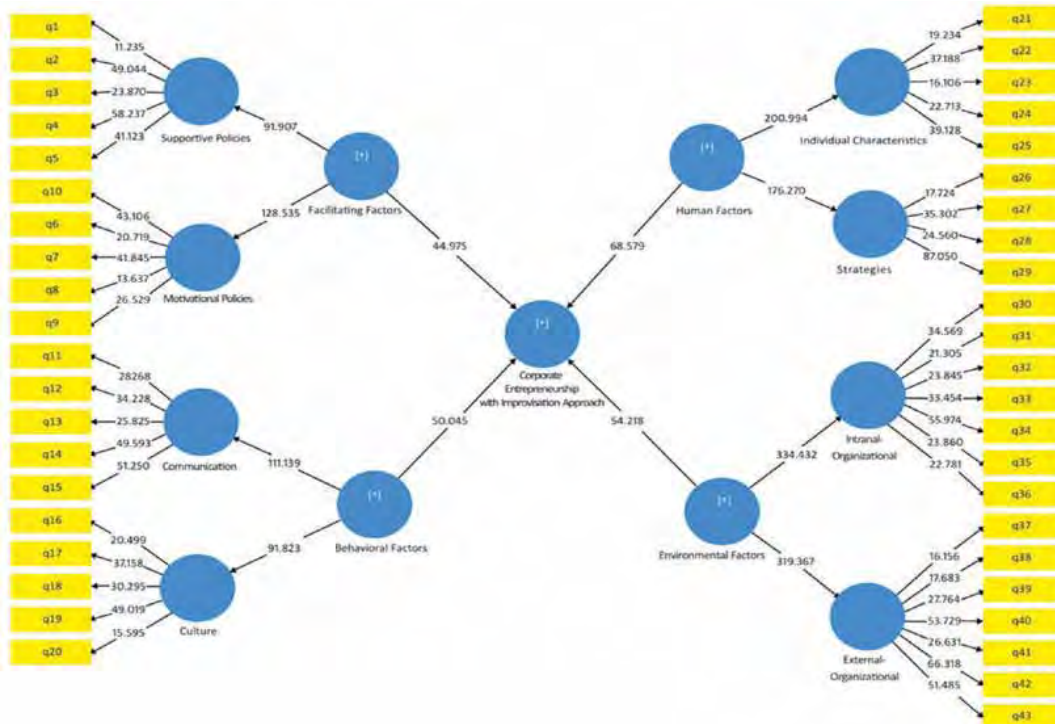


Fig. 2: t- statistics value

Table 4. Fitness indexes (Source: Authors' elaboration)

	SRMR	NFI
Acceptable values	0.10≤	0.9≥
Calculate values	0.017	0.912

Table 5: T-statistics and research impact coefficients

Endogenous variable	Organizational entrepreneurship with an optimization approach			Test result
	Path coefficient	t-statistic	Significance level	
Human Factors	0.275	68.579	0.001	Confirmed
Facilitating factors	0.250	44.975	0.001	Confirmed
Behavioral factors	0.249	50.045	0.001	Confirmed
Environmental factors	0.324	54.218	0.001	Confirmed

of SRMR less than 0.10 indicate an acceptable fit of the overall model. According to Table 4, this index is also at an acceptable threshold, so it can be claimed that the current research model has a perfect fit. Normed fitness index (NFI) has also been used to measure fit. The acceptance range of this index should be between 0 and 1 and the NFI should be higher than 0.9 (Kline, 2015). As a result, as shown in Table 3, this value is equal to 0.912, which is also confirmed as a result of this index.

Testing the hypotheses

T-statistic was used to investigate the hypothetical relationships between the variables. To test the main hypothesis, four sub-hypotheses have been used, which confirmed the t-coefficients of the four existing relationships according to Table 5. To determine the effect of predictor variables on dependent variables, standardized factor load coefficients related to the paths of each hypothesis are examined. These coefficients indicate, that changes in the dependent variable can be explained by up to a few percent of the independent variables.

The results show that the tstatistic of all routes is higher than 1.96. showing the confirmation of the hypothesis. Therefore, it can be said with 95% confidence that the factors affecting organizational entrepreneurship have a positive and significant effect on the improvisation approach. Based on the relationships obtained and using PLS3 software, the results show that the validation of all the obtained hypotheses is consistent with the proposed model, so the environmental factor with the impact coefficient of 0.324 and behavioral factors with 0.249 being the highest and the lowest value respectively in the

corresponding model.

CONCLUSION

From a development perspective, considering the use of improvisation to respond quickly to problems, it can be said that it causes the rapid use of opportunities and minimizes the loss of financial resources, human resources, time, etc., in the organization and lead to growth and entrepreneurship of the organization. The purpose of this study was to present a conceptual model of organizational entrepreneurship with an improvisational approach. To achieve this goal, first by reviewing the literature and then by conducting semi-structured interviews with experts, the components influencing organizational entrepreneurship with an improvisational approach were identified, and then to validate the components, a questionnaire based on selected codes which were approved by the experts were distributed among the statistical sample including 381 managers and experts from 22 districts, organizations and companies affiliated to the Municipality of Tehran with more than 10 years of work experience. The release of the Smart PLS 3 software showed that the research hypotheses were confirmed. The first hypothesis confirms the impact of human factors on organizational entrepreneurship with an improvisational approach. According to the results of Smart PLS 3 software, it was found that the T-statistic is equal to 68.579, which is more than 1.96, so this hypothesis is confirmed. Given that managers shape the activities of the organization and their characteristics can help the organization to achieve the goals in the best possible way, if managers are capable, entrepreneurship with an improvisational approach will be easier to implement

in the organization. The results of this study also show that improvised decision-making processes in entrepreneurship in The Municipality of Tehran, if present in the perspective of the organization, will become a goal for the organization. The results of this hypothesis are consistent with the research of [Terfinger et al. \(2021\)](#) and [Dana et al. \(2021\)](#). As for the second hypothesis, which shows the impact of facilitators on entrepreneurship in organizations through improvisational approach, the confirmation of this hypothesis is confirmed by a t-statistic equal to 44.975 greater than 1.96. Therefore, if entrepreneurship is supported by the government and related organizations using financial facilities and tax exemptions, building entrepreneurship capacity, etc., it will enable entrepreneurs to organize officials in the the Municipality of Tehran to improvise their duties. Tehran Municipality can provide the conditions needed for improvised decision-making for employees by reforming structures, closing power gaps, and increasing the empowerment and independence of employees and managers. Entrepreneurship and improvisation training for employees and managers can also help boost entrepreneurship with improvised access to these organizations. Because entrepreneurship and improvisation are two topics that can be promoted through training. The results of this hypothesis are consistent with the work of [Dana et al. \(2021\)](#) and [Hassani et al. \(2016\)](#). The improvisational approach showed that this hypothesis was also supported by a statistic of 50.045 greater than 1.96 for the third hypothesis related to the effect of behavioral factors on organizational entrepreneurship. As a result, in any organization, communication is a major factor in the transfer of information to internal and external parts of the organization, and the lack of optimal communication causes problems in the organization. When discussing entrepreneurship with an improvised approach, the need for reliable information and communication becomes even more important as new information and quick decisions are needed. Thus, the Municipality of Tehran can exchange information and build trust and honesty among its employees. Proper systems of information, communication, external and internal communications and contact with successful entrepreneurs provided the basis for organizational entrepreneurship with an improvised approach. In addition, the culture of the employee is

one of the factors that influence improvisation in any work situation, and entrepreneurship is no exception. If the leader of the the Municipality of Tehran comes up with such an idea, employees will start brainstorming and innovating without fear of failure. The results of this hypothesis are consistent with those of [Mannucci et al. \(2021\)](#). Regarding the fourth hypothesis, which is the effect of environmental factors on organizational entrepreneurship with an improvisational approach, it was found that the value of T statistic is 54.218, which is more than 1.96, so this hypothesis is confirmed. It turns out that one of these internal factors is financial resources. Therefore, all decisions within an organization must be achieved by providing the necessary financial resources, if the Municipality of Tehran has the necessary financial resources to invest in entrepreneurial and improvised entrepreneurial decisions, It leads to improvisational decisions and enhances the entrepreneurial spirit of the organization's approach in this organization. The internal capabilities of Tehran Municipality, such as responding to emergencies and taking advantage of identified opportunities, require improvised decisions by managers and employees of the organization, and when these cases are in the field of organizational entrepreneurship, the importance of improvisational decisions becomes more obvious as the entrepreneurship of the organization is the cornerstone of innovation. Therefore, in order to respond to environmental changes, an organization's capabilities and resources must be adapted to environmental conditions, thereby enhancing environmental change and responsiveness. In this case, decisions can be made more quickly and the Municipality of Tehran's organized entrepreneurship can be improvised. The results of this hypothesis are consistent with the researches of [Arend \(2020\)](#) and [Latif et al. \(2020\)](#). In addition, the results showed that not all people can be successful entrepreneurs or make impromptu decisions, and not all organizations can implement organizational entrepreneurship with an impromptu approach, as these cases require different skills that individuals and organizations ought to have. If the employees of the Municipality of Tehran have the positive traits required for improvised entrepreneurship, and if the organization also addresses the issue strategically, then the organization's capacity for improvised entrepreneurship will be enhanced. Although

this may lead to internal conflicts, but respect is a necessary principle to manage these conflicts and the entrepreneurial spirit of the organization and make it positive for the organization. Organizational entrepreneurship is a process of revitalizing the improvement of organizational performance. Therefore, organizations that put organizational entrepreneurship at the forefront of their activities, when they emerge, are often recognized as dynamic units, flexible, and ready to gain competitive advantage and new business opportunities. They discover new areas of business as well as new ways of doing business in existing fields. So, if an opportunity is identified in the environment, improvisation can be used to leverage the change and improvement.

Suggestions

According to the obtained results, the subsequent suggestions are suggested to the policymakers, the decision-makers of organizational managers:

- Newcomers to the organization should not be blamed for failing to pioneer and improvise decisions so that the entrepreneurial culture is institutionalized with an improvisational approach in Tehran Municipality;
- By formulating acceptable incentives and confirmatory policies, offer the bottom for brand spanking new concepts and organizational entrepreneurship, and encourage employees and managers to improvise entrepreneurship in the organization by supporting innovative people in the organization;
- In formulating organizational strategies and perspectives, special attention should be paid to entrepreneurship and improvisation so that the subject is accepted as one of the organizational tasks between managers and employees.

Limitations and future research

Every research faces limitations in time and space, and this research is no exception to this rule. Since the data required for the research were collected through interviews with experts of the Municipality of Tehran, so it can be acknowledged that the analysis of this research was based on data collected from different perceptions of experts and not from objective sources that may in some cases the findings were influenced by personal beliefs. Finally, because the present study was conducted in 22 districts of

the Municipality of Tehran- Iran, therefore, it may be possible to extend it to other organizations in the country with different results that are not very reliable. Therefore, the suggestions of this research for the future are as follows:

- Conducting this research in other organizations Comparing the results obtained with the present study in order to identify weaknesses, strengths, opportunities and organizational threats;
- Considering the role of management styles in model presentation;
- Considering the field of functional innovations and market innovations in the field of organizational innovations in the proposed model.

AUTHOR CONTRIBUTIONS

N. Moradi, performed the conceptualization and literature review, compiled the data, manuscript preparation and editing references. A. Rezaeian, performed the methodology, analyzed and prepared the manuscript text. F. Hamidifar, helped in the literature review and manuscript preparation.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors.

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ABBREVIATIONS

<i>AVE</i>	Average Variance Extracted
<i>CR</i>	Composite Reliability
<i>GOF</i>	Goodness Of Fit
<i>PLS</i>	Parcial Least Squares

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ORIGINAL RESEARCH PAPER

Analysis of human resource architectural components based on governance approach

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ABSTRACT

BACKGROUND AND OBJECTIVES: Human Resource Architecture, one of the components of organizational architecture, is the process of identifying and combining the appropriate elements of human resource management to create and present a vision of human resources in the organization. Organization in which there is a coordination between employee behavior, human resource systems, resource activities, and the mission and goals of the organization. Governance is also an economic and political means of exercising power in a country's economic, political and social institutions, or as a set of traditions and institutions in which a sovereign operates, or for managing all relationships, and is defined as an executive term at all levels. The purpose of this study is to investigate the architectural performance of human resource management in municipalities.

METHODS: This study is quantitative and developmental research. In this study, non-interactive method and thematic analysis of documents were used. Initially, 30 documents were identified and examined, and then the text reading table using the Scopus index identified 7 fully related documents. Next, three open, axial and selective encodings are performed on the specified documents. MAXQDA2020 software was used for data analysis. Then, to verify the validity of the identified components of the cryptographic output, its validation was performed using a distribution of 75 questionnaires among middle and senior managers of the Municipality of Tehran, using LISREL software.

FINDINGS: Considering the coding, finally, human resource architecture with a governance approach in four dimensions (partnership and network governance; contractual and joint governance from above; outsourcing and job-oriented governance and hierarchical and knowledge-based governance) and 15 components of the category was classified. In partnership and network governance, the most repetition in component-related documents emphasizes on joined-up management (5 repetitions) and in contract and partnership governance, the most repetition is related to the commitment and accountability components (5 repetitions) and outsourced and job-oriented government with private component. (6 repetitions) and hierarchical and knowledge-based governance with an internalization component (4 repetitions). Based on the findings of confirmatory factor analysis, only the internalization component (T-Value <1.96) was not approved in the Municipality of Tehran.

CONCLUSION: From the coding, it is finally concluded that the human resource architecture with a four-way governance approach of the partnership and network architecture; contractual and joint governance from above; Outsourcing and job-oriented architectures as well as hierarchical and knowledge-based architectures have the most iterations in the reviewed literature.

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INTRODUCTION

Organizations are complex organisms whose efficiency, flexibility, and transfer rate are compromised without a proper architecture. Collectively, the term “Enterprise Architecture” (EA) can be defined as an organizational plan that describes the mission structure and information required by the organization and the technologies needed to support them, and creates a transition to the implementation of these technologies (Gorkhali and, 2017). Organizational architecture is divided into several types of architecture, including Information Architecture (IA), Human Resource Architecture (HRA) and Metrics Architecture (MA) (Mirpour et al., 2020). HRA is the process of identifying and combining relevant elements of human Resource Management (HRM) to create and present a view of an organization’s Human Resources (HRs) in which the synergies between the employees, the Human Resource System (HRS), human resource activities, and the mission and goals of the organization are self-evident (Shokrollahi et al., 2020). HRA seeks to transform an organization’s approach to HRM to reflect the organization’s human composition and appearance to new requirements with a focus on people as an important competitive advantage of the organization (Ranjbarian and Azizi (2914). Potentially, HR architecture can be a strategic asset for the organization likewise as a source of sustainable competitive advantage (Luddin and Suyatno, 2019). Human resource architecture is a mechanism for knowledge-based human resource management. In human resource architecture, on the one hand, there is the organization that spends all its resources to fulfill its missions, and on the other hand, there are people who provide a sustainable competitive advantage for the organization (Zare, 2019). Human resource architecture requires studying and determining the architecture of the current human resources of the

organization and its purpose is to highlight the human face of the organization by employing qualified people in terms of value creation and unique knowledge in the organization in accordance with its missions and strategies. Individuals who can use their unique knowledge to create value not only in the form of a specific job, but also in the framework of the missions and goals of the organization (Happell et al., 2021). On the other hand, with all the characteristics of human resources and its value in organizations and according to the division of organizations in public, private and local, there is an obligation to use the architecture of human resources; because designing a human resource architecture model for the municipalities is one of the most important issues (singh et al., 2019). A survey of the Scopus citation database, using the keyword of human resource architecture, identified only nine international articles between the years 1999 to 2021, which, as Fig. 1 shows, no more than one article has been published per year.

Literature Review

There is a lot of ambiguity about the term human resource management architecture. Becker and Gerhart (1996) were the first authors to use these terms in texts on human resource management systems. In that discussions, they evoked the connection between the philosophy of human resource management, human resource management policy and the method or actions of the management of human resources. Lepak and Snell (2002) used the term somewhat differently. They talk about the overall picture of how business executives use different types of human resources to achieve their goals. According to Lepak and Snell (2002), human capital is the main center of value creation and determinant of organizational assets. These two experts created a framework called human resource architecture. Mathews et al. (2020)

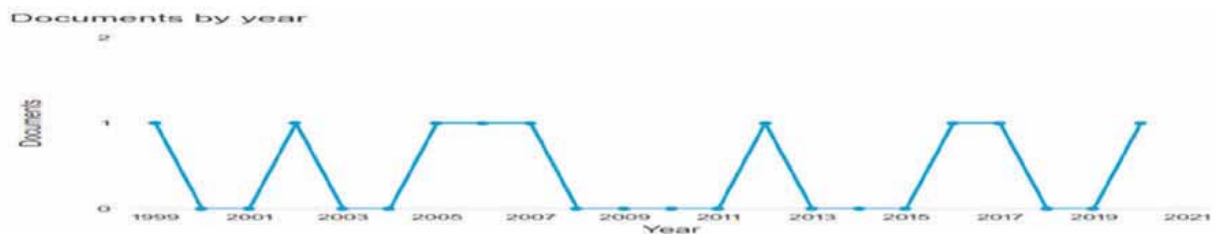


Fig. 1: Frequency chart of international researches by year (first article published in 1999) Fig. 2: Governance model (Goldsmith and Eggers, 2004)

believe that the difference in employment is due to differences in human capital, which is accompanied by differences in the composition of human resources used in staff management. [Lepak and Snell \(2002\)](#) emphasized the strategic value and uniqueness of human capital as the main drivers of recruitment modes and human resource combinations. The strategic value of human capital refers to the potential of individuals to improve the efficiency and effectiveness of the organization, discover and extract market opportunities, and neutralize potential environmental commitments ([Benn et al., 2014](#)). It is believed that as the strategic value of human capital increases, the likelihood of internal employment by the organization increases ([Borisova et al., 2017](#)). On the other hand, the uniqueness of human capital refers to the scarcity, specialized and specialized nature of that capital in the organization ([Pepurah, Ganu, 2018](#)). When employees are non-transferable, organizations are more likely to invest in training, education. People expect to invest in general (transferable) skills. Organizations are also more likely to employ non-specialized human capital from outside the organization by paying current labor market salaries. Meanwhile, differentiation is the clearest reason for internal employment. While differentiation is the clearest reason for internal hiring, organizations invest more in developing and improving relationships with external employees and in cases where their partners emphasize the creation and transfer of personal knowledge. If the development of human capital were limited to a single person, it is of course a path of dependence and requires the ultimate knowledge that is created according to the situation ([Magidi and Mahiya, 2021](#)). The framework of [Shaw et al. \(2001\)](#) confirms the view that multiple groups of employees contribute to the organization's goals in different ways. For example, managing strategic-oriented human resources in an organization is different from ordinary employee. The framework of [Shaw et al. \(2001\)](#) confirms the view that multiple groups of employees contribute to the organizational goals in different ways. For instance, strategically oriented human resource management in an organization is different from the normal employee ([Pyone et al., 2017](#)). The terms governance and government have pure and specialized meanings that are sometimes used interchangeably, regardless of the concept. The concept of government is derived from the Greek words *kyberman* and *keybernetes*,

which means to guide and keep things together, while the concept of government implies to political unit to perform the task of policy-making and is more prominent than the implementation of politics. Therefore, it can be said that the word governance refers to being accountable both in the field of policy and in the field of implementation ([Rothstein and Teorell, 2008](#)). Governance is not a new concept, but its background goes back to the beginning of the formation of human civilization, in simple terms, the concept of governance; it is a decision-making process and the background of the process in which decisions are made ([Areiqat et al., 2020](#)). In the late 1980s, the term governance became common in seminars and research literature in the development literature. International institutions such as the World Bank, the International Monetary Fund, and the United Nations Development Program have pioneered the design and application of governance, and the term governance in academic circles has gradually become the focus of theorists and experts in the fields of economics and political science ([Von Engelhardt, 2018](#)). In its 1989 study, the World Bank found that governance, the way the country is governed, or the relationship of citizens to rulers, is a central issue in development ([Auriacombe, Shikha, 2019](#)). Subsequently, at the Second Conference on Human Settlement in Istanbul in 1996, the United Nations emphasized the need to take steps to establish state governance in the cities of the world and made its motto "global action for good governance" ([Trindade, 2020](#)). The World Bank defines governance as the way that power is exercised over a country's economic management and social resources in order to achieve development ([Jamal and Camargo, 2018](#)). There are three sectors involved in governing a country, including the government, civil society, and the private sector, all of which are essential to human development. In addition, all three sections are interacting with each other, so that the weakness and strength of one of them will disrupt the social balance, so by creating the necessary connection and balance and separation of duties of each of these three the section will provide the possibility of better living in a desirable society ([Salamon et al., 2017](#)). Among the researches, [Lepak and snell \(1999\)](#) are the most cited research. In this study, human resource architecture in terms of uniqueness and value of human capital is considered a category regarding the development of human resource architecture in which human resource

Table 1: scientometrics of articles on human resource architecture components

Title	References	Number of references	Research methods and findings
The human resource architecture: toward a theory of human capital allocation and development	Lepak and Snell (1999)	1546	Given that not all employees have the same strategic knowledge and skills, a resource-based perspective, corporate capital theory, and transaction cost economics are used to develop a human resource architecture with four different modes of employment: internal, Development, Acquisition, Contract, and Alliance. This research has investigated the relationships between employment status, employment relationships, human resource settings and competitive advantage criteria.
Examining the human resource architecture: The relationships among human capital, employment, and human resource configurations	Lepak and Snell (2002)	808	The characteristics of human capital as well as the human resource (HR) configurations were examined for employees in four different employment modes (knowledge-based employment, job-based employment, contract work, and alliance/partnership). The results showed that the strategic value and uniqueness of human capital in these four modes of employment are different. In addition, each employment situation is associated with a specific type of human resource configuration (commitment-based, productivity-based, compliance-based, and participatory).
Relational archetypes, organizational learning, and value creation: extending the human resource architecture	Kang et al. (2007)	517	Theories of knowledge-based competition emphasize the firm's ability both to explore and to exploit knowledge as the source of value creation. Human resource management was directly introduced into this forum by introducing a framework of relational archetypes—entrepreneurial and cooperative—that is derived from unique configurations of three dimensions (structural, affective, and cognitive) of social relations within and across firm boundaries. The result identified how human resource configurations can be linked to the strategic management of these relational archetypes
Human resource architectures for new teachers in Flemish primary education	Vekeman et al. (2015)	9	In this research, four human resource architectures were identified: office human resource architecture, developmental, strategic and strategic-developmental. This architecture showed that only a minority of principals strategically configure a set of HR practices for new teachers. The difference between these four HR architectures can be seen in the extent to which managers understand and cope with external challenges.
Examining the human resource architecture relationship with employee productivity of chemical industries	Khan et al. (2021)	4	This study investigates the relationship between human resource architecture and the productivity of chemical industry employees. Using the correlation test, the results showed that there is a significant relationship between human resource architecture and its dimensions with labor productivity. Also, using univariate and multivariate regression, showed that strategic human resource management has the greatest impact on productivity of the workforce.
Human resource architecture model: a Twenty-year review and future research directions	Luo et al. (2020)	3	This study has developed a framework in two dimensions (ie content and the use of human resource architecture model) based on which it systematically discusses current findings in terms of theoretical application, empirical validity, and human resource development and critique.
Manager profile and its impact on human resources architecture	Medina et al. (2017)	1	This study seeks to analyze whether the competencies and role of the human resources manager affect the acceptance of human resource architectures more or less in accordance with the model of Lepak and Snell (1999). The results obtained through the use of PLS-SEM modeling showed that a more strategic role and a higher level of competence of the human resources manager do not guarantee a higher level of compatibility with Lepak and Snell (1999) model of human resource architecture. These results are probably due to the secondary role that these managers still have in many companies, with scarce resources and limited influence, and little room for maneuver. There is also significant inertia that makes it difficult to make major changes to HR practices.

development takes

place in four modes of internal development, procurement, contract, and alliance.

Literature review

With regard to scientometrics, 7 articles on human resource architecture components were identified in the Scopus index, which is shown in Table 1.

The theoretical framework of this research is taken from the model of Goldsmith and Eggers (2005). According to this study, governance is a synthesis of four elements: Network orientation; Joined-up management; Outsourcing and Hierarchy.

Goldsmith and Eggers (2005) showed that there are two main spectrums of hierarchical governance and network governance. In the article, citing many researches, the frequency of network governance have been thoroughly investigated in different context and confirmed that in all cases under consideration, the government plays the role of almost a third party and creates a horizontal structure with the participation of other sectors. On the other hand, however, there is hierarchical governance, which scholars believe existed in the 20th century, and government officials operated in an orderly and hierarchical manner with little involvement of private and non-profit organizations. Among them there is a tendency to joined-up governance. With the examples mentioned in this article, governments have the ability to manage their networks, in particular their ability to allocate financial power and capital, i.e. services are provided vertically

and operations are performed horizontally. When it comes to administrative outsourcing, governments often outsource their work to these sectors either because of their weak capacity to manage government networks (often financial and investment issues) or lack of trust in the private, non-profit sector and civil society. To summarize the research, it can be said that most of the studies dealt with human resources and good governance issues separately, but none of the studies dealt with both issues together. Therefore, the purpose of this study is to investigate these issues from various dimensions in Tehran, the capital metropolis of Iran, as a strategic and political city. The Municipality of Tehran is a metropolis with 64,000 people at headquarters level, 22 districts, regions, organizations and companies. Due to the fact that municipality is a non-governmental public sector, the human resource policy and human resource models used in this organization should be different due to the partnership and cooperation with the people (Klein *et al.*, 2020). Also, considering that the Municipality of Tehran, as one of the most influential organizations in the administration of the capital in governance, requires the participation of three institutions of government, civil society, and the private sector, so in the present study, an appropriate strategy in dealing with these three sections, was examined and in this regard, the most optimal architectural style of human resources was presented with it so that the capacity of human resources can be used in the best possible way in order to provide services to stakeholders. Hereof, the main issue of the present study is to provide

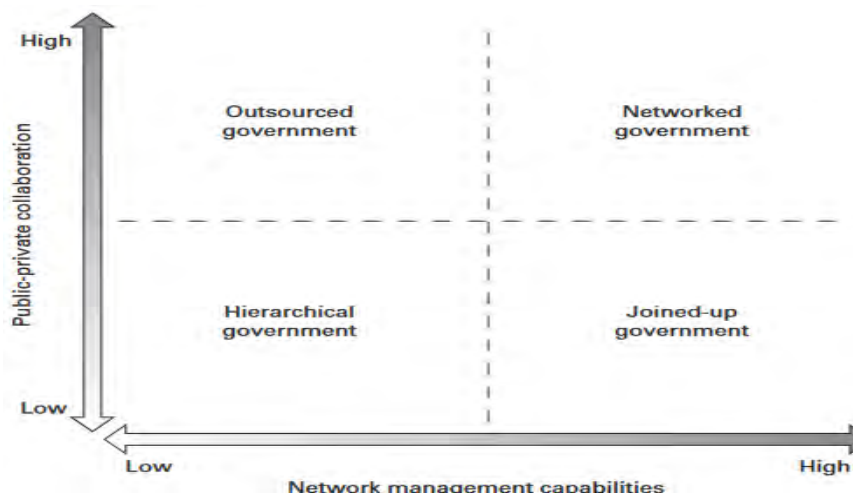


Fig. 2: Governance model (Goldsmith and Eggers, 2004)

Table 2: research method, statistical population and sampling method in research stages

Stages	Society	Type of sampling	Number of examined sample	Data collection method
Identify the components of governance-based human resource architecture	Scopus Indexing	Accessible	7 fully related documents	Available documents
Validation of human resource architecture components based on governance according to the nature of the Municipality of Tehran	Middle and senior managers in the Municipality of Tehran	Accidental	75 Middle and senior managers	Questionnaire



Fig. 3: Open coding in MAXQDA2020 software

a model of human resource architecture based on governance in the Municipality of Tehran. The current study have been carried out in Tehran in 1400.

MATERIALS AND METHODS

The present study is a quantitative and developmental research which seeks to identify governance by considering the nature of the municipality as a public non-governmental institution and having various governmental (disciplinary, economic and cultural) goals. This research is non-interactive and uses documentary content analysis. Based on this, first 30 documents were identified (Table 1), then using Scopus index, 7 fully related documents were selected and three codes were opened for the specified items, open, axial, and selective. The MAXQDA2020 software was used to analyze the data, and the LISREL 8.50 software's confirmatory factor analysis method was used to investigate the validity of the identified components of the coding output (validation was performed using a distribution of 75 questionnaires). The statistical population and sampling method are different in two stages and were done according to Table 2.

RESULTS AND DISCUSSION

Research findings

By analyzing the collected data from existing documents as well as second-hand data extracted from scientific indexes, the main categories and sub-categories were extracted. Open coding was continued to the stage of category saturation.

Open Coding

In the open coding of texts, the list of which is shown in Fig. 3, 43 document codes were identified and entered into the software, in this phase the titles were initially selected mainly by the researcher and an attempt was made to have the greatest relevance and consistency with the data it represents.

From the data entered into the software, 43 initial codes were identified.

Axial coding

By finding out the initial codes and characteristic similarities and differences, they were classified into various abstract classes and general classes, the idea underlying this classification is to examine previous analyzes and relevant data and coverage of the subject



Fig. 4: Axial coding in MAXQDA software

under study, and obtain relevant information to search for general abilities around a particular axis. Fig. 4, shows the section related to axial coding is displayed using the software.

Then, to know more about the codes and their repetition, an axis coding process was performed which has been of great help to the selective coding and research process. The resulting encoding (Fig. 4) is used to generate a selective encoding. After having extracted and determined the main categories, the initial model is obtained (Fig. 5).

Validation findings

In this section, after identifying the components, its validation was performed using confirmatory factor analysis and LISREL software in standard estimation mode and significant coefficient. The coding results of Maxqda2020 software have reached four main components: They are studied in the format shown in Fig. 6, with standard evaluation modes and significance factors. In the standard estimation coefficient, the more is moved from the coefficient 0.2 to the number 1, the greater the impact. In addition, the significance coefficient must be above 1.96. The calculation of factor loads in the standard mode of network

architecture, joined-up architecture from above, outsourced architecture and traditional hierarchical architecture is shown in Fig. 6.

According to Fig. 7, the twelfth component (internalization) is not approved in the Municipality of Tehran as the T-Value is <1.96.

Table 3, shows that all indicators have a good fit of the model.

Considering the coding, finally, human resource architecture with a governance approach in four dimensions (partnership and network governance; joined-up governance; outsourcing and job-oriented governance and hierarchical and knowledge-based governance) and 15 components of the category were classified. In partnership and network governance, the most repetition in the documentation related to the component of emphasis on joined-up governance, with 5 repetitions and in governance contractual and collective are the most repetitions related to the commitment and accountability component (with 5 repetitions) and outsourced and job-oriented governance with the privatization component (with 6 repetitions) and hierarchical and knowledge-based governance with the internalization component (with 4 repetitions). In their study, Vekeman et al. (2015)

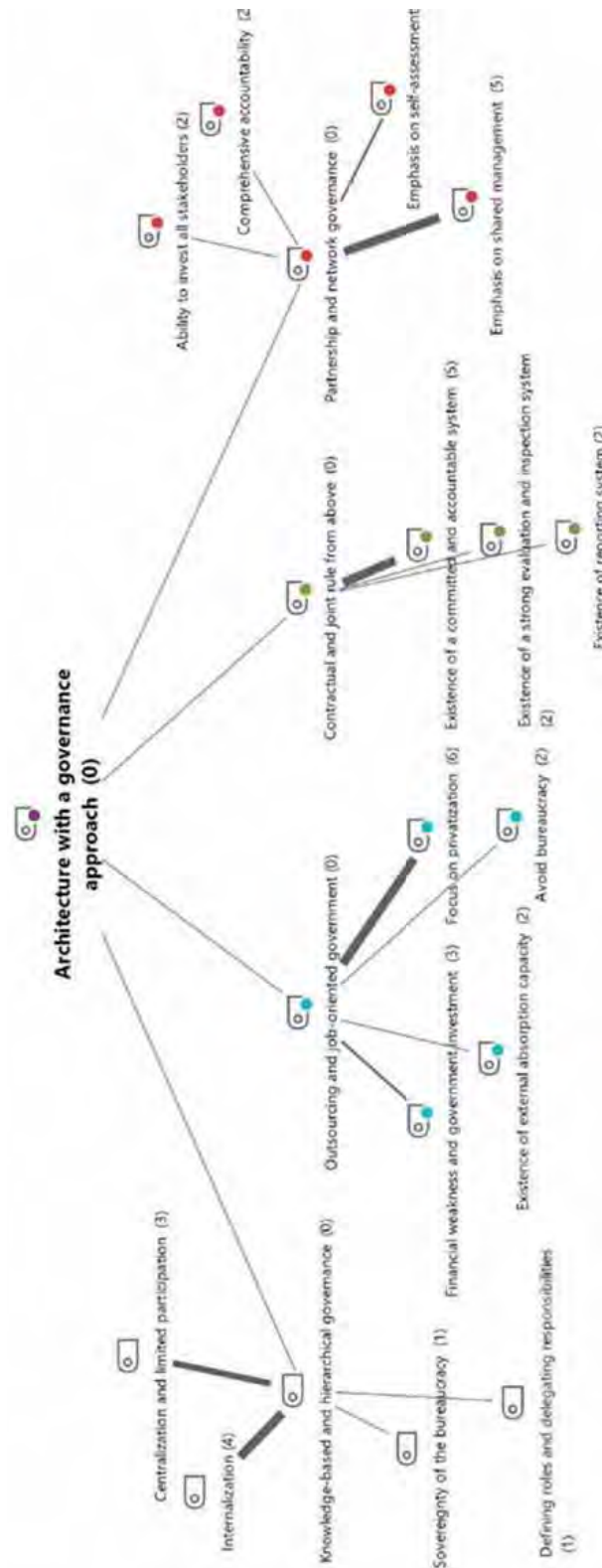


Fig. 5: The initial model based on open and axial coding

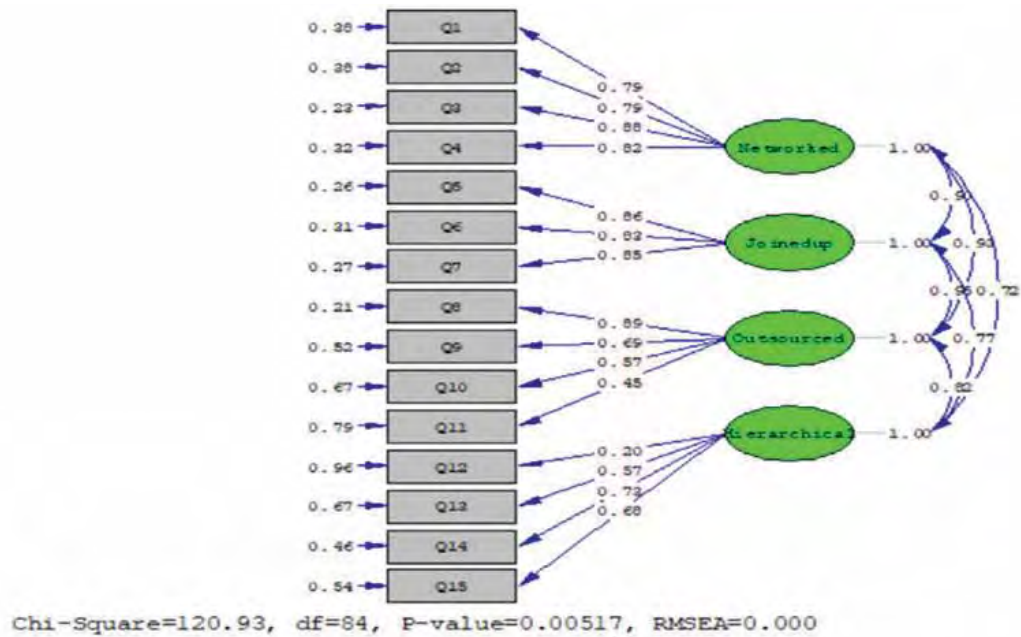


Fig. 6: Factor loads in standard estimation mode

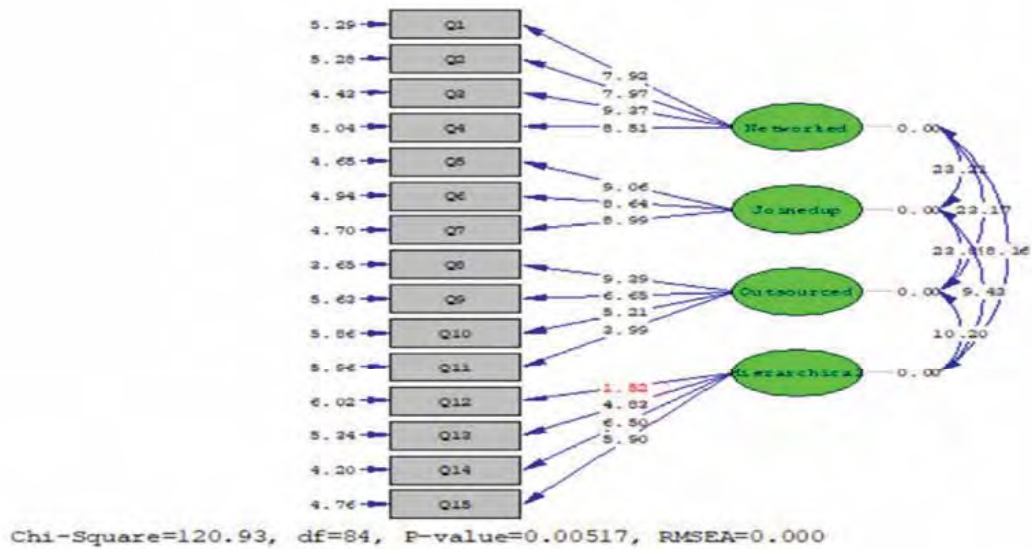


Fig. 7: Factor loads in the case of significant coefficient

examined how human resource architectures are configured by managers for new employee, seeking to recruit, hire, and retain. In addition, with the differences and commonalities in this direction, four human resource architectures have been identified: administrative, development, strategic, and strategic human resource architectures. However, in current

study, due to the existence of urban governance, partnerships and network governance; contractual and joint governance from above; outsourcing and job-oriented governance as well as hierarchical and knowledge-based governance have also been identified. [Khan et al. \(2021\)](#) examined the relationship between human resource architecture and the

Table 3: Fitting of the structural equation model of the research

Fit Index	Amount
Degrees of Freedom	84
Chi-Square	120
X ² /df	1042
Root Mean Square Error of Approximation (RMSEA)	0.0
Normed Fit Index (NFI)	0.87
Non-Normed Fit Index (NNFI)	0.85
Comparative Fit Index (CFI)	0.9
Goodness of Fit Index (GFI)	0.85
Adjusted Goodness of Fit Index (AGFI)	0.84

productivity of industrial workers and showed that strategic human resource management (SHRM) has the greatest impact on labor productivity while in the current research, policies that are a subset of the basic elements showed a great impact on the components of joined-up governance. Goldsmith and Eggers (2005) in a research confirmed that governance is a synthesis of four elements of Network orientation; joined-up governance; Outsourcing and Hierarchy, whereas in the present study, policies that are a subset of the basic elements showed a great impact on the components of joined-up architecture. This article tried to identify the architectural indicators of human resources with an emphasis on governance in the Municipality of Tehran. Organizational architecture is an organizational plan that describes the mission structure and information required by the organization and the technologies needed to support them, and defines the transient process for implementing these technologies. The role and level of involvement of employees in helping to manage the organization is very important. Hence, managers can move forward and improve the efficiency of human resources by implementing the human resource architecture model in accordance with the requirements of good governance of the Municipality of Tehran in which efficiency and productivity can be achieved by taking into account civil society factors, guidance from political stakeholders and higher authorities, environmental change, strategic factors, and support, building trust and creating a competency-based approach.

CONCLUSION

The purpose of this study was to investigate the architectural indicators of human resource-based governance of the Municipality of Tehran. Human resource architecture is one of the components of

organizational architecture, the process of determining and combining the appropriate elements of human resource management in order to create and present a vision of the organization of human resources in which the coordination between employee behavior, human resource system, human resource activities, missions and objectives of the organization. Governance is also defined as the set of traditions and institutions within which rulers operate, or as the method of exercising power in the economic, political, and social institutions of countries or the economic, political, and executive tenure of managing all relations at all levels. With this in mind, new models of good governance have been proposed that have different goals, standards, organization and complexity. This research was carried out with the aim of analyzing the indicators of the architecture of human resources on the basis of governance in the communities, in order to achieve the objectives of the research, qualitative and quantitative development methods were used to identify and extract the dimensions of the model the human resource architecture of non-interactive and the content analysis of the document were used. After studying the theoretical foundations and research background and identifying 30 completely related articles to the subject, compiling a table of texts using the Scopus index led to the identification of 7 completely related documents. Considering the coding, finally, human resource architecture with a governance approach in four dimensions (partnership and network governance; contractual and joint governance from above; outsourcing and job-oriented governance and hierarchical and knowledge-based governance) and 15 components of the category was classified. In partnership and network governance, the most repetition in component-related documents emphasizes on joined-up management (5 repetitions)

and in contract and partnership governance, the most repetition is related to the commitment and accountability components (5 repetitions) and outsourced and job-oriented government with private component. (6 repetitions) and hierarchical and knowledge-based governance with an internalization component (4 repetitions). Based on the findings of confirmatory factor analysis, only the internalization component (T-Value <1.96) was not approved in the Municipality of Tehran.

Suggestions

In order to implement the obtained model, the following suggestions are presented to managers and urban decision makers in the Municipality of Tehran:

- Paying particular attention to civil society;
- Paying particular attention to political, economic, social, cultural, managerial, technological and other developments ;
- Having a strategic vision of environmental issues;
- Establishing a program and system for evaluating performance and determining tasks and authorities, integrating and merging several decision-making centers

AUTHOR CONTRIBUTIONS

s. Ahmadvand reviewed the literature, collected, analyzed and interpreted the data. H. Rahmani was in charge of correspondence, data analysis and review of text editing results.

M. Musa Khani, was very helpful in reviewing the literature and interpreting the data.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors.

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ABBREVIATION

AGFI	Adjusted Goodness of Fit Index
CFI	Comparative Fit Index
EA	Enterprise Architecture
GFI	Goodness of Fit Index
HRS	Human Resource System
HRM	Human Resource Management
HR	Human Resource
MA	Metrics Architecture
NFI	Normed Fit Index
NNFI	Non-Normed Fit Index
RMSEA	Root Mean Square Error of Approximation

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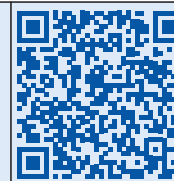


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ORIGINAL RESEARCH PAPER

Planning implication of universities growth on land use:
Confirmatory evidence from GIS spatial analysis

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ABSTRACT

BACKGROUND AND OBJECTIVES: Universities have customarily been seen as agents of development in the regions they serve owing to their roles of teaching, research, innovation and community extension. There is however a dearth of knowledge on how they influence land use change with a specific reference to compliance with planning standards. This paper therefore through a case study investigates the impacts that the growth of Kisii University has on land use change in Nyamag, a neighbourhood where it is situated within Kisii Municipality, Kenya. It subsequently links the observed change to compliance with planning standards.

METHODS: Guided by the theory of regulatory compliance, the study adopted a case study research design with a sample size of 226 drawn from 577 developments in Nyamag. Spatial data on land use change was collected using satellite images from Google Earth covering three epochs of 2005, 2014 and 2021. Analysis was undertaken using GIS. Data investigating compliance with planning standards were conversely collected using an observation checklist, land survey maps and analyzed using a one-sample t-test and paired t-test.

FINDINGS: The study established that in 2005, forest, short vegetation, transitional and built-up areas respectively covered 17%, 39%, 34% and 11%. These by 2021 correspondingly changed by 46%, -10%, -29% and 57% for the forest, short vegetation, transitional and built-up areas. The latter recorded the highest land use change, a condition mainly credited to the hostels built by private developers in an attempt to meet a demand created by students who could not find accommodation within the university. Research findings further disclosed that developments around the university were not complying with the planning standards used in regulating plot sizes, building coverage ratio and road reserves, leading to land use conflicts.

CONCLUSION: The establishment and growth of Kisii University have remarkably influenced land use change, which in the absence of development control contributes to the disregard of planning standards. This is because the government mainly sees universities as an avenue for spurring regional economic growth with less attention on their spatial implications. These findings may enlighten policy-making institutions with critical information for effective planning and development control around universities. The study also fills a gap that hitherto existed on the nexus between land use change and compliance with planning standards as relates to the growth of universities. It additionally enlightens the international audience on how the impacts of universities growth on land use may be evaluated through a triangulation of spatial and statistical approaches.

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INTRODUCTION

Although investment in human capital attracted less attention before the nineteenth century, the perception considerably changed in the twentieth century when the acquisition of skills and competencies emerged as a precursor for development. This is because education was gradually being used to influence productivity and creativity in addition to promoting entrepreneurship and advances in technology, and in so doing, playing a central role in economic and social progress (Owen *et al.*, 2017). Central to this proposition is the theory of human capital which underpins that investment in education enhances workers' productivity thus resulting in an increased economic return along with increased macroeconomic growth (Laura and Jeff, 2017). Increased investment in education has further been linked to benefits such as reduction in poverty and income inequality, a decline in population growth, low crime rates, national unity and political stability. These have made countries heavily invest in the sector (Psacharopoulos and Patrinos, 2018), a fact corroborating that education is not only key to sustainable development but similarly a requisite for promoting inclusive participation in the societies and economies which are constantly affected by the rapid globalization (UNESCO, 2014). A country cannot, therefore, realize meaningful development if it overlooks investment in the education sector (Karolyn, 2021; Patrinos and Psacharopoulos, 2020). Attention is drawn to the establishment of universities and suggests why many countries are leveraging the sector to accelerate their economic prospects. The aim is to promote the intellectual, cultural, and economic betterment of their populace (Bayuo *et al.*, 2020; Odhiambo, 2018; Mapuranga, 2016). Appraising the benefits of knowledge, skills and competencies that accrues from universities, therefore, remains paramount (Pee and Vululleh, 2020) owing to the role they play in advancing society by teaching, learning, research, outreach and innovation (Al-Youbi *et al.*, 2021; Kimathi, 2020). This is attained by disseminating new skills, knowledge and moral responsibilities that meet the future job market needs along with promoting gainful participation in the global economy (Chan, 2016). Regionally, Agenda 2063, Africa's tactic for a prosperous continent vouched for the development of the African Virtual and E-University as a policy for

promoting academic programmes that enhance the accessibility of continuing and tertiary education. The agenda further envisions an Open, Distance and eLearning (ODEL) of high quality and that students can easily access in any location and anytime (The African Union Commission, 2014). Locally, the Government of Kenya (GOK) in 2008 launched its popular economic blueprint christened "Vision 2030" to transition the country into a middle-income country that is globally competitive. To achieve this, the need to invest in the training of qualified manpower was singled out as a priority. Universities were consequently tasked to play this pivotal role. For a progressive implementation, a 100% increase in the number of accredited universities by the year 2030 was set as a target in the Vision's Sector Performance Standard (SPS) (The Republic of Kenya, 2010). This study, therefore, operationalized two objectives. First, by investigating the impacts that the growth of Kisii University has had on land use in Nyamagae, Kisii Municipality, Kenya. Second, it determined the link between the observed change and compliance with planning standards. It was undertaken between February 2021 and August 2021 to contribute further knowledge on land use development control by addressing the limitations of previous studies. It attained this by addressing the existing research gaps consequently linking theoretical and practical approaches to spatial planning and development control. The study specifically enlightens the international audience by demonstrating how the impacts of universities growth on land use may be analyzed through a triangulation of spatial and statistical approaches. It also apprises key policy formulating bodies in Kenya such as the GOK, Commission for University Education (CUE), County Government of Kisii (CGOK) and other county governments in Kenya with factual evidence that could inform policy framework on spatial planning. From the foregoing, section 26 of the Universities Act, 2012 (The Republic of Kenya, 2012) requires the CUE to ensure the establishment of universities in each of the 47 counties of Kenya by giving priority to those without universities. A policy question arising at this point is whether the GOK, CUE and CGOK undertake risk-based spatial planning to ensure that proposed universities do not have a negative impact on land use. To further put this question into context, the next subsection gives a background understanding of university education in Kenya.

Background to university education in Kenya

University education was formally introduced in Kenya when the Royal College, Nairobi, was elevated to a university college in 1961. The college entered into a memorandum with the University of London to enable students to receive degrees. Later in 1963 when the University of East Africa (UEA) was established, a period when Kenya also ceased to be a colony of Britain, the college was elevated to the University College, Nairobi (UCN), making it one of the constituent colleges of the UEA (others being Makerere, Uganda, and Dar es Salam, Tanzania). The UEA wound up in 1970 resulting in the establishment of the University of Nairobi as the first university in Kenya (Makerere and Dar es Salam universities were also established during this time) (Kimathi, 2020). Upon attaining independence in 1963, the GOK developed a policy titled, "African Socialism and its Application to Planning in Kenya," commonly known as "Sessional Paper Number 10 of 1965," to initiate the country's economic transformation agenda. It recommended that economic growth needed human resource that is adequately skilled, trained and experienced (The Republic of Kenya, 1965). From this background, the GOK came up with further policies that would enhance access to education resulting in rapid growth at all levels including the university sector. Since the mid-1980s, a response to higher demand for university education has led to a remarkable expansion of public universities (Mutula, 2002). For instance, while in 2013 there were seven public universities, the tally exponentially increased to 31 (343%) by 2021, a move prompted by the GOK's intention to ensure that each county has a university. While this growth has contributed to regional economic benefits, a debate is now ensuing that public universities are too many and not financially viable. This has attracted controversies across the political and academic fronts. For instance, in 2019, the National Treasury announced the intention to merge public varsities (Mutua, 2021; Nganga, 2019; Nyaundi, 2020; Tubei, 2019; Kenya News Agency, 2019). The plan was however set aside in favour of comprehensive policy reforms only for the debate to re-emerge when the World Bank, as a condition for advancing financial assistance to Kenya, recommended the merging of the public universities due to duplication of courses and the need to cut spending (Otiato, 2021). However, the

University Academic Staff Union (UASU) through a court petition successfully stopped the proposal on the contention that it was not aligned with any national educational policy in addition to not being participatory as required by the constitution of Kenya (Wanzala, 2021). The GOK's recent approach to the establishment of public universities has so far been driven by two interrelated agendas. First is the legal requirement for having a university in each county. The second is the target set in Vision 2030 of increasing the number of universities by 100% (The Republic of Kenya, 2012; The Republic of Kenya, 2007). While the noble intent is to promote access to higher education, a policy limitation is that no prior planning is usually undertaken to mitigate the potential implications that universities would have on land use, a gap the current study filled. The World Bank and GOK's recent policy articulation on merging public universities is therefore seen as a one-sided affair since it does not take cognizance of their spatial implications on land use and development.

Literature review

A growing body of empirical evidence confirms the important roles played by universities in promoting development and in so doing linking knowledge creators with the industry through incubations, entrepreneurship and community development (Al-Youbi *et al.*, 2021; Marozau *et al.*, 2021; Arocena *et al.*, 2021; Mei and Symaco, 2021; Pee and Vululleh, 2020; Filho *et al.*, 2019; Purcell *et al.*, 2019; Brennan, *et al.*, 2018; Kimathi, 2020; Odhiambo, 2018; Michaela *et al.*, 2015; Filho *et al.*, 2017; Harrison and Turok, 2017; Chan, 2016; Mapuranga, 2016). Their scope is however limited to the impact of universities on socio-economic development and not land use. A further body of literature hence attempts to address this gap by examining the impact that universities have on land use and the consequential spatial implications. As a starting point, through the application of the Normalized Difference Vegetation Index (NDVI) technique covering 10 to 13 years, Cetin *et al.*, (2021) recently established that the newly established 13 universities in the eastern and south-eastern regions of Turkey changed the boundaries of urban centres by 4.49%, consequently contributing to land use change. A related study by Ruoppila and Zhao (2017) also confirmed that universities were influencing land use development in Shanghai town. From a theoretical

viewpoint, the results of this study are suggesting that research focusing on China's urban development should not be overlooking the spatial implication of universities. This corroborates a previous insight by [Owoeye and Ogunleye \(2015\)](#) that the establishment and subsequent growth of universities influence the spatial heterogeneity of urban land use. Comparable observations in Indonesia ([Rahadiano et al., \(2021\)](#)) found out that although in 2015 the vegetation around Universitas Padjadjaran covered 64.99% of the total land use, it declined to 52.28% in 2017 due to new neighbourhood developments. In Malaysia, [Yigitcanlar and Sarimin \(2011\)](#) upheld that although universities promoted a knowledge-based economy through rapid spatial transformations, they still required regulation to foster economic development. A previous study around the Catholic University of Brasilia and the University of Brasilia by [Martins and Sarimin \(2007\)](#) also established that most commercial activities were near the campuses because of the demand created by their population. Proximity to the universities also influenced land prices, that is, parcels closer to the campuses were more expensive than those that were far. In this way, the campuses acted as magnets that attracted developers. Failure by policy and legislation to effectively address the spatial implication of establishing universities has also been acknowledged. This fact is supported by [Odhiambo \(2014\)](#) who argues that the Urban Areas and Cities Act of 2011, and the Universities Act of 2012, overlooked the possibility of having university towns in Kenya resulting in unplanned small urban centres around universities, a situation heightened by a lack of effective coordination framework among relevant government agencies. A study by [Kinoti and Nyaga \(2018\)](#) around Karatina University, Kenya, as well established that lack of coordination among different government institutions led by the CUE contributed to uncontrolled land use change resulting in the loss of biodiversity and environmental degradation. Their findings relate to that of [Ngochi \(2011\)](#) in Meru, Kenya, which investigated the influence that Kenya Methodist University had on its neighbouring land use. Results demonstrated that before the establishment of the university, agriculture was the dominant land use. The situation however rapidly changed after the university was established with residential buildings being the dominant land use. Built-up areas increased by 13% in contrast to

vegetation cover that declined by 16%. Property values as a result increased by 19% (1-kilometre radius from the university) and 16% (2 kilometres radius from the university). Rapid land use around the university contributed to land use conflicts because of inadequate development control and the lack of a neighbourhood spatial plan. A comparable study by Mabonga (2016) in Kakamega, Narok and Juja towns between 1989 and 2014 revealed that before the establishment of Masinde Muliro University of Science and Technology (MMUST), Jomoo Kenyatta University of Agriculture and Technology (JKUAT) and Masai Mara University (MMU), the towns' annual growth rate was 0.13%. However, after their establishment, the rate gradually increased to 0.53%. This led to uncontrolled developments characterised by inadequate infrastructural services such as water, roads and sanitation. From the reviewed studies, while most of them link the location of universities with socioeconomic development, some associate them with land use change. There is therefore a gap in knowledge on how a neighbourhood land use change that has been elicited by the establishment of universities contribute to non-compliance with planning standards. As alluded to before, the current study was undertaken in Nyamage within Kisii Municipality, Kenya, between February 2021 and August 2021. It was steered by two objectives. First, to investigate the impacts that the growth of Kisii University has had on land use in Nyamage, Kisii Municipality, Kenya. Second, to determine the link between the observed change and compliance with planning standards

MATERIALS AND METHODS

Study area, growth of Kisii University and scope of the study

Nyamage is located in the Bobaracho sublocation, approximately 2 kilometres from the Kisii Municipality's central business district. It is the neighbourhood where Kisii University has been established. The Municipality is situated in the western part of Kenya, 316 km from Nairobi, Kenya's capital city ([Fig. 1](#)). As the administrative and commercial capital of Kisii County, the Municipality strategically sits at the centre of the western Kenya tourist circuit that includes the renowned Maasai Mara Game Reserve. The town's population was 121,115 in 2021 and projected to be 250,000 by 2030. Spatially, although

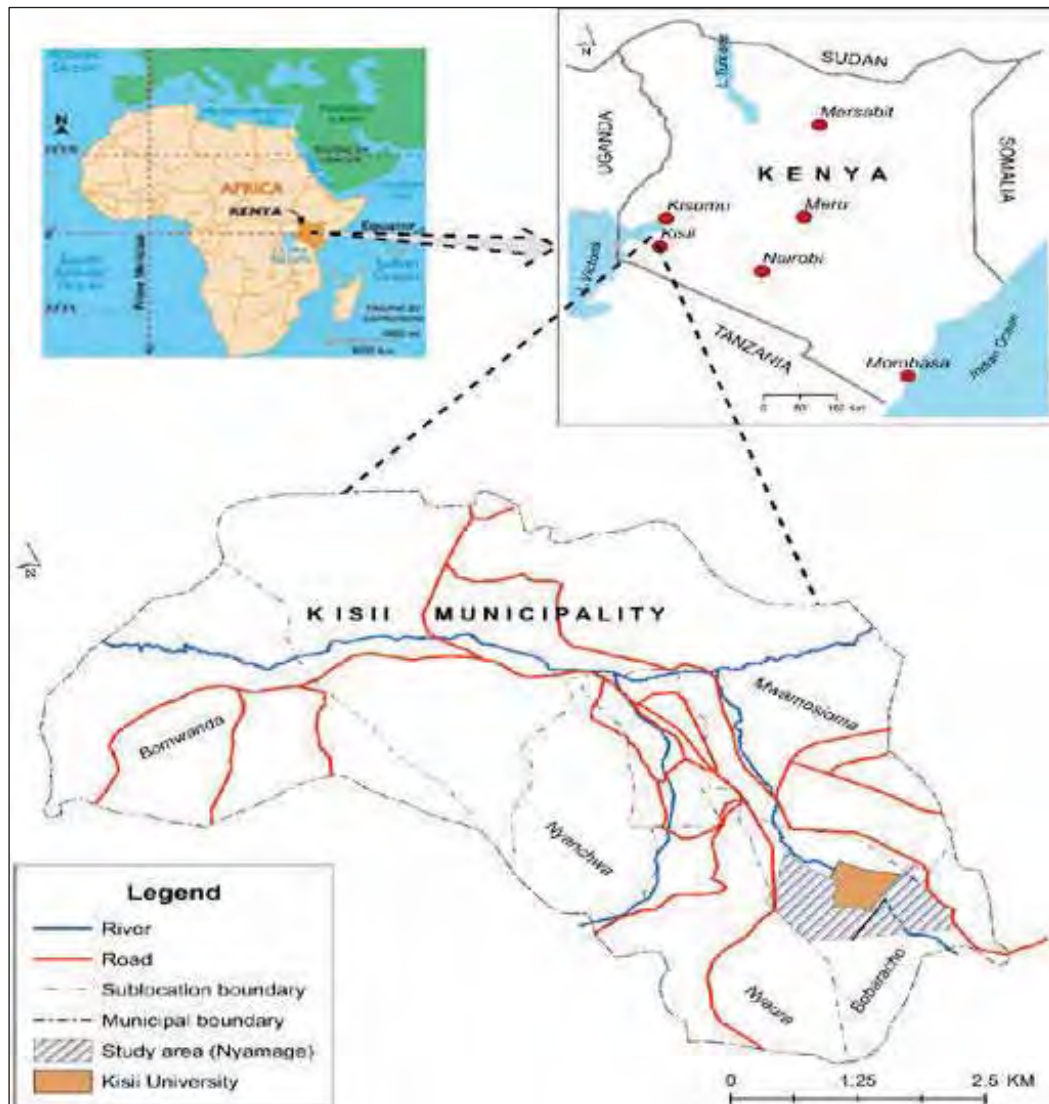


Fig. 1: Location of the study area in the national and regional context

the town covers 34 km² only 4% is planned implying that much of the development is taking place without any spatial planning intervention framework (Omollo, 2021; Omollo, 2020). This includes Nyamaga where Kisii University is situated. The institution was first established in 1965 as a primary teachers' training college and then elevated to a secondary teachers' training college in 1983, and thereafter established as a campus of Egerton University to host the faculty of commerce. The status changed in 2007 when the campus was gazetted through a legal notice as one of

the constituent colleges of Egerton University. Finally, the college was in 2013 awarded charter making it a public university. Since then, the university has expanded rapidly in terms of academic programs, student enrolment and staff establishment. It currently has over 15,000 students spread across eight schools: Arts and Social Sciences, Education and Human Resource Development; Business and Economics, Agriculture and Natural Resources Management, Law, Health Sciences, and Information Science and Technology (Kisii University, 2019). In the

recent admission of government-sponsored students to the 63 universities by the Kenya Universities and Colleges Placement Service, Kisii University received the sixth-highest share of 4,600 (Nyaundi, 2021). A progressive increase in students' population coupled with inadequate hostels within the university has led to uncontrolled developments in Nyamage as investors rush to make the most of rental income. As a way forward, the university delinked accommodation from admission making most students seek alternative accommodation outside the university. This shift in policy contributed to a proliferation of unregulated private hostels and other developments around the university, consequently contributing to a significant change in land use. With a student's population of more than 15,000, the university technically and legally meets the population threshold of establishing a town as recommended by the Urban Areas and Cities (Amendment) Act (The Republic of Kenya, 2019b). This demonstrates the stature that it has towards land use change which currently remains unregulated. While the study area covered 1.05km² around the university (Fig. 1), spatial analysis was based on the epochs covering the years 2005, 2014 and 2021. Guided by the distance decay theory which avers that demand for a commodity increase as the distance to the market decreases and then significantly declines as distance increases, the study area was spatially delineated based on students' hostels which were assumed to determine the spatial influence the university had on the neighbourhood land use. The planning standards investigated were limited to the building coverage ratio (BCR), plot size and widths of road reserves.

Theoretical setting and research design

This study was steered by the theory of regulatory compliance (TRC) to justify the importance of complying with planning standards. Historically, TRC dates back to the 1970s when the correlation between compliance with rules was likened to good practice values (Fiene, 2019). Full compliance was therefore envisaged to promote positive outcomes. Economic activities, hence, need regulation through monitoring, surveillance and enforcement to ensure full compliance (Besselink and Yesilkagit, 2020). In the current study, TRC underpins why developments around universities should comply with the recommended spatial planning standards effected

through development control. The GOK, CGOK and CUE have therefore a responsibility of ensuring that developments around universities are planned and controlled to promote sustainable spatial development as construed under the United Nation's Sustainable Development Goals (SDGs). This study adopts a case study research design which permits detailed and intensive examination of multifaceted subjects in their real-life environment (Pacho, 2015; Tetnowski, 2015; Crowe *et al.*, 2011). Applied in the current study, this approach entailed a deep contextualization of the spatial implications of establishing Kisii University in Nyamage neighbourhood, Kisii Municipality. The research findings may therefore be applied to other regions where universities have equally contributed to unregulated land use change.

Study population, sample and sample design

The study population were 577 developments in Nyamage, a neighbourhood covering 1.3 km² to the southern, eastern and western parts of Kisii University (Fig. 1). This area was segregated through a ground-truthing exercise which delimited where private students' hostels were located in relation to the university, consequently determining the span of influence that the university had on land use change. Owing to the lack of a sampling frame, developments were spatially identified using a cropped and georeferenced Google Earth image dated June 2021. The buildings were thereafter digitized using ArcGIS version 10.5 software resulting in an attribute table that was used as the sampling frame. Sample size determination relied on the table provided by Krejcie and Morgan (1972). Accordingly, if the population is between 550 and 600, the sample should be 226. With this information, a random number table was employed to draw the required samples.

Data collection and analysis

Google Earth provides high spatial resolution free images that can be used in land use mapping, particularly for the regions where landscapes are heterogeneous (Malarvizhi *et al.*, 2016; Wibowo *et al.*, 2016; Hu *et al.*, 2013). On the account of this insight, Google Earth satellite images covering three epochs (2005, 2014 and 2021) were used in the current study to determine the impacts that Kisii University had on the surrounding land use change. The images were saved in *jpeg* format, georeferenced

using ArcGIS 10.5 software and spatial analysis was undertaken as hereunder:

- i) Clipping the three epochs (each 1.3 km²) covered by Kisii University that also includes Nyamage, the neighborhood whose land use has been spatially transformed by the university.
- ii) Running *iso cluster* unsupervised image classification to automatically divide the spatial data into groups of similar items.
- iii) Ground truthing and accuracy assessment (using 500 points) of 2005, 2014 and 2021 classifications to ascertain their validity.
- iv) Preparing land use maps for 2005, 2014 and 2021 classifications.
- v) Computing land use change between 2005, 2014 and 2021 from the spatial attribute tables.

A structured observation checklist was used in collecting quantitative data on whether developments in Nyamage complied with the CGOK's permitted planning standards of BCR (75%), widths of access roads (9-18 meters) and minimum plot sizes (0.05 hectares – ha.). BCR refers to the ratio of the area covered with buildings (ground floor) divided by the area of the land covered by the building, where building area is a building's floor space when observed from the sky/above. The checklists had four columns: type of planning standard, the value of the recommended planning standard, observed/measured compliance and deviation from the recommended standard. Data from checklists were analyzed using a one-sample t-test and dependent sample t-test in SPSS version 21 software. Paired sample t-test was used to establish if the mean difference between the observed widths of access roads and their recommended planning standards were zero. It was preferred because the study area had different road widths (ranging from 9-18 m). One sample t-test on the other hand examined whether the mean of observed minimum plot sizes and BCR were statistically different from the known hypothetical values/planning standards, that is, 0.05 ha. and 75% respectively. The presence of a statistically significant difference between the recommended planning standards and observed/measured values for each planning standard was determined using a dependent sample t-test. To assure truthful observations, the recommended

widths of road reserves were obtained from the survey/Registry Index Maps procured from the county survey office, scanned, georeferenced and vectorized to roads and land parcels thereafter overlaid with the 2021 satellite image. This enabled computation on the extent to which the buildings complied with the three planning standards. A two-week ground-truthing exercise was undertaken to validate the measured compliance. Before commencing data collection, permission was sought from each sampled property owner. In cases where a sampled property was occupied by a tenant, details of the landlord were obtained from them and the landlord contacted for an interview at an agreed date that was within the data collection work plan. An assurance was given that the study was for academic purposes only and that any sensitive information will not be disclosed.

RESULTS AND DISCUSSIONS

This paper through a case study of the Nyamage neighbourhood in Kisii Municipality, Kenya, investigated the impacts that the growth of Kisii University has had on land use change. It further sought to link the observed change to compliance with three planning standards: BCR, plot size and access roads. This section therefore presents and discusses the research findings. It does this under two interrelated subsections. While the first section examines the implications of land use change, the second determines compliance with the three planning standards. The two sections ultimately culminate into a conclusion and recommendations based on the research objectives and findings.

Spatial implications of Kisii University on land use change

There is no common standard for classifying land use and land cover, and it is less likely that an accepted standard might be soon developed. Classifications are therefore developed to address the objective of what the user intends to achieve. Nevertheless, when planning to come up with a land use classification in remote sensing that will meet the expectations of most users or readers, some evaluation criteria guidelines should first be determined (Anderson *et al.*, 1976). Based on earlier knowledge of Nyamage along with a ground-truthing that was undertaken, a scheme for land use classification guided by Anderson *et al.*, 1976 was developed in Table 1.

Table 1: Land use classification for Nyamage

Type of land use	Description
Built-up areas	Areas with features such as road networks and buildings that are man-made/unnatural.
Forest	Densely growing trees that forms closed canopies. Also, encompass forests planted along the rivers.
Short vegetation	Land covered by grass and land that is used for cultivating crops, for example, maize or tea bushes.
Transitional areas	Areas that are intermittently converting or changing from one land use to another. Occurs when any category of land use stops to occur as its area become provisionally without any land use cover/development.

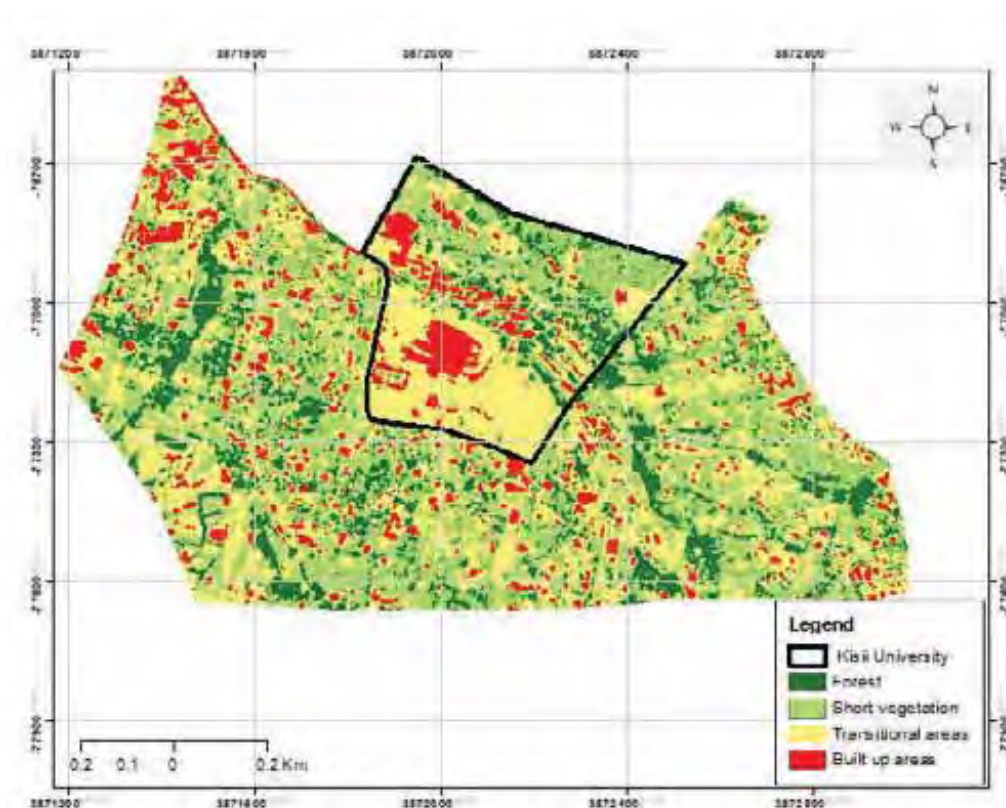


Fig. 2: Land use in 2005

Land use in 2005

The year 2005 was chosen as the base for establishing the status of land use in the study area before the establishment of the university, consequently providing a comparative insight into how land use around the university was likely to change in future. In 2005, the university was a campus of Egerton University hosting one faculty with less than 500 students. Further, the devolved governments (including Kisii County) had not been

established since Kenya was still operating under the 1969 constitution. During this period, short vegetation accounted for the highest land use (39%/52 ha.) followed by transitional areas (34%/45 ha.) and forest (17%/22 ha). Built-up areas had the lowest coverage (11%/14 ha.). The proportional land use is spatially illustrated in Fig 2. The cell size used in this land use classification (X, Y) was 1.649 m by 1.649 m.

A thematic map resulting from a land use

Table 2 Confusion matrix for 2005 classification

Land use	Forest	Short vegetation	Transitional areas	Built-up areas	Total	User Accuracy	Kappa
Forest	78	3	1	0	82	0.950617	
Short vegetation	0	196	0	0	196	1	
Transitional areas	0	0	169	1	170	0.994118	
Built-up areas	0	0	0	52	52	1	
Total	78	199	170	53	500		
Producer Accuracy	1	0.984925	0.994118	0.981132		0.98998	
Kappa							0.985544

Table 3: Land use in 2014

Land use	Area (Ha)	Proportional %	Change (%) from 2005
Forest	30	23	+5
Short vegetation	54	41	+1
Transitional areas	35	26	-8
Built-up areas	14	11	0

classification is considered valid only if it impartially or accurately represents the land cover of the region it is attempting to spatially depict. Fundamentally, classification accuracy is construed to imply the degree to which the resultant satellite image classification concurs with reality or conforms to the 'truth' on the ground (Stehman and Foody, 2019). Two important issues concerning accuracy are whether each land use category classified is present at the points indicated on a map, and if the boundaries separating each category is validly located (Lyons *et al.*, 2018). Table 2, therefore, attempts to address these interrogations by undertaking an accuracy assessment for the 2005 classification in the form of a confusion matrix.

User accuracy accounts for the number of pixels correctly classified in each land use class/category divided by the total number of pixels (row total) classified for all the land use categories of the classified image. It aims at representing the likelihood that a pixel classified into a particular category characterizes that category on the ground (Salah, 2014). It consequently computes the commission error by signifying the likelihood of the extent to which the classified sample accurately represents what is on the ground (the truth). The overall accuracy for the 2005 land use classification was 0.98998 (99%). Table 2 also indicates that in 2005, the maximum user accuracy was 100% for built-up areas and short vegetation. On the other hand, the

highest producer accuracies (omission error) were for transitional areas (99.4%) and built-up areas (98.1%). The overall accuracy for the entire classification was however 98.6%. A more detailed method for conducting classification accuracy is the use of the Kappa coefficient which likens the sum of pixels per cell of the confusion matrix with the likelihood to allot pixels as an arbitrary variable. It was used to measure each classification's accuracy since it considers all the elements in the confusion matrix instead of the diagonal elements. This resulted in 0.986, an almost perfect agreement, consequently giving additional credence and validation that the classification could be used to inform spatial policy on planning.

Land use in 2014

Further analysis is undertaken (Table 3 and Fig. 4) to compare land use change in 2014, a year after the university had been awarded charter to become a public university, against land use in 2005 before awarding of the charter in 2017. The cell size for the classification (X, Y) was 1.644 m by 1.644 m.

Compared to 2005, land use under forest in 2014 increased by 5% to 30 ha. This was the highest recipient of the 2005-2014 land use transition period. A similar increase in coverage occasioned for short vegetation that witnessed an increase of 1% translating to 54 ha. Land use under transitional areas, however, reported the highest decline (8%). This may be explained by

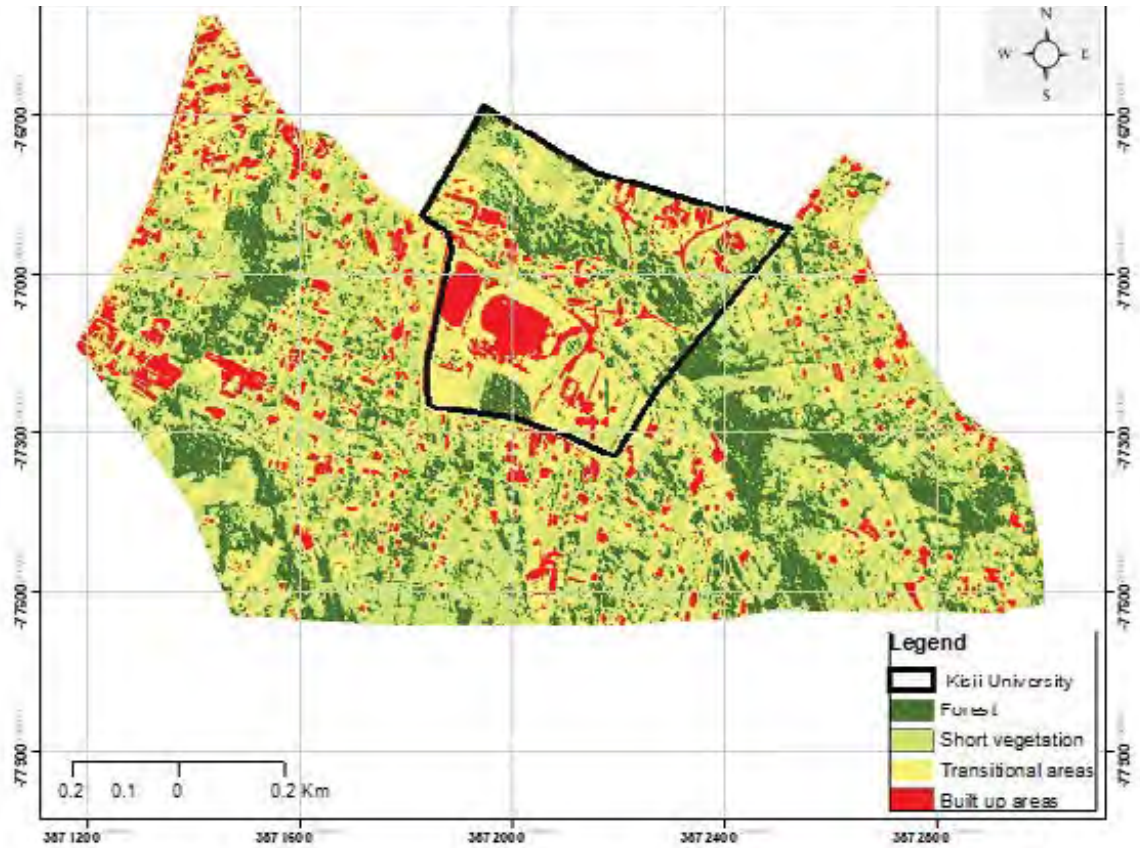


Fig. 3: Land use in 2014

Table 4: Confusion matrix for 2014 classification

Land use	Forest	Short vegetation	Transitional areas	Built-up areas	Total	User Accuracy	Kappa
Forest	114	0	0	0	114	1	0.045802
Short vegetation	0	159	28	16	203	0.783251	
Transitional areas	0	0	6	125	131	0.045802	
Built-up areas	0	0	0	52	52	1	
Total	114	159	34	193	500		
Producer Accuracy	1	1	0.176471	0.26943		0.662	0.555817
Kappa							

the fact that much of it could have changed to other uses. Noticeably, there was no change under land covered by the built-up areas. This suggests that the demand for developments around the university's neighbourhood had not started picking up. To determine the efficacy of the 2014 classification, an accuracy assessment in form of a confusion matrix

was computed in [Table 4](#).

The overall accuracy assessment for the classification was 66.2%. Further, the Kappa coefficient was 0.556 (55.6%) which is interpreted as moderate agreement. As the case of the user's accuracy, the producer's accuracy also determines how good a particular area has been classified on a

Table 5: Land use in 2021 and comparative land use change

Land use	Area (Ha) 2021	Proportional %	% change, 2005 - 2014	% change, change, 2005 - 2021
Forest	32	24	+7	+46
Short vegetation	47	35	-13	-10
Transitional areas	32	24	-9	-29
Built-up areas	22	17	+57	+57

map. It however focuses on the omission error, that is, the percentage of observed ground features that the map has not classified. The higher the errors of omission, the lesser the producer's accuracy in the map. As indicated in [Table 4](#), transitional areas and built-up areas had the lowest producer accuracies of 0.176 (18%) and 0.269 (27%) respectively for the 2014 classification. Transitional areas were largely misclassified due to comparable spectral properties with short vegetation, regarding built-up areas. A similar misclassification also occurred due to similar spectral similarities with transitional areas. This may be explained by the fact that most of the rusted roofing sheets appeared similar to areas under transition such as open grounds or murram roads. While transitional areas registered the lowest user accuracy of 0.05%, built-up areas and forests had the highest user accuracies of 100%.

Land use in 2021

The year 2021 marked eight years since the university was awarded a charter. By this time, unlike in 2014, short vegetation was dominant (35%) followed by transition and forest areas respectively (24%). Built-up areas covered was the least. Comparatively, between 2005 and 2014, forested land increased by 7%. This was due to an increase in the number of trees planted along the riparian reserves of River Nyakomisaro that also traverses the university. Short vegetation on the other hand declined by 10% with transitional areas also declining by 9%. Particular attention is however drawn to the built-up areas that significantly expanded by 57%, further revealing the impact that the university has on the neighbourhood's spatial transformation ([Table 5](#) and [Fig. 4](#)). The study, therefore, sought to determine the differences in land use change between 2005, the base year used for undertaking spatial analysis and 2021. Results demonstrated that built-up area was the highest recipient (57%), followed by forests (46%). The highest losers during the period were

short vegetation (13%) and transitional areas (29%). This summary is presented in [Table 5](#).

A comparison between 2005 and 2014 conversely confirms that the built-up areas expanded more (57%) followed by forests (7%) ([Fig. 4](#)). Short vegetation equally experienced the highest decline (13%). Land use under forest went through the highest expansion owing to the concerted efforts by the university to complement the GOK's initiatives of attaining a minimum forest cover of 10% in Kenya. This initiative is evident by a visible greenbelt of forest cover that traverses the university along River Nyakomisaro. The trend is also evident in the southeastern part of the university where the neighbouring community has planted eucalyptus trees along the river. This initiative is however not environmentally friendly since the trees are known to drain water resources.

As alluded to in the land use classification scheme for the study area ([Table 1](#)), short vegetation was construed as grasses and cultivated land. Its decline may therefore be explained by the fact that much of it could have been changed to built-up areas (buildings development). Alternatively, vegetation such as maize whose production is predictably seasonal could have been harvested by the time the image was taken by the Google Earth satellite. Despite the interplay between various land uses, the most outstanding so far remains built-up areas whose unregulated expansion contributed to spatial conflicts through the disregard of planning standards elicited by the growth of Kisii University in Nyamag. The accuracy assessment for this classification is presented in [Table 6](#).

While the resulting Kappa coefficient for the 2021 land use classification was 0.7356 (74%), thus rated as a substantial agreement, overall accuracy, on the other hand, was 80% (rated as very good). The commission errors were 0.00834 (forest), 0.25424 (short vegetation), and 0.44629 (transitional areas). There was no commission error for the built-up areas, denoting that no other land use was erroneously included as part of the built environment. Conversely,

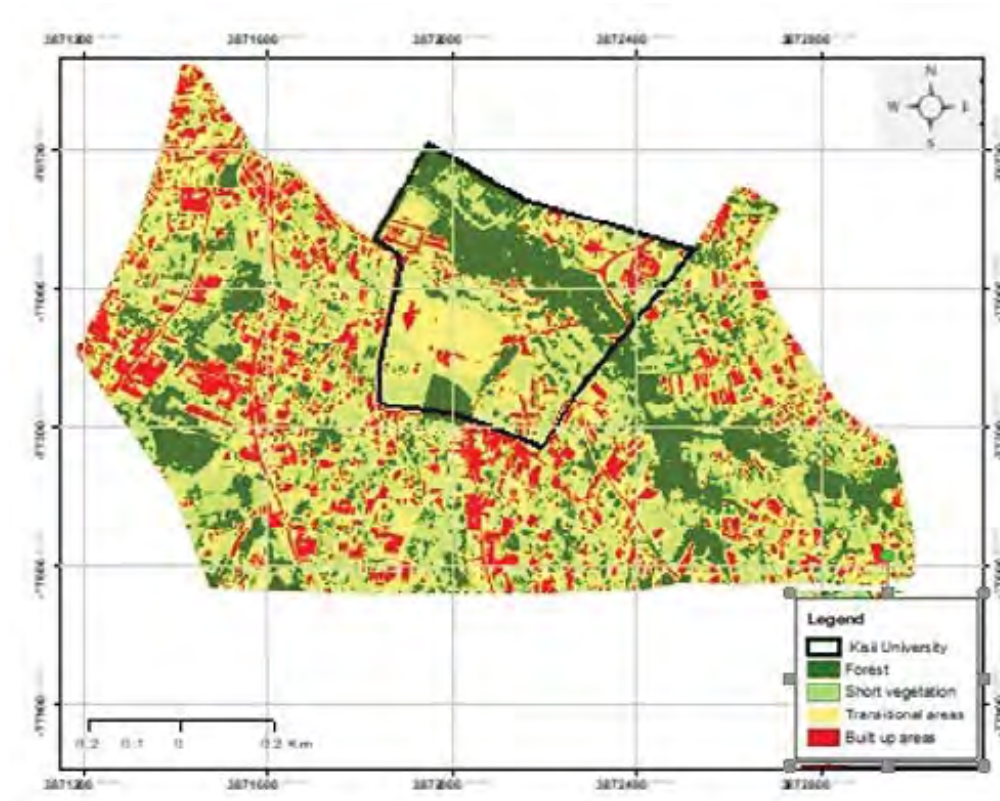


Fig. 4: Land use in 2021

Table 6. Confusion matrix for 2021 classification

Land use	Forest	Short vegetation	Transitional areas	Built-up areas	Total	User Accuracy	Kappa
Forest	119	1	0	0	120	0.99166	0.7356
Short vegetation	1	132	2	42	177	0.74576	
Transitional areas	0	0	67	54	121	0.55371	
Built-up areas	0	0	0	82	82	1	
Total	120	133	69	178	500	0	
Producer Accuracy	0.991	0.99248	0.97101	0.460		0.8	
Kappa							0.7356

the omission errors were 0.009 (forests), 0.00752 (short vegetation), 0.02899 (transitional areas) and 0.54 (built-up areas). The producer accuracy for the built-up land was low because some cells (transitional areas and vegetation) which should have been included as part of the built-up areas was erroneously excluded. A summary of land use change between the 2005 and 2021 periods is finally presented in Fig. 5.

The Table confirms that short vegetation and transitional areas underwent a noticeable decline

between 2005 and 2021. Forests and built-up areas appear as the key beneficiaries of this decline since their spatial coverage noticeably increased during the period. In all cases, forests and built-up areas recorded the highest increase in land use change. Particular attention is however drawn to the rapid expansion of built-up areas which, in absence of adequate development control by the CGOK, has contributed to unsustainable spatial development in Nyamag.

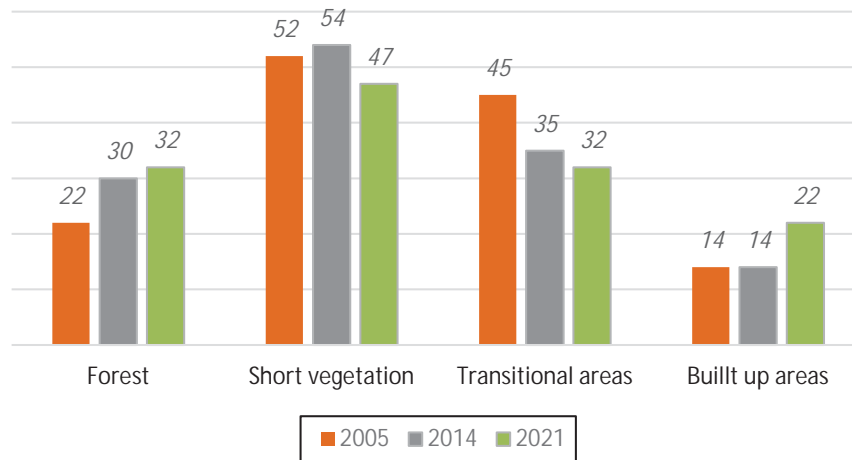


Fig. 5: Summary of land use change, 2005-2017

Implications of Kisii University on land use – A development control perspective

Having examined land use change around the university, this subsection now delves into the planning implications of this observed change. Under it, compliance with three planning standards that included land subdivisions, BCR and widths of access roads are examined.

Land subdivisions

When a parcel of land is divided or partitioned into two or more new parcels of land, the large or the original piece is deemed to have been subdivided (Strack, 2019). Land subdivision is consequently a continuous process that involves the regulation of private and public land ownership through development control. Land subdivision planning standards, therefore, serves to promote the development control principles of safety, convenience and accessibility (CMDHCD, 2009). Their effectiveness is enforced through planning standards which forms part of development control instruments. Subdivision planning standards also intends to regulate uneconomic land subdivisions along with controlling plot congestion. Their enforcement improves the provision of activities within a plot for instance parking and sufficient space for supporting linked infrastructural services. In this way, subdivision planning standards are closely related to the floor area index and BCR. Given that

the recommended minimum planning standard for plots in Nyamagwe was 0.05 ha, the current study determined if developments complied with it. An initial interpretation of the data using the one-sample statistics showed that mean compliance ($M=0.154$, $SD = 0.240$) was within the recommended 0.05 ha. (the recommended planning standard). This prompted a further investigation to confirm whether the observations were statistically significant. The outcome is presented in Table 7.

The one-sample test (Table 7) reveals the outcome of the significance test where the top row gives the population mean or the known/hypothesized value (recommended planning standard of 0.05 ha.). In this case, the extent of compliance was significantly higher than the recommended planning standard, $t(182) = 5.866$, $p = .000$, signifying compliance. With this insight, through a case by case descriptive statistics, the study determined if compliance with this planning standard was observed by each sampled development. The descriptive outcome is presented in Table 8.

The Table reveals that although compliance was significantly higher by a mean difference of 0.104 ha, cumulatively, 65% of developers (a majority) overlooked the recommended planning standard on minimum plot size, further demonstrating inadequate development control. To further explore the magnitude of the problem, a spatial analysis was undertaken to single out the subdivisions that were

Table 7: Test for significance on compliance with land subdivision planning standard

One-sample test	Test value = 0.05 ha.				
	t	df	Sig. (2-tailed)	Mean Difference	95% confidence interval of the difference
					Lower Upper
Recommended vs observed plot size	5.866	182	.000	.104030	.06904 .13902

Table 8: Case by case grouping of observed compliance with subdivisions

Observed Plot size (ha)	Frequency	Proportional %	Cumulative %
0.006	6	3.3	3.3
0.010	1	0.5	3.8
0.030	6	3.3	7.1
0.030	6	3.3	10.4
0.037	7	3.8	14.2
0.039	18	9.8	24.0
0.040	27	14.8	38.8
0.041	6	3.3	42.1
0.042	6	3.3	45.4
0.043	6	3.3	48.6
0.044	6	3.3	51.9
0.045	18	9.8	61.7
0.046	6	3.3	65.0
0.050	18	9.8	74.9
0.059	5	2.7	77.6
0.330	6	3.3	80.9
0.340	6	3.3	84.2
0.380	6	3.3	87.4
0.390	6	3.3	90.7
0.650	6	3.3	94.0
0.900	11	6.0	100.0
Total	183	100.0	

not complying with the standard of 0.05 ha. This was undertaken by examining the parcels of land that were located on the western part of the university. Two registry index maps (2005 and 2020) were used for comparison. Results presented in Figs. 6 and 7 submits that in 2005, shortly before the university was established as a college, noncomplying plots were not following any predetermined spatial pattern. The situation, however, changed in 2020 with much of the noncomplying subdivisions now evidently forming a linear pattern near the university.

Building Coverage Ratio

As alluded to before, BCR refers to the total area covered with buildings (ground floors) divided by the area of the land covered by the buildings, where

building area is construed as a building's floor space when observed from the sky/above, usually indicated as a percentage. The approved BCR for Nyamage, the neighborhood where Kisii University is located, was 75%. Its enforcing as a planning standard is envisaged to result in the following benefits:

i) Controlling the intensity and density of land use development. Thus, within the same plot, a higher BCR value correspondingly contributes to a higher floor area/coverage, therefore increasing pressure and demand on land use and infrastructural facilities.

ii) Provision of space for supporting essential services, for example on plot parking and septic tanks.

iii) Presents planners with design opportunities

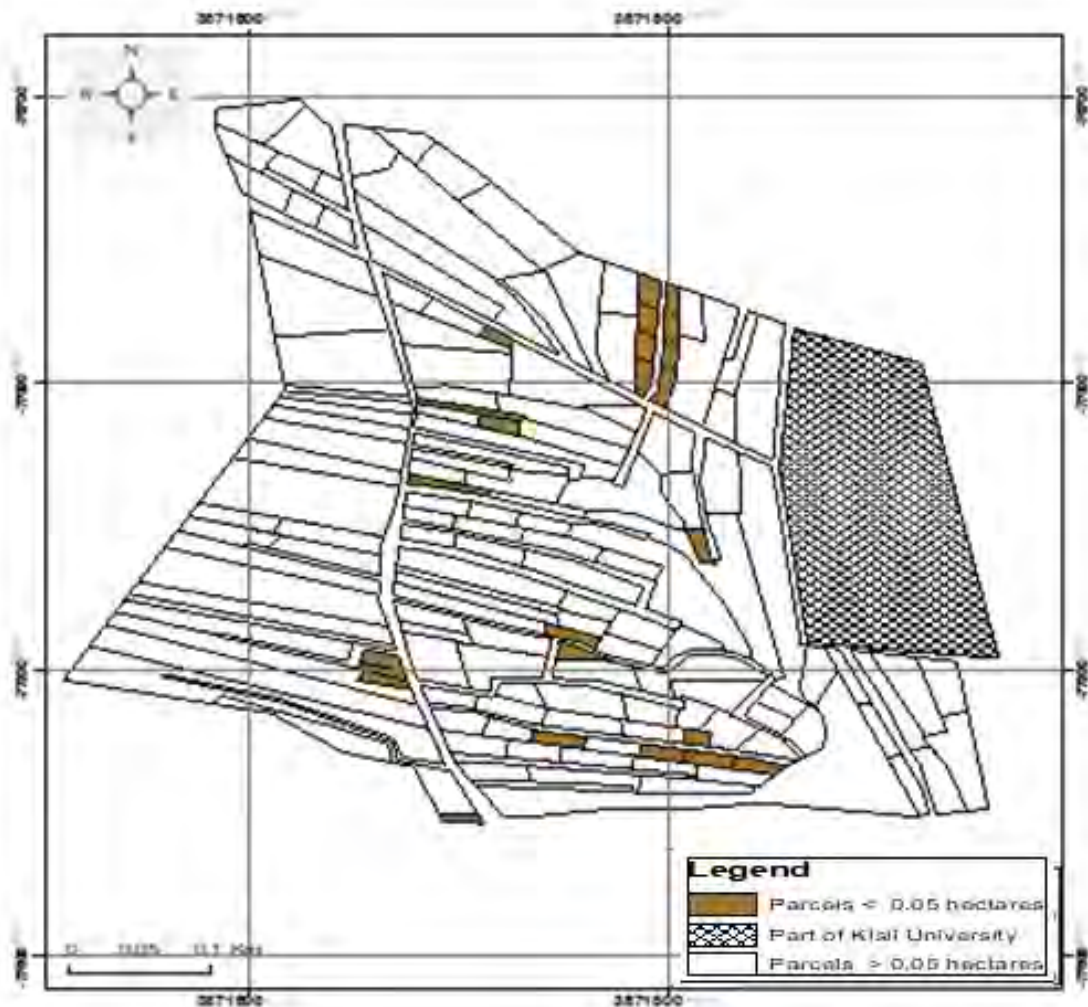


Fig. 6: Noncomplying land subdivisions in 2005

for increasing the amount of habitable and open spaces that could be available within a plot, therefore improving the principles of development control that includes safety, conservation, access and convenience.

The study, therefore, sought to establish if the standard was being observed by the sampled developments in Nyamage. The initial one-sample descriptive statistics showed that mean compliance ($M = 82.022$, $SD = 15.950$) exceeded 75%. A further analysis was undertaken to establish if the observations could have been statistically significant. The test returned a significant increase in BCR among the developments that were sampled, $t(182) =$

-5.955 , $p = .000$, consequently depicting inadequate development control by the CGOK. The maximum BCR was 100% while the lowest was 25%. The modal frequency on the other hand was 85%. [Table 9](#) further gives a comparative analysis on a case-by-case descriptive review of each of the sampled developments in the neighbourhood.

The table authenticates that cumulatively, only 17% of the sampled development complied with the recommended minimum planning standard of 75% that regulates BCR. This further depicts inadequate development control by the CGOK. This problem is bound to escalate soon as the university continues expanding through an increased student population and community engagement through extension.

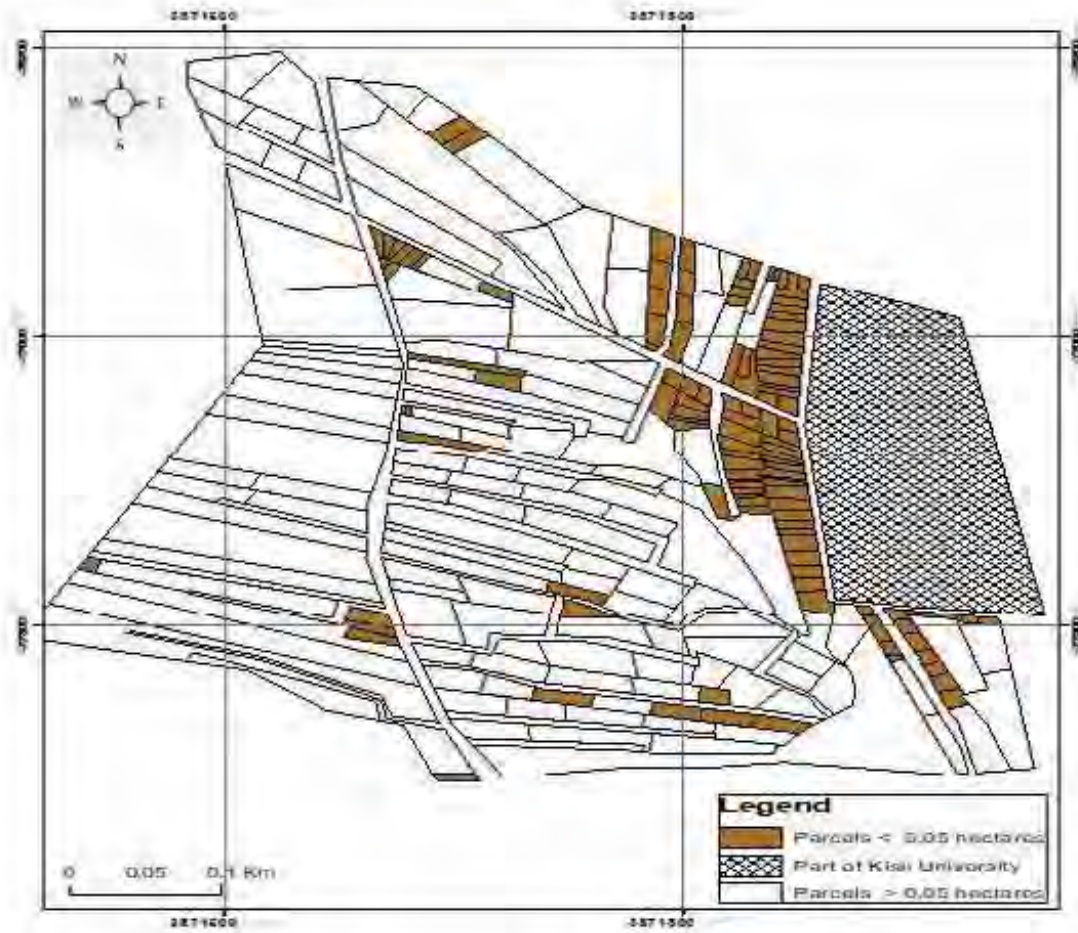


Fig. 7: Noncomplying land subdivisions in 2020

Table 9: Case by case grouping of observed compliance with BCR

Observed BCR (%)	Frequency	Proportional %	Cumulative %
25.00	6	3.3	3.3
50.00	12	6.6	9.8
65.00	7	3.8	13.7
70.00	6	3.3	16.9
80.00	30	16.4	33.3
85.00	54	29.5	62.8
90.00	31	16.9	79.8
95.00	19	10.4	90.2
100.00	18	9.8	100.0
Total	183	100.0	

Minimum road reserves

Roads open up isolated areas by stimulating socio-economic development. As such, they are considered the most important public assets (Mostafa, 2018). The current study, therefore, investigated the level to

which the planning standard on the minimum widths of road reserves in the study area was complied with by the sampled developments. The results of the descriptive paired sample statistics showed that the observed mean for road reserves ($M = 5.093$, $SD =$

Table 10: Test for significance on minimum road reserve

Paired samples	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% confidence interval of the difference				
				Lower	Upper			
Observed widths of the road vs Recommended width of roads	-3.957	1.189	.087	-4.129	-3.782	-44.98	182	.000



Fig. 8: Illegal developments (left and right) fronting the university's main gate (center)

1.166) was lower than the planning standard ($M = 9.049$, $SD = 382$). To further explore if this increase was statistically significant, analysis of paired sample t-test was computed in Table 10. The outcome indicates that the observed minimum plot sizes ($M = -3.956$, $SD = 1.190$) were statistically significant, $t(182) = -44.981$, $P = 0.00$ therefore suggesting why most roads in the study area are narrow. This disregards the development control principles of accessibility, conformity, safety and convenience which should be promoted by the CGOK.

The problem is also depicted pictorially (Fig. 8 and Fig. 9) where illegal developments are sited Infront of the university's main gate and behind the tuition block. The developments are located on the stormwater drains and pedestrian footpaths, further undermining the principles of development control such as safety, access and compatibility, a situation that validates

insufficient planning and development control by the CGOK. In Fig. 9, uncontrolled developments are not only built along the university's fence but also blocks the fronting 9-meter road reserve in Nyamage..

The findings of the current study agree with that of Dindi (2013) who established that the growth of Jomoo Kenyatta University of Science and Technology contributed to a decrease in vegetation, bare ground and tremendous growth in built-up areas in Juja. The increase in built-up areas was due to the construction boom of hostels around the university in an attempt to meet a demand created by students who could not be housed on campus. This expansion was without proportionate to investment in physical infrastructure leading to an unsustainable environment. Research findings from the current study similarly corroborate that of Mabonga (2016) who through spatial analysis demonstrated a significant change in land use and



Fig. 9: Illegal developments behind the university's newly constructed tuition block

land cover as a result of establishing JKUAT, MMUST and MMU. The study recorded the considerable transformation of farmlands and forests into built-up environments leading to uncontrolled settlements around the universities. The current study however examines the planning implications of such land use change by focusing on compliance with the recommended planning standards and in so doing filling a gap in the literature that hitherto existed in urban land use planning and development control as a legislative and policy requirement.

CONCLUSION

This study investigated the impacts that the growth of Kisii University has had on land use change through a case study of the Nyamage neighbourhood in Kisii Municipality, Kenya. It also sought to link the observed change to compliance with the recommended planning standards that included BCR, plot size and access roads. Research findings revealed that the establishment and growth of Kisii University have in the past 14 years contributed to significant land use change within the surrounding neighbourhood of Nyamage with built-up areas accounting for the greatest transformation. This rapid change further contributed to noncompliance with key planning standards such as the minimum plot size, BCR and minimum plot size, resulting

in land use conflicts and pressure on the limited infrastructure such as water and sewer reticulation, consequently contributing to unsustainable spatial development. The problem keeps recurring even though the CGOK has been mandated by part IV of the Physical and Land Use Planning Act ([The Republic of Kenya, 2019a](#)) to among others, ensure that land use development is orderly; ensuring that approved plans are implemented; conservation and protection of the environment; promoting public health and safety; control land subdivision; approve and issue development permits. It, therefore, appears that the GOK's main focus of establishing universities was to meet the target set in Kenya Vision 2030 of having at least 100 universities alongside the recommendation of the Universities Act of 2012 which advocates for university in each of the 47 counties, without paying attention to their implications on land use change.

Recommendations

The study makes two policy pronouncements. First, at the moment, the CUE through the Universities Standards and Guidelines, 2014 ([The Commission for University Education, 2014](#)) require universities that are proposing to be chartered to only possess master plans that show the physical infrastructure that is existing and the proposed developments. The guidelines also condition universities to have

strategic plans that cover general development in areas such as learning and administrative facilities, enrolment of the student, staff establishment and development, research, academic programs on offer, information communication and technology, and community extension. Given this observed limitation, it is recommended that regulation number INST/STD/07 on planning should be revised to make it mandatory that any proposed university, besides the physical master plan and strategic plan, should also in collaboration with the concerned county governments, ensure that the neighbourhood where it is proposed is first planned. Second, as provided under section 52 of the Physical and Land Use Planning Act, the CGOK should at the earliest opportunity declare the entire study area as a “special planning area” to provide a legal basis and resource allocation for preparing a comprehensive physical and land use development plan which will be used as a tool for undertaking development control. Although the current study has linked the growth of universities to urban land use, its scope in terms of spatial planning was limited to only three planning standards. Future research may therefore be undertaken to explore the impacts that universities have had on other related physical planning standards such as floor area ratio, car parking, and provision of pedestrian footpaths.

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CONFLICT OF INTEREST

The author declares no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the author.

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ABBREVIATIONS

<i>BCR</i>	Bulling Coverage Ratio
<i>CGOK</i>	County Government of Kisii
<i>CUE</i>	Commission for University Education
<i>Fig.</i>	Figure
<i>GIS</i>	Geographic Information Systems
<i>GOK</i>	Government of Kenya
<i>ha.</i>	hectares
<i>JKUAT</i>	Jomoo Kenyatta University of Science and Technology
<i>Km</i>	Kilometers
<i>Km²</i>	Kilometer square
<i>m.</i>	Meters
<i>MMU</i>	Masai Mara University
<i>MMUST</i>	Masinde Muliro University of Science and Technology
<i>NDVI</i>	Normalized Difference Vegetation Index
<i>SDGs</i>	Sustainable Development Goals
<i>SPS</i>	Sector Performance Standards
<i>TRC</i>	Theory of Regulatory Compliance
<i>UASU</i>	Union of Academic Staff Union
<i>UCN</i>	University College Nairobi

UEA University of Eastern Africa
% Percentage

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ORIGINAL RESEARCH PAPER

The effect of community-based crisis management on the resilience to disasters with the mediating role of social capital

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ABSTRACT

BACKGROUND AND OBJECTIVES: In recent years, the occurrence of natural disasters, including floods, earthquakes, storms, and the like, has increasingly resulted in severe concerns in Iran as such disasters were unfortunate, causing human and financial losses, especially in disaster-prone areas like the south of Kerman province. Thus, it is critical to focus on innovative Community-based Crisis Management approaches. The present research aims to study the effect of community-based crisis management on the resilience to disasters with the role of social capital in the south of Kerman province. Although much research has been conducted in this area in recent years, no study can be found that has simultaneously measured these three variables and from the citizens' perspective, which is the innovation of this paper.

METHODS: Research data were collected using a questionnaire; thus, the research questionnaire was distributed among many citizens in the south of Kerman province. Research findings were analyzed through using LISREL.

FINDINGS: The results showed that the community-based crisis management variable with an impact factor of 0.37 has a positive and significant effect on citizens' resilience. Social capital also plays a mediating role in the relationship between community-based crisis management and resilience, while having a positive and significant effect on citizens' resilience.

CONCLUSION: The research findings help policymakers, managers, and crisis management experts deliver effective programs to reduce vulnerability and enhance citizen resilience of south of Kerman province against natural disasters.

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INTRODUCTION

One of the dangers that have constantly threatened the lives of human societies over the centuries is the occurrence of disasters that may cause irreversible damages to multiple aspects of human life, including social, environmental, and residential areas, in case of lack of awareness and unpreparedness (Pourahmad *et al.*, 2019). Crises are of critical human concern, which is more pronounced in developing countries due to disasters intensity (Ziervogel *et al.*, 2017). It is expected that disasters and their consequences will affect around 800 million people worldwide in the next twenty years, causing abundant death and economic losses (Soltani *et al.*, 2016). Like other developing countries, Iran is currently facing many issues. Iran is ranked among the top 10 countries in terms of unexpected events, with 34 of 40 natural disasters identified globally with around 90-95% climatic origin. Due to climatic and tectonic conditions in Iran, the most critical natural disasters are earthquakes, landslides, avalanches, floods, droughts, hurricanes, lightning, extreme cold and heat, desertification, hail, and freezing (Sarvar and kashani, 2016). With only 1% of the global population, Iran accounted for 6% of natural disaster casualties. It underwent around 14 earthquakes (within the range of 6.2-7.7 R) over the last 50 years (the most recent of which has occurred in Fin, Hormozgan province). Meanwhile, Iran's vulnerability to the earthquake is almost a thousand times larger than an earthquake-prone country like Japan (Moeinian *et al.*, 2019). Although such occurrences are unpredictable cannot be predicted long before, careful planning and appropriate policies for participatory approaches and citizen empowerment could diminish disaster damages as much as possible (Ali *et al.*, 2019). In many cases, the damages caused by secondary accidents were much larger than the accident itself (Moeinian *et al.*, 2019). However, natural disasters are often beyond human control; the damages and injuries caused can be restrained. Hence, Iran is dealing with one of the significant challenges of decreasing natural disaster losses and damages through citizen resilience and empowerment (Fazeli Kebriya *et al.*, 2021). From the crisis management perspective, the local community structure and decentralized and participatory decision-making through social groups associated with cooperation and mutual trust may result in logical disaster responses and decreased

vulnerability (Neal and Philips, 1995). Despite the importance of the community-based approach and the variables mentioned above, the traditional top-down approach is still considered the dominant crisis management method in Iran (Mohebat Zohan *et al.*, 2020). In addition to intensified secondary injuries, it also heightens citizen vulnerability to natural disasters (Ricciardelli *et al.*, 2018). Community-based disaster management aims to enhance public knowledge (awareness) and preparedness in disaster-prone areas. The significance of local community participation lies in the fact that people know their place of residence and its opportunities and threats much better than any other outsider (Ali *et al.*, 2019). According to Karimi and Taghilou (2020), the community-based approach overcomes the top-down approach shortcomings, which failed to address local needs due to neglect of local resources and potentials. It tends to decrease public vulnerability, reform planning, and crisis management. In addition, Hosseini *et al.* (2017) considered inadequate attention to the nature of reduced or increased risk, low community resilience, neglecting social capital, and improper educational programs are of some community-based approach challenges in Iran. The community-based approach essentially relies on citizen empowerment through participation (Mohebat Zohan *et al.*, 2020). Participation refers to the presence of people attending at all processes, including policymaking, planning, decision-making, and implementation (Jahangiri *et al.*, 2013). Moreover, public participation significantly contributes to decreased vulnerability and enhanced resilience (Cutter *et al.*, 2008). On the other hand, recent studies aimed at finding the relationship between resilience and social capital during natural disasters showed interesting results. Malekan *et al.* (2020) investigated the relationship between social capital and drought resilience in rural areas of Kangavar. Research data were analyzed using SPSS and AMOS and revealed a significant positive correlation between resilience and intra-group, relational, and organizational social capital. Savari and Abdeslahi (2019) focused on studying the effect of social capital in improved drought resilience of rural households. The results demonstrated a significant positive relationship between rural household resilience and social capital. Moreover, structural equation modeling also revealed that social capital could explain resilience at 0.81. Arvin

et al (2018) also conducted another study and found a significant relationship between social capital and resilience-focused risk management. Accordingly, Delilah Roque *et al.* (2020) also concluded that social capital facilitates efforts to recover and enhance resilience through shared values, expand the social network, and more contributions. Although many studies have been so far conducted on resilience and social capital at natural disasters, no research has yet analyzed the relationship between community-based crisis management and the two variables in Iran. If crisis management authorities in Iran seek appropriate prospective policies focused on local people empowerment, it seems necessary to consider community-based crisis management, citizen resilience, and social capital. The present research originality lies in the fact that the first research studies the relationship among these three critical variables. By sharing the research results with research findings of other similar developing countries, the present research may decrease natural disaster vulnerability in communities. In response to community concerns to destructive natural disasters, the present research studies the relationship among three variables using structural equation modeling through LISREL. In this regard, a research survey was carried out among citizens of the south of Kerman province in 2021. Fig. 1 illustrates the research conceptual model.

According to the research experimental and

theoretical foundations, research hypotheses are as follows:

H1: Community-based crisis management positively affects citizens' resilience in the south of Kerman province.

H2: Social capital positively affects the citizens' resilience in the south of Kerman province.

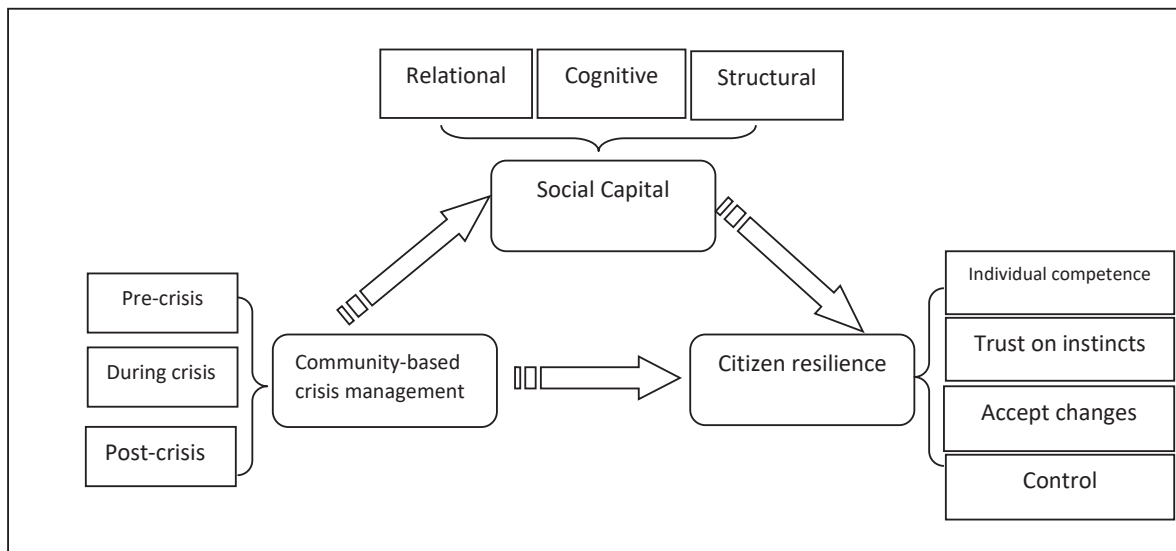
H3: Community-based crisis management positively affects citizens' social capital in the south of Kerman province.

H4: Social capital positively mediates the relationship between community-based crisis management and citizens' resilience in the south of Kerman province.

MATERIALS AND METHODS

Research method In the present study, according to the applied purpose and based on the implementation method, is a descriptive-survey based on structural equation modeling that has been done in the south of Kerman province.. The south of Kerman is extended about 50000 square km consisting of Jiroft, Anbarabad, Kahnooj, Menoojan, Rudbar, Faryab, and Ghale Ganj cities (Fig. 2). The understudied area's diverse climate results from the location topography and geography (Sharifi *et al.*, 2019). According to the latest census 2016, the population in the centers of the southern cities of Kerman province was 444141. The area is prone to

Fig. 1: Research conceptual model



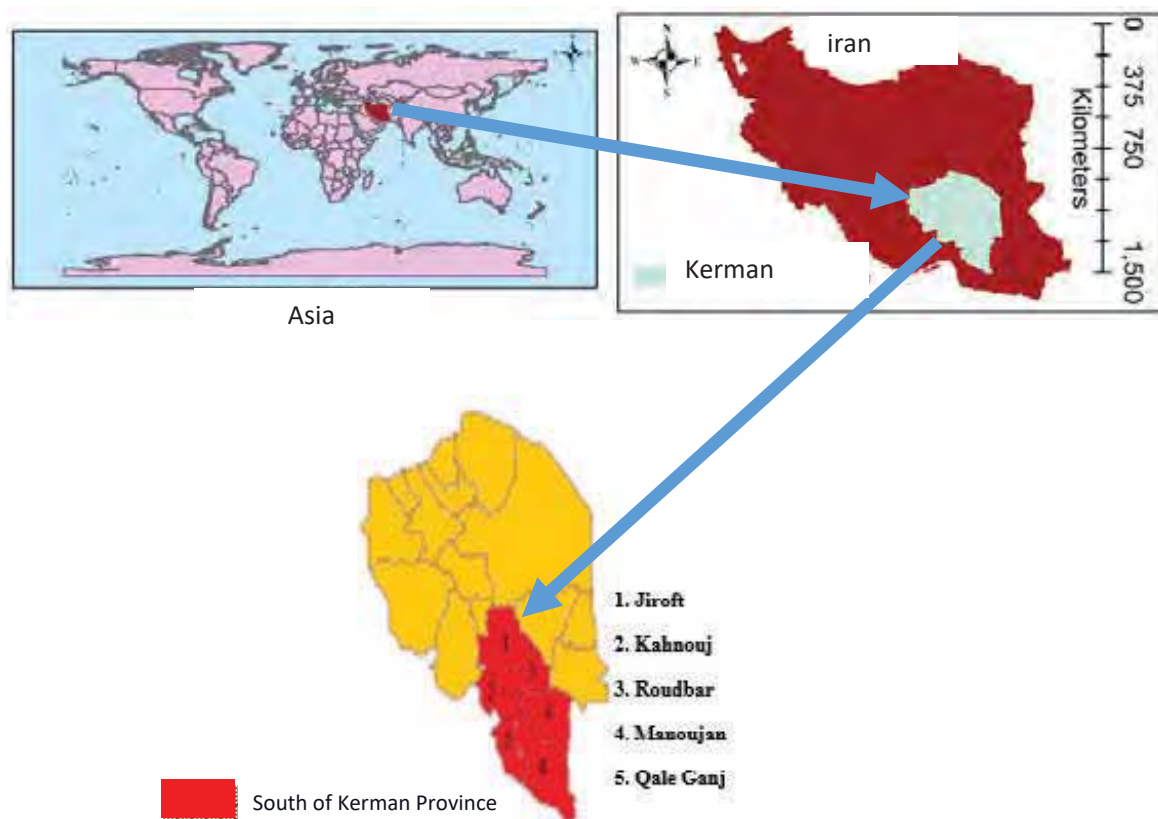


Fig. 2. Location of the study area

earthquakes due to the Sabzewaran fault, a fault zone separated into eastern and western Sabzewaran. The latter extends around 100 km in the west of Kahnooj to the south of Jiroft. The interaction of western Sabzewaran and Jiroft faults has caused a tectonic depression in the north of Kahnooj. As one of the most critical southern cities of Kerman province, Jiroft, with an area of around 9653 km², accounts for 5.3% of the total area of Kerman province. It is surrounded by Kerman city from the north, Faryab, and Kahnooj in the south. Also, it is located in the east of Bam and the west of Baft, Arzuiyeh, and Rabor. Jiroft is situated in the vast plain of Halil River on the southern outskirts of the Jebal Barez mountain chain and Delfard. It has a warm climate with hot summers when the temperature reaches 50°. Anbarabad is another city located 257 km from Kerman province. It is situated northwest of Jiroft, south of Kahnooj and Rudbar-e Jonubi County, and east of Bam and Rigan County. With an area of nearly 4699 km², Anbarabad

is equal to 6.2% of the province's total area. With an area of 2190 square kilometers, Kahnooj is located southwest of Kerman, accounting for 2.1% of the total area. It is situated north of Jiroft and east of Rudbar-e Jonubi County. The city is surrounded by Faryab city from northwest to the west, Qaleh Ganj in the southeast, Rudan County, Hormozgan Province in the southwest, and Manujan County in the south. Manujan County is also located north of Kahnooj, west and southwest of Rudan County, east of Qaleh Ganj, south of Minab in Hormozgan province. It is situated in a hot, humid, and vast plain 400 km southwest of Kerman, 155 km of south Jiroft, and 130 km of east Bandar-e' Abbās. Another southern city of Kerman is Rudbar-e Jonubi County, located northwest of Rigan County, northeast of Anbarabad, west of Kahnooj, and east of Dalgan County in Sistan and Baluchestan province. It is also surrounded by Qaleh Ganj in the south. Rudbar-e Jonubi County lies 230 km away from the capital of Kerman province with an

Table 1: Questionnaire validity and reliability factors

Variable	Components	Convergent Validity	Fornell and Larcker Convergent Validity	Cronbach's alpha	Compositional reliability
Community-based crisis management	Pre-crisis	0.574	0.757	0.823	0.842
	During crisis	0.637	0.798	0.721	0.838
	Post-crisis	0.548	0.740	0.780	0.824
Resilience	Individual competence	0.501	0.707	0.864	0.853
	Trust on individual instincts	0.571	0.757	0.891	0.901
	Accept changes	0.583	0.763	0.783	0.873
	Control	0.516	0.718	0.904	0.860
Social Capital	Cognitive	0.563	0.750	0.835	0.857
	Relational	0.528	0.726	0.856	0.923
	Structural	0.554	0.744	0.820	0.893

area of 6864 square kilometers. Faryab is surrounded by Jiroft from north to the northeast, Arzuiyeh in the northwest, Hajiabad in the west, Rudan County in the south, and Kahnooj in the east. Finally, the southernmost city of Kerman province is Qaleh Ganj, with 10438 square kilometers. It is located 400 km from the province capital in the north of Kahnooj and Rudbar-e Jonubi County, south of Bandar-e Jask in Hormozgan Province, and Fanuj in Sistan and Baluchestan province. Qaleh Ganj is also situated east of Hamun-e Jaz Murian (inland basin) and west of Manujan County. Furthermore, the northern Gook faults, southern Gelatohi fault, and Jiroft and Sardouei faults have constantly threatened Ghale Ganj. On the other side, with a mean rainfall of 173 mm, the southern areas are suffering from drought and annual economic losses as an arid and semi-arid region. Precipitation dispersion and thunderstorms have also caused seasonal floods. Studies reveal that flood-prone areas are almost located south of Kerman province at low altitudes containing south Roudbar, Ghale Ganj, and some parts of Anbarabad.

Research samples were 384 selected through simple random sampling method by Cochran formula (0.05). Data were collected through the library and filed study methods, and the conceptual research model was obtained by investigating national and international papers and scientific books. The conceptual research model was validated using the field studying method through three questionnaires. The first researcher-made questionnaire was designed to measure the community-based crisis management

variable before (awareness and education, theoretical participation, cultural-social capital, intellectual capital), during (practical participation, public emotional management, communication), and post-crisis (social participation, mass media, collective memories, identity creation) in a 5-point Likert Scale (Very Low, Low, Moderate, High, Very High). Citizens' resilience was measured using the [Connor-Davidson Resilience Scale \(2003\)](#), which is a 25-item Likert scale from zero (totally unacceptable) to five (always acceptable), assessing resilience (individual competence, trust in instincts, accepting positive change, and control). [Nahapiet and Ghoshal's \(1998\)](#) inventory was used to evaluate the social capital variable. It consists of 28 items assessing structural, cognitive, and relational dimensions of social capital variable in a 5-point Likert Scale (Strongly agree, agree, neither agree nor disagree, disagree, strongly disagree). Face and content validity, and construct validity were verified by experts and confirmatory factor analysis, respectively. Cronbach's alpha measured the reliability of research instrumentations, and further, compositional reliability of the latent variables was also obtained. Given that $AVE > 0.5$ examines the correlation between construct and its measurements, results of research questionnaires' validity and reliability ([Table 1](#)) display that the AVE value was larger than 0.5 for all variables of community-based crisis management, resilience, and social capital inventories. In addition, Cronbach's alpha and compositional reliability were also obtained larger than 0.7 verifying the research questionnaires'

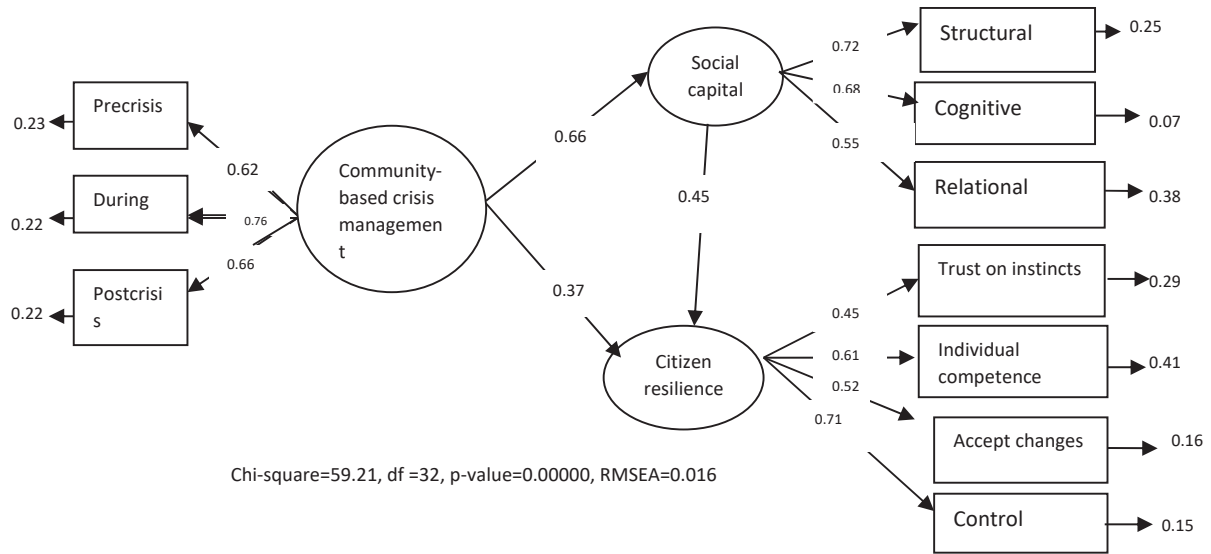


Fig 3: Structural model for standard coefficients

validity. Research data were analyzed using structural equation modeling through LISREL.

RESULTS AND DISCUSSION

Factor Analysis

The structural equation model was run in two steps through LISREL. First, to verify the model reliability, validity, and confirmatory factor analysis, the model was measured. Then, the structural model was studied to investigate the relationships between research variables. Fig. 3 represents confirmatory factor analysis output for standard coefficients. The standard estimate shows factor loading. The more prominent factor loading closer to 1 means the component can explain the latent variable better. The negligible relationship is disregarded for the factor loading of less than 0.3. 0.3-0.6 is an acceptable factor loading range; further, factor loadings larger than 0.6 are desired. As shown in Fig. 3, the factor loading of all items was obtained larger than 0.3. Thus, the items can adequately explain the understudied variable.

Model Fit

The goodness of fit is a technique to calculate how well a theoretical model fits an experimental one. For structural equation modeling and partial least squares, the goodness of fit is obtained by multiple indexes. The research model index of fit

is reported in Table 2. Normal Fit Index (NFI), also referred to as *Bentler and Bonett fit index*, was firstly investigated; values larger than 0.8 are acceptable, indicating goodness of fit. As the estimated value was 0.91, it could be stated that the model goodness of fit is accepted. Traditionally, Goodness of fit Index (GFI) was also used for measuring the goodness of fit (acceptable range is within 0.9 and above). Since the obtained value equals 0.94, so the model goodness of fit is verified. Adjusted goodness of fit index (AGFI), equivalent to the mean squares instead of sum squares in the GFI numerator and denominator, was analyzed. According to the accepted range of ≥ 0.90 , the estimated 0.92 confirms the fitness of the model. Bentler also provided an accepted Comparative Fit Index (CFI) > 0.90 ; thus, the obtained 0.95 indicates the goodness of fit. IFI is another comparative fit index within the accepted range of > 0.90 ; therefore, the measured value of 0.93 presenting in Table 2 shows the goodness of fit. As Chi-square is an inappropriate index for structural equation modeling, the standard Chi-square test was used, which estimates free parameters by simply dividing Chi-square by degree of freedom. A value less than two is desired, and values less than five can be accepted without loss of generality. According to the obtained value of 1.247, it can be stated that the model is accepted for this index. Root Mean Square Error of Approximation

Table 2: Research model index of fit

The measured value	Acceptable range	Index
0.91	Larger than 0.80	NFI
0.95	Larger than 0.90	CFI
0.93	Larger than 0.90	IFI
1.247	1-5	X ² /df
0.001	0.008	RMSEA
0.94	Larger than 0.90	GFI
0.92	Close to 1	AGFI

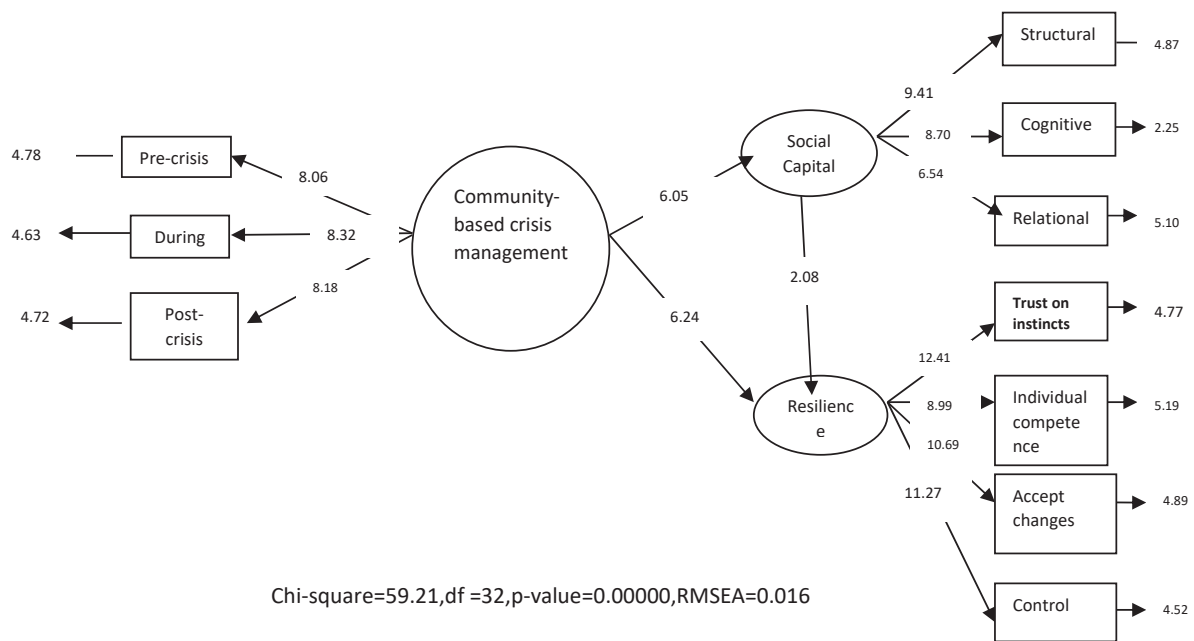


Fig 4: Significant research model

(RMSEA) is also used for checking goodness of fit, where if the value is less than 0.05, the goodness of fit is accepted; while, the model is moderately fit within 0.0 and 0.08. The obtained value of 0.01 demonstrates the acceptable goodness of fit for this index. In general, by assessing all fitness indices, the model goodness of fit is verified.

Research hypotheses test

The casual relationship between research variables was evaluated using t and p. Given the significance level of 0.05, the t value must be larger than 1.96. Smaller values uncover insignificant parameters. Moreover, the p-value of less than 0.01 also reveals significance at 0.99. Fig 4 shows the research model for significance coefficients. Research

hypotheses tests and structural modeling results are presented in Table 3.

According to the first research hypothesis and $\beta=0.37$, the more pronounced community-based components during the crisis, the higher natural disaster citizen resilience (Prasad Parajuli and Shakya, 2019; Cox and Hamlen, 2015; Qin, 2020; Khair *et al.*, 2021). Hosseini *et al.* (2017) pointed out that providing citizen empowerment opportunities may potentially enhance public risk compatibility and harmful consequences. Involving them in planning, organizing, policy-making, coordination, and controlling may decrease losses and damages. Meier *et al.* (2021) recently in a similar study examined the empowerment of citizens to improve their resilience to floods and stated that if citizens are

Effect of community-based crisis management on resilience

Table 3: Research hypotheses test results

Hypotheses	Independent variable	Dependent variable	Coefficient of determination	Beta	Significance
H1: Community-based crisis management affects citizens' resilience.	Community-based crisis management	Resilience	0.51	0.37	P<0.001
	Prior crisis			0.63	
	During crisis			0.39	
	Post crisis			0.51	
H2: Social capital affects citizens' resilience.	Social capital	Resilience	0.32	0.49	P<0.001
	Structural			0.33	
	Cognitive			0.39	
	Relational			0.47	
H3: Community-based crisis management affects social capital.	Community-based crisis management	Social capital	0.46	0.66	P<0.001
	Before crisis			0.57	
	Within crisis			0.33	
	Post crisis			0.48	
H4: Social capital mediates the relation between community-based crisis management and resilience.	Resilience <social capital < community-based crisis management		0.36	0.32	P<0.001

empowered, their resilience to disasters will increase. Moreover, [Norris and Stevens \(2007\)](#) also view public resilience as a significant community-based issue. They believe that resilience plays a critical role in lessening injuries. The research second hypothesis was confirmed at $\beta=0.49$. The hypothesis shows the effect of social capital on citizen resilience ([Aldrich, 2010](#); [Poortinga, 2012](#); [Bianca, 2018](#); [Lee, 2020](#); [Ritchie And Gill, 2018](#)). This is consistent also with the findings of [Fazeli Kebriya et al. \(2021\)](#), studying the relationship between social capital and employee resistance to natural disasters like earthquakes. They claimed that it is critically important to address social capital as a particular capital distinguished from other capitals, including trust, cooperation, partnership, and dependence. Social capital leads to cohesion, strong motivation for success, honesty, respect, and mutual trust. More social capital may result in higher consensus, cooperation, meritocracy, resilience, calm, and increased confidence during catastrophes. In addition, [Malekan et al. \(2020\)](#) also declared that people react differently to crises; some show higher disaster resilience. They proposed that resources and capital on social networks are distinguishing factors as disaster consequences are related to the community structure. Any shortcomings and weaknesses in

the social capital may disrupt the social order. The research third hypothesis was confirmed at $\beta=0.66$. This hypothesis demonstrates that community-based crisis management influenced citizen social capital in the south of Kerman province ([Musavengane and Simatele, 2016](#); [Koh and Cadigan, 2008](#)). [Motahari \(2016\)](#) indicated a significant relationship between social capital in the local community and crisis management components. The local people tending to participate in risk reduction programs is positively related to the level of participation and social and kinship relations status. [Wagner et al. \(2008\)](#) stated that one of the ways to increase participation and cooperation among citizens is to pay attention to the components of social capital such as mutual trust, cooperation, interaction and attention to relationship networks. [Juaita et al. \(2019\)](#) also believed that social capital is a common feature of crisis-resistant societies and moving towards a community-oriented approach with emphasis on the participation of indigenous citizens of the region leads to greater solidarity and cooperation. The research fourth hypothesis indicates that social capital plays a mediating role in the relationship between community-based crisis management and resilience. The hypothesis was confirmed at $\beta=0.32$. Risk reduction goes much beyond

engineering and structural measures, and addressing social dimensions is treated as one of the most critical natural disaster risk management links. The idea of social capital focused on resilience significantly contributes to the decreased posttraumatic stress disorder (Arvin *et al.*, 2018; Savari and Abdeshahi, 2019; Delilah Roque *et al.*, 2020; Murphy, 2007; Jia *et al.*, 2020; Morsut *et al.*, 2021). A community where its citizens enjoy a greater sense of commitment, mutual trust, respect, and cooperation, would be more resilient and undergo less vulnerability. On the other side, social capital may enhance community-based crisis management components and increase public willingness toward participation, which in turn would lead people to prioritize public to personal interests in coping with catastrophes. As a result, the public vulnerability would decline.

CONCLUSION

In recent years, the attitudes of natural disasters and dealing with this phenomenon have had many ups and downs. So, the purpose of focusing on the reduced vulnerability has turned into increased resilience to disasters and empowerment of local people. According to the new vision, risk reduction programs must improve public participation and create and enhance resilient community features. Therefore, it is critically important to create and promote resilient communities toward sustained development. In this regard, The present research has been conducted to study the effect of community-based crisis management on citizen resilience to natural disasters with the mediating role of social capital. Great natural catastrophes in the southern areas of Kerman province have caused many challenges and difficulties encouraging scholars to conduct this study. Despite recent measures adopted for citizen preparedness facing a crisis, the conventional top-down approach is still the prevailing method in dealing with misfortunes. Thus, reviewing and revising the conventional approach to the new community-based approach seems necessary to focus on citizen empowerment. The present research investigated the three variables of resilience, social capital, and community-based crisis management. Once research data were analyzed, all research hypotheses were confirmed (Table 3). Natural disaster management requires citizen empowerment through a community-based approach and enhanced

resilience to natural disasters through improved social capital components, decreasing vulnerability. Almost all earlier studies have focused mainly on the two variables of resilience and social capital in natural disasters. In contrast, the present research provided more effective findings for less vulnerability relying on the community-based approach since it highlights citizen participation, which reduces the vulnerability. This study provides valuable information for crisis managers and experts. The research findings are expected to serve as an academic reference to understand better the effect of the three variables in dealing with natural disasters. It also supports the aid of crisis managers, practitioners, and politicians to deliver effective plans for decreased vulnerability and improved natural disaster citizen resilience in the south of Kerman province.

Suggestions

Based on the research results, the following recommendations are suggested: Since community-based empowerment is crucial, it is required to adopt necessary measures to remove barriers toward participation. Good participation is a voluntary and accountable one; therefore, macro-educational programs must be included in education. Handing out educational manuals and improving experimental learning beyond theoretical education is critically important, leading to increased resilience among citizens. Give the positive effect of social capital on the citizens' resilience and community-based crisis management; it is recommended to expand close face-to-face relations among neighbors to get together at incidents through local group ceremonies. In addition, local communications and the sense of cooperation and philanthropy can be extended and augmented through raising people's awareness and culture utilizing mass media, brochures, and educating kids to improve resilience finally. Ultimately, it should be pointed out that the present research only studied social capital as the mediation variable; however, there must be many other effective variables. So, it is advised that other mediating variables are also examined.

AUTHOR CONTRIBUTIONS

A.Salehi performed the literature review, analyzed and interpreted the data, prepared the manuscript text. NM. Yaghobi helped with the literature review,

compiled the data and model design. A. Keikha helped in the literature review, methodology review and manuscript edition.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors.

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ABBREVIATIONS

<i>AVE</i>	Average Variance Extracted
<i>SEM</i>	Structure equation modeling
<i>P-VALUE</i>	Probability value

<i>NFI</i>	Normal Fir Index
<i>CFI</i>	comparative fit index
<i>GFI</i>	Goodness of fit index
<i>RMSEA</i>	Root Mean Square Error of Approximation
<i>AGFI</i>	Adjusted goodness of fit index (AGFI)
<i>IFI</i>	Incremental Fit Index
<i>X²/df</i>	Normed Chi-square
<i>R²</i>	Coefficient of determination
<i>B</i>	Path coefficient

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CASE STUDY

Evaluation of affecting mechanisms of urban development and its sphere of influence

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ABSTRACT

BACKGROUND AND OBJECTIVES: Today, many factors and forces influence urban development and its organization. The uncontrolled development of cities and their uneven growth is due to various political, physical, economic, social and cultural processes. The purpose of this study is to evaluate and analyze the mechanisms affecting the urban development of Boroujerd city and its sphere of influence

METHODS: The research method is structural-analytical-descriptive, which is the main purpose of applied research by collecting data, analytical, quantitative, and documentary methods that have been used to explain the conceptual framework of research in the form of indicators. Delphi method was also used with emphasis on fuzzy logic.

FINDINGS: The results of regression analysis showed that the correlation coefficient of the variable of land exchange on Boroujerd urban development was equal to 0.740 and also the level of activity of this city in the two economic sectors of industry and services is of basic type and showed a higher value than other urban areas of the province and also unemployment index shows that city has less unemployment (19.3%) than other cities in the province and the average rate of the province (23.9%).

On the other hand, the impact of factors and indicators of natural population growth in Boroujerd in the field of urban development was 1.97, which was a small part of urban population growth and development.

CONCLUSION: Economic and social indicators have an undeniable role in the formation and development of the city and its sphere of influence and should be considered by city officials and stakeholders. So based on the development of policies such as Planning to organize the privacy and preventing the settlement of immigrants, prevent the land mechanism and also new development patterns can solve the future matters of the city.

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INTRODUCTION

Urbanization and the rapid expansion of cities have caused many problems in most countries of the world, so that not only urban planning policies but also socio-economic and environmental issues in many urban areas have been affected by this phenomenon. In the meantime, although population growth is the primary cause of rapid urbanization, but its unreasonable dispersion has adverse effects on the natural and cultural environment of communities (Ghorbani *et al.*, 2012; Neisiani *et al.*, 2016). With the social changes of the system and the physical organization of cities, it undergoes fundamental changes (Rajabi and Moradi Mokkram, 2019). One of the levers of controlling and managing urban development is well-thought-out and appropriate planning to control the physical development of the city in its unplanned form. (Ghanbari *et al.*, 2016). Such spatial development for the city, which is itself due to irregular migration and increasing urban population, has caused many anomalies and urban disorders in the country since the mid-1960s, driven by the land reform law, and as a result, the balance between humans and disrupted environmental resources in cities due to the limited scale of facilities and land. The result of such uncontrolled expansion is the growth of cities, the creation of tin settlements and urban suburbs with unhealthy health conditions, and unfavorable living conditions near most major cities in the country (Bahraini, 2010). Such major challenges today are the approach of organizing and empowering them in line with planned goals. The issue of growth and development planning and proper location for the inevitable expansion of cities has become a necessity due to today's complex developments in these centers of human aggregation. (Batty, 2013). Today, in discussing the formation of cities, their sphere of urban influence and the physical development of the city in the next stages, most planners and researchers along with human factors determine natural, climatic and geographical factors such as geology, ecology and environment (Bahraini, 2010). Environmental and climatic elements, along with other environmental factors, are the most important factors in the formation and development of cities and the continuation of urban life. (Atayi and Fanayi, 2015). in Atayi and Fanayi's research,(2015) it is believed that the natural features of the region provide many opportunities for the physical

development of the city and concluded that the most important natural factors affecting the development of cities are topography, land slope, climate, geology, hydrology and geomorphology. Beterlas *et al.* (2011) in a study of some Greek cities found that economic and social factors have had a significant impact on the rate of development and these factors have determined the growth direction of cities. Amoateng *et al.* (2013) believe that the physical development of cities and the development of the surrounding areas is influenced by human activities and land uses in cities and landscapes. Peiser , (2001) in research on the role of communication considers that transportation to be effective in urban development and this matter and believes that in areas where communication is easy, more urban centers are formed and developed. Pareta and Prasad, (2012) believe that local landforms have historically played a key role in the location of settlements and their future development is influenced by regional geomorphology. Thus, urban development is influenced by natural, environmental, economic, social, and political processes that have gone through various stages throughout history, and the sphere of influence of cities develops over time. Due to the demands of time, these factors may act at different levels of local, regional, national with more power and influence than other factors and special mechanisms. Urban areas, depending on their size and function, will have a wide gravitational pull and will inevitably form relationships with their surroundings (Inostroza *et al.*, (2013). Cities develop by absorbing the overflow population of the surrounding areas (Kheyroddin, and Ghaderi, 2020) and are under pressure due to population density, and in some cases, they also transfer pressures to the suburbs and surrounding areas. More importantly, to survive, they establish product, service, administrative, social, and the like relations. The importance of the sphere of influence on cities is very decisive in some cases (Krätke, 2014), and sometimes the subject also determines the role of the city and gives it shape and consistency (van der Voordt and van Wegen, 2007; Momeni and Hattami, 2011). Therefore, considering the importance of the issue, this article examines the effective mechanisms in the formation and development of Boroujerd city.

. Based on this, the structural model of the research is demonstrated in Fig. 1:

Urban development as a spatial concept can be

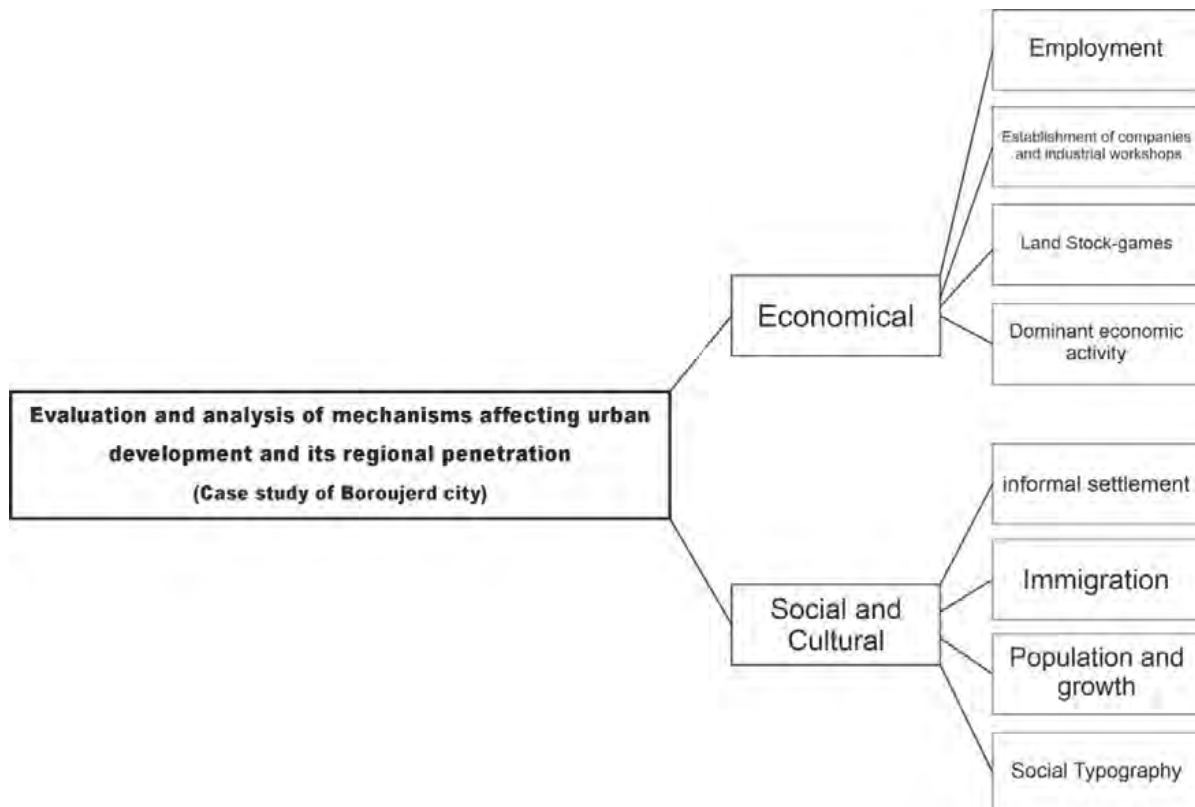


Fig. 1: Research conceptual framework

defined as changes in land use and density levels to meet the needs of city dwellers in housing, transportation, leisure, and food, etc. Urban development has a potential social, economic and physical mobilization to improve the quality of the urban environment to establish a balance in the quantity and quality of urban life (Lynch, 1960). Understanding the urban development process plays a crucial role in urban development planning and sustainable urban management (Cheng and Masser, 2004). The history of urban planning and the process of urbanization also show that the expansion of the city in physical dimensions and other cases related to urban development due to scientific necessities have led to the emergence of methods and initiatives mainly based on trial and error, which result in a kind of ambiguity. There has been a theoretical and practical contradiction in decision-making for cities (Bemanian and Mahmoodinezhad, 2000). In urban development and progressive development projects in recent decades, cities and settlements

are often disregarded for the importance of land use in different directions and on valuable lands such as rich plains, foothills, seashores, suburbs, Rivers, have expanded (Bemanian and Mahmudinejad, 2000). Natural factors are among the influential factors in geographical studies. These factors are not of equal importance and value because they are dispersed unevenly on the surface of the earth and find different characteristics with other factors and elements everywhere. The environmental factor is the physical environment of nature, the main and constructive element of urban space, and is the first bed in which the artificial environment is formed (Jafari Mehrabadi *et al.*, 2017). Therefore, the natural structure of the urban environment is one of the external factors that play a key role in the development and expansion of cities. On the other hand, the main basis of urban planning and urban design studies is the basic economic study of the city, based on which employment, population, income, and finally the need for space are determined (Shie,

2001). In this way, the fate of each city is determined by the amount and manner of its production activities and income generation (Jaeger *et al*, 2010). One of the economic factors that create and play a role in the city is the type of economic activity that governs the city (Scott, 2006). This activity is due to the favorable facilities of the surrounding rural areas and in this regard, the factor of communication and transportation has an important role, because it accelerates the transfer of primary resources and goods needed by urban centers and other agricultural products. In this urban society of hypermobility and interconnection, a static conception of space needs to be questioned or at least put into perspective insofar as individuals organize their daily lives around a multiplicity of places (Peiser, 2001). In urban studies, in addition to examining the characteristics of natural topography and buildings, it is necessary to pay attention to the social topography of groups located in cities (Cetin, 2016). The purpose is to examine the social status of different neighborhoods of the city, each of which, according to the facilities and perspectives, create certain spatial structures in the environment. Social topography can explain the social strata in cities according to their cultural, living, residential, and behavioral characteristics and in urban decisions, determine the scope of activities and how to deal with them. In the social geography of cities, social topography is the basic platform for measuring the segregation of different area living in cities (Rahnaei, 1988; Hemaloshinee and Nomahaza, 2017). Government policies can be effective in the development of cities in various ways, including the development of administrative and political structure. The economic condition dependence of third World cities might be considered as productive relations and it involves the creation of slums, suburbs, the deterioration of the central city, establishment of land bank and control of urban development form and optimal use of urban lands. Today, the role of states in geographical spatial planning, which was previously forgotten in geographical studies, is a determining factor and is emphasized in all geographical areas, especially urban geography. Among these decisions is the determination of borderlines and their effect on the growth and development of the city, as well as the transfer of administrative and guidance maps of cities, which affects the dynamism of cities (UNCTAD Agenda, 2015). it can be said that the uncontrolled

expansion of cities on the one hand and the lack of control mechanisms on the other hand, as well as the need to create different uses and construction of urban facilities. Also, equipment and foresight coordinate with social, economic, cultural and industrialism, forced the thinking man to plan and comprehensively design the city to create welfare and comfort. The uneven growth and the increasing expansion of cities are some of the problems of today's cities that have led to the phenomenon of suburbanization. The most important problems caused by suburbanization are a waste of land size, lack of adequate urban facilities and services, and lack of suburban continuity (Aliyu and Amadu, 2017). In recent decades, due to the social, economic, and political opportunities of Iranian cities, significant changes have taken place. The main developments cause such as urban population growth, uncontrolled physical development and new spheres of influence lead to affect in the transformation of new urban plans and some other reasons such as rapid expansion of serve and commercial occupation qualified this trend of growth. This city is the 33rd most populous city in Iran (Population and Housing censuses, 2016). The city is located in the north of a fertile plain called Silakhor and is surrounded by high green peaks of the Zagros Mountains. Numerous permanent springheads flowing from the foothills of these mountains plays a main role in the region's economy and the development. The city has had a special communication position since ancient times and today the location of this city on the Tehran-South highway is one of the factors of its economic prosperity. Therefore, the strategic role and position of the city with socio-economic and political developments and changes in this region can be considered and evaluated as one of the factors of growth and development of the city in different periods of the past and present (sheikh *et al*, 2014) (Fig. 2).

The legal area of city is 3719.09 hectares, which is divided into three municipal districts and 17 areas, which include 36 neighborhoods. The initial core of the city (the beginning of urbanization) was formed in 1921 and continued until 1941. The study of the population growth rate of the city in the comparison of other province cities shows that the population of the city has increased from 49186 people in 1956 to 326452 people in 2016. And in 1966 with a

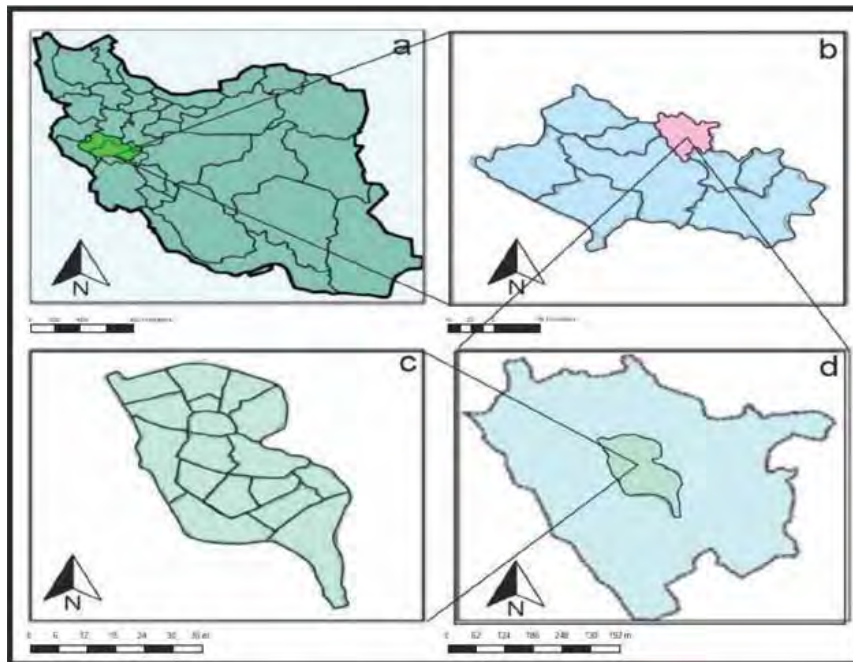


Fig.2: The position of Boroujerd city in political-functional divisions upstream

a) The position of Lorestan province in Iran. b) The position of Boroujerd city in Lorestan province. c) The position of the primary care in Boroujerd. d) The position of neighborhood primary care in Boroujerd)

growth rate of 3.8 percent to 71486 and in the next decade to 101345 people. It can be understood the most demographic changes in 1975 up to 1985, which has reached 183,160 people due to the 6.1% growth of the population of it. From 1986 onwards, the population of city has continued to increase. Therefore, Boroujerd city is in the middle of the region, according to the population ([Population and Housing censuses, 2016](#)) (Fig. 3).

This city is one of the most significant cities of the province of Lorestan, whose location can be seen in [Fig. 4](#) in terms of growth and development of urban services and economic and social development and other cities in the province. The economy of this region is based on regional and supra-regional trade, retail, agriculture and animal husbandry, administration and government services, as well as the production of industrial and mineral products. Due to its special geographical location and location on busy roads and proximity to the areas of the traffic of Lor tribes, The city has been one of the important commercial centers of the region in the past centuries and the big market of this city has many shops and caravanserais. Up to the statistical yearbook of Lorestan province, this city

has a great potential to become an industrial, service, and finally, agricultural hubs in the region ([Table 1](#)). The main comparison of the spatial coefficient of the city with other cities of Lorestan province can explain the potential of high capacity to be in rapid way to qualification as a growth center of province. It should be explained that the Location Quotient (LQ) of three dimensions has been used in tables.

What the [Table 1](#) shows is that city can play an effective role in the development of its region's economy by having a relative ability in the field of industrial and service activities (compared to other cities in Lorestan province). According to the [Table 2](#), the activity of this city in the two economic sectors of industry and services is of a basic type and shows more than other urban areas of the province. It can be said that the main activity while responding to the demands of the residents, can increase the income of their area by exporting goods and services outside it ([Table 2](#)).

The data in [Table 2](#) shows that there is a clear difference between Boroujerd city and the national level in of sustainable economic development indicators. One of the reasons for the unfavorable



Fig.3: Development of the city in different historical stages of the city



Fig. 4: Location of Lorestan province and Borujerd city (Borujerd detailed plan, 2017)

economic situation in city is the lack of attention to the issue of job creation and immigration in this city, especially the young and economically active population.

As a result the rising percentage of inactive people, the loss of investors in the industry, especially up to recent years economic crisis and lack of necessary support, failure to attract investors and job creation, unwillingness to invest in the industry

due to high risk will affect this situation. On the other hand low urban population desire to work in agriculture, which are reasons such as unfamiliarity and Sufficient information in this area, drought, lack of capital, hard work, etc., have caused the vast majority of the population to be employed in the service sector. Other factors such as lack of some infrastructure, lack of government attention to solving economic problems in this region, and weakness and

Table 1: Comparison of the spatial coefficient of Boroujerd city with other cities of Lorestan province, (Statistical yearbook of Lorestan province, 2011)

City	L.Q ¹ (Agriculture)	L.Q(Industry)	L.Q(Sereries)
Boroujerd	0,6	1,35	1,3
Khoramabad	0,81	0,77	1,23
Kuhdasht	1,3	0,8	0,95
Dorud	0,7	1,5	0,9
Selseleh	1,5	0,36	1,03
Aligudarz	1,34	1,04	0,78
Pol-e Dokhtar	1,85	0,44	0,85
Azna	1,4	0,91	0,83
Delfan	1,47	1,21	0,62

Table2: Comparison of selected economic indicators of Boroujerd city and urban districts of Iran

Index	Boroujerd city	State urban districts	D _i
Economically active population rate	36,91	38,77	-
Economically inactive population rate	63,09	60,4	-
The difference in the percentage of activity of men and women	58,52	38,95	-
The employment rate of the population 10 to 14 years old	0,62	0,8	+
Active population rates in the agricultural sector	3,53	22,27	-
Active population rates in the industrial sector	17,13	26,51	-
Percentage of households owning the building and land	68,07	62,2	+
Percentage of tenant households	24,11	9,2	-
Unemployment rate	17,26	11,82	-
The number of couples in which the indicators of Boroujerd city are positive =			2

(population and housing census, 2016)

inadequacy at management levels are other factors affecting the economic instability (Parizadi *et al.*, 2016). This study aims to evaluate and analyses the mechanisms affecting urban development in city after the conceptual framework propositions. The current study has been carried out in Islamic Azad University of Tehran North Branch in 2021.

MATERIALS AND METHODS

The research method is descriptive- analytical and is practical in the purpose. at first, the initial model is compiled based on theoretical background and in next stage, this model was tested and developed through the Delphi method Then, all factors were assessed by collecting field data and using a questionnaire and the extracted data were analyzed through descriptive statistics and qualitative analysis. The Delphi method has been developed to reliably generate and gather ideas and opinions and generate relevant information for decision making. This method is used in all kinds of futurisms. In this method, the researcher prepares questionnaires related to the subject under study and sends them by e-mail to all the desired elites. 14 factors as a default in the first stage extracted from theoretical background and empirical foundations for mechanisms

affecting urban development from the perspective of panel experts such as university researchers and experts that had a research background up to this subject which include macroeconomic, social, and cultural factors. In this regard, to investigate the first stage, all the factors affecting urban development are mentioned, including; Employment, investment, Social situation, Land mercantilism, dominant economic activity, marginalization, migration, population, Black-Business, ethnicism, integrated management, transportation, intercity economic relations, and construction are listed.

RESULT AND DISCUSSION

Findings on Delphi method implementation

The first round

During this period, the panel members identified 10 of the 14 factors extracted from successful researches as having a great impact on formulating a framework of mechanisms affecting urban development at the center of influence. Detailed results related to the implementation of the first stage of distribution of the questionnaire are shown in Table 3. Factors of business, integrated management, intercity economic relations, ethics have been removed from the Delphi trend due to their average importance of less than 2.5. In the

following, to perform the analysis and interpretations required to achieve the desired results, it is necessary to describe the research method step by step, which subsequently in each part of the desired output can be in mechanisms affecting urban development. The content analysis process begins when the analyst considers patterns of meaning and topics that are of potential interest. This analysis involves a continuous flow between the data set and the encoded summaries and the analysis of the data that is generated. The collection of survey data in the present study, starting of questionnaires in the first stage of the research and the extracted data is analyzed through descriptive statistics and qualitative analysis (Table. 3).

The panel members identified, 8 factors out of the 10 factors presented in the second round, having a high and very high impact (with an average greater than 3) on the framework for determining the mechanisms affecting urban development, taking into account its sphere of influence. Two factors of transportation and construction were also eliminated. Detailed results related to the implementation of the second stage of the questionnaire distribution are shown in Table 4. The Kendall coefficient for the members' answers about the order of the nine factors that had a great and very high impact in this round was 0.765 (Table. 4).

In the third round, the development of indicators determining the mechanisms affecting urban development, taking into account its area of influence, along with the average opinion of members in the second round and the previous opinion of the same member was provided to all panel experts. Detailed results related to the implementation of the third stage of the questionnaire distribution are shown in Table 5. The Kendall coordination coefficient for members' answers about the order of nine factors was 0.790 (Table. 5).

Reasons to stop polling

The results of the three rounds of the Delphi method in the research had shown that for the following reasons, there is a consensus among the panel members and it is possible to end the repetition of rounds:

- In the second round, more than 50% of the members chose 10 influential factors in compiling the indicators determining the mechanisms affecting urban development, considering main matter, which had an average greater than 2.5, among their factors.
- The standard deviation of the members' answers about the importance of the factors in the third round has significantly decreased compared to the previous rounds.

Table 3: Stage 1 of the Delphi method in developing indicators determining the mechanisms affecting urban development, taking into account its sphere of influence

No	Factors	Response Ads.	average	Standard deviation	Min.	Max.
1	Employment	29	4,86	0,35	2	5
2	Investment	28	4,98	0,37	3	4
3	Social situation	33	5,21	0,37	2	5
4	Land mercantilism	25	4,72	0,45	1	5
5	Dominance economic activity	31	5,10	0,37	2	5
6	Marginalization	33	4,80	0,40	1	4
7	Migration	32	4,86	0,35	1	4
8	Population	30	4,30	0,37	1	4
9	Black-Business	33	2,21	0,45	2	5
10	Ethnicism	33	2,31	0,52	1	5
11	Integrated Management	33	2,1	0,76	1	5
12	Transportation	33	3,51	0,52	1	4
13	Intercity economic connection	33	2,41	0,57	1	5
14	Instruction	33	2,55	0,60	2	5

Table 4: Phase 2 of the fuzzy method in developing indicators determining the mechanisms affecting urban development

No	Factors	Response Ads.	average	Standard deviation	Min.	Max.
1	Employment	15	3,54	0,91	3	5
2	Investment	15	3,08	1,03	3	5
3	Social situation	15	3,41	0,91	4	5
4	Land mercantilism	15	3,22	0,95	3	5
5	Dominance economic activity	15	3,22	1,11	3	5
6	Marginalization	15	3,34	1,03	3	5
7	Migration	15	3,40	0,96	3	5
8	Population	15	3,52	0,97	4	5
9	Transportation	15	2,78	0,95	2	5
10	Instruction	15	2,69	1,11	2	5

Table 5: Step 3 of the fuzzy method in developing indicators determining the mechanisms affecting urban development, taking into account its sphere of influence

No	Factors	Response Ads.	average	Standard deviation	Min.	Max.
1	Employment	15	4,24	0,67	1	5
2	Investment	15	4,08	0,91	1	5
3	Social situation	15	4,51	0,82	1	5
4	Land mercantilism	15	4,22	0,45	1	5
5	Dominance economic activity	15	4,22	0,38	1	5
6	Marginalization	15	4,34	0,92	1	5
7	Migration	15	4,40	0,78	1	5
8	Population	15	4,52	0,99	1	5

➤ Kendall's coordination coefficient for members' answers about the order of factors in the third round is 0.790. Given that the number of panel members was more than ten, this amount of Kendall coefficient is quite significant.

➤ Kendall's coordination coefficient for arranging the nine factors influencing the determinants of mechanisms affecting urban development, considering its sphere of influence in the third round compared to the second round, increased by only 0.025. Panel members did not show significant growth between two consecutive rounds.

➤ The points given to the factors by experts and elites indicate that the criteria of social status, employment, population have the highest score and therefore have the greatest impact on the realization of the mechanisms affecting urban development in the framework development process.

Therefore, the indicators that determine the mechanisms affecting urban development can be presented such as final factors includes Employment, Investment, Land Stock-game, Dominance economic activity, Marginalization, Migration, Population and Social situation and also So in order Employment ratio,

Establishment of companies and industrial workshops, Land Stock-game statue, Dominance economic activity ratio, Marginalization ratio, Migration ratio, Population ratio and Social typology are research main indexes.

Evaluation

As Table 2 shows, there is a significant relationship between economic, social, and cultural variables and indicators of city and its urban development. For analyze the economic indicators and their impact on the urban development of city and its sphere of influence, 4 indicators of employment, workshops and industrial companies, land exchange, and economic activities governing the city were examined. As Table 3 shows, there is a significant relationship between employment and the urban development index. That is, the more employment and diversity there is in the city especially the young and educated, and the greater its impact on the formation of urban development and the development of its sphere of influence. The results of regression analysis in Table 6 show that the correlation coefficient of the employment variable in urban development and the area of influence is equal to 0.606. That is, for one unit of increase in employment indicators in the city, The results indicate as much as 0.538 positive changes in urban development. Therefore, the employment index has a positive effect on urban development. The Pearson correlation coefficient is between 1-0. That is, whatever the obtained coefficient leads to the number one, it indicates the relationship and effect of the two variables on each other. The study of field survey showed that the establishment of workshops and industrial companies in city has brought urban income to the city and thus has helped to create urban welfare. It has improved the infrastructure of urban transportation and transportation of goods. On the other hand, it has caused the population to remain and attract immigrants from the surrounding cities. According to Table 2 there is a significant relationship between the index of the establishment of workshops and industrial companies

in city and the development of the city and the sphere of influence. This means that the more workshops and industrial companies are established in the city, the more city will be developed. The results of regression analysis showed that the coefficient of variation of workshops and industrial companies in the urban development of city and its sphere of influence is equal to 0.695. Therefore, the establishment of workshops and industrial companies in the city will affect urban development and its sphere of influence (Table. 6).

One of the factors intensifying the process of physical development of the city is the land game exchange (Mohammadi mianrodan, 2013). The results of the survey showed that there is a significant relationship between land mechanism and the urban development. That is, the higher the land mechanism rate in the city, the greater the physical development of the city. The results of regression analysis showed that the correlation coefficient of the variable land mechanism in urban development is equal to 0.740. If the variable effect of economic activities governing the indicators of urban development and its sphere of influence is controlled, its magnitude is 5.046. Therefore, economic activities governing the city (service-agriculture) as one of the economic variables have a positive impact on the urban development. Also, the Pearson correlation coefficient indicates a direct relationship between the variables of economic activities in the city and urban development indicators with a coefficient of 0.701. Today, rural-urban migration has led to unthinkable urban development. The city has attracted many immigrants in recent decades due to its political, administrative, service centralization, and injection of government budgets on the one hand and 1979's Revolution change on the other hand. This trend will continue for decades to come. Marginalization, lack of services and equipment, false jobs, and unbridled physical-spatial development have affect the city. Statistics show that about a third of the city's population lives in the suburbs. These marginalized people have migrated to city in search

Table 6: Development of the main indicators of mechanisms affecting urban development, taking into account its sphere of influence

Factors Branches	Final Factors	Research main indexes
Economical	Employment	Employment ratio
	Investment	Establishment of companies and industrial workshops
	Land Stock-game	Land Stock-game statue
	Dominance economic activity	Dominance economic activity ratio
Social and Cultural	Marginalization	Marginalization ratio
	Migration	Migration ratio
	Population	Population ratio
	Social situation	Social typology

of jobs by migrating from other cities and villages of the province. According to Table 4, the higher the immigration capacity of city, the greater its impact on urban development and its sphere of influence. The results of the regression analysis showed that the correlation coefficient of the variable of immigration or urban migration on urban development and it is equal to 0.741, so the ratio of the variance of the urban development variance is explained by the urban migration variable is 0.523. If the effect of immigration variables in the development of city is investigated and controlled, its impact on urban development the ratio is about 1.003. The results of the regression analysis showed that the correlation coefficient of natural population growth variable and urban development and ratio is equal to 0.781, so the ratio of the variance of the urban development variable that is explained by the natural population growth index is 0.584. If the factors and indicators of natural population growth in it are controlled and examined, its impact on the rate of city development is 1.97 (Tab. 7)

The study of the role of social topography of city shows that there is a significant relationship (0.000) between the two variables and the impact of the social topography of city on urban development is 2.237. Therefore, the city officials should pay special attention to this factor. In the analysis of social and cultural factors and their indicators in urban development, it can be boldly said that social and cultural factors are the most important factors creating the rapid development of cities. So that the development of the city is closely related to the growth rate of urban population and in this regard, the natural increase of urban population, the rate of *net* migration to the city, the transfer of population construction of non-urban communities in the city, and urban population construction are the main factors. With the growth of population and consequently with the rapid growth of urbanization and urbanism, social relations in cities are transformed and the traditional relations of the past are changed by the dynamic conditions of urbanization. These changes affect the fabric of urban networks and improve and expand social relations between the inhabitants of cities and creating the necessary facilities for the lower classes of society and the growth and flourishing of talents and their creativity and their use of social facilities. Up to the findings, the study of the role of the social topography of Boroujerd city in urban development and its sphere of influence showed that there is a significant relationship (0.000) between the two variables. On the other hand, the variance ratio of urban development

variance is due to the natural population growth index of the city. The study of economic and social activities showed that it seems that in this city, far from other cities of the same level and the development process is not sustainable. This has resulted in an imbalance in urban development. The land mechanism is one of the problems of the urban districts, especially the marginal areas. This factor influenced its urban development and its zone of influence. According to a survey, land prices in the city have increased significantly in recent years. The results of the regression analysis show that the correlation coefficient of the land exchange variable on urban development is 0.740. The results showed that there is a significant relationship between the index of the establishment of workshops and industrial companies. These establishments have contributed to the creation of jobs and the sustainability of the population of the new town. The impact of these towns on the employment and unemployment index shows that this city has less unemployment (19.3%) than other cities in the province and the average rate of the province (23.9%). The establishment of companies and industrial workshops has helped to develop the infrastructure of city has accelerated the development of the city and has brought financial and economic capital as well as urban income to the city and thus helps to create urban welfare in the city. On the other hand, the establishment of companies and industrial workshops has attracted immigrants from other cities to it. finally, it can be said that economic and social indicators have an undeniable role in the formation and development of city and its sphere of influence and should be considered by city officials and stakeholders.

CONCLUSIONS

According to the research conducted on the subject, the main factors affecting urban development and its sphere of influence were examined, which according to the type of the initial model is compiled based on theoretical background and in next stage, this model was tested and developed through the Delphi method Then, all factors were assessed by collecting field data and using a questionnaire and the extracted data were analyzed through descriptive statistics and qualitative analysis. The results of analysis showed that the correlation coefficient of the variable indicators in urban development was so various. On the other hand, the impact of factors and indicators of natural population growth in Boroujerd in the field of urban development was high, which was a small part of urban population growth and development. Economic

Table 7: the relationship between social and cultural indicators and urban development of Boroujerd and its sphere of influence

Variables	Regression	R-Square	F test	Significance level	Constant	B	Beta	Pearson coefficient
The relationship between immigrations and urban development in city and its sphere of influence	0.741	0.532	384191	0,000	1,003	0,738	0,741	0,741
The relationship between natural growth and urban development in city and its sphere of influence	0.781	0,584	379191	0,000	1,97	0,521	0,781	0,781
The relationship between economic activities in the city and urban development of city and its sphere of influence	0,530	0,281	147980	0,000	2,237	0,472	0,530	0,530

and social indicators have an undeniable role in the formation and development of the city and its sphere of influence and should be considered by city officials and stakeholders. So based on the development of policies such as Planning to organize the privacy and preventing the settlement of immigrants, land mechanism and also new development patterns can solve the future matters of the city.

In connection with the application of these research results in planning, especially urban planning, it can be said that the distribution of dimensions and dynamic expansion of urban areas are key issues in managing urban growth and reducing its negative effects on the environment and ecosystems. Is. Even if urban growth is considered a necessity for a sustainable economy, uncontrolled or irregular urban growth without considering its effective conditions can cause various problems such as destruction of open spaces, change of landscapes, environmental pollution. Traffic congestion, pressure on infrastructure, and other social and economic matters. To address these issues, continuous monitoring of urban development evolution in terms of the type and extent of change over time is essential to assist planners and decision-makers in future urban planning. Simultaneously with the emergence of many problems due to population density and widespread urbanization in cities, planners and urban planners to provide approaches to deal with population accumulation in cities due to problems and challenges due to density and lack of facilities and land and the formation of slums In this regard, the issue of factors and mechanisms affecting urban development and its

sphere of influence has been of particular importance. The type of relationship between cities is one of the most important factors in recognizing the problems of cities, and also their ratios is the reason for the expansion and development of the city and its suburbs.

Therefore, recognizing and analyzing these factors will help in better planning for proper and sustainable development of the city and comprehensive control and planning by considering the city and the amount and type of relations between the city and its sphere of influence. In this study, seven important mechanisms of Boroujerd's urban development and area of influence were identified. In the first place, the development of this city, like most cities in its surrounding area and even other cities in the country, has been primarily the product of natural mechanisms. The city's development has been north-south for a few years now. The second mechanism that affected it's urban development and area of influence was the economic mechanism. One of the factors that intensified the physical development process in city was the exchange of land. Natural population growth and migration constitute the fourth mechanism affecting urban development in city and its sphere of influence. The lack of efficient plans for the resettlement of migrants has led to the creation of suburban areas around cities, the expansion of the city to the periphery, and the destruction of agricultural lands and gardens.

The fifth mechanism affecting the development of the city and its ratio has been the development of rapid urbanization. One of the important characteristics of the urbanization process in city is its rapid and unforeseen

physical expansion. These changes are in the form of rapid population growth and physical growth of the city in an unbalanced and uncoordinated manner, especially in the southern lands of the city, and in the last stage of development, it has also included the northern lands of the city. The sixth mechanism affecting the urban development and its area of influence was the localization and communication of the city. This communication situation has been efficient in the physical development of the city, in the economy and tourism of the city. This has influenced the city's industrial development by building upon intersectoral and complementary industries to guide the city's industrial development. The seventh mechanism affecting the urban development has been the topographic condition and the slope of the land. The geomorphological hazards of the city have brought about the development of the city in the last two periods, north and south. The western part of the city has experienced the least development over the past few years.

Suggestions

According to the studied case, the following suggestions as policies by mentioning the priorities of action are provided for the better development of city and its sphere of influence such as:

- 1- Planning to organize the privacy and sphere of influence
- 2- Preventing the settlement of immigrants in the urban sphere of influence
- 3- Supervising construction control in the city
- 4- Preventing the change of land use around the city and its sphere of influence
- 5- Organizing urban development based on the proposed patterns of urban development
- 6- Planning to prevent the land mechanism

AUTHOR CONTRIBUTIONS

F. Mohammadian performed the literature review, experimental design, analyzed and interpreted the data, prepared the manuscript text, and manuscript edition. P. Ziviyar Pardei and A. Estelaji supervised the experiments, literature review, data compiling and manuscript preparation

CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double

publication and, or submission, and redundancy have been completely witnessed by the authors.

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ABBREVIATIONS

LQ	location quotient
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ORIGINAL RESEARCH PAPER

Identifying and analyzing the content deficiencies of the civil service management law as a model for legislation in urban management

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ABSTRACT

BACKGROUND AND OBJECTIVES: The civil service management law in the administrative system of the country is a public policy and the mother law, which includes valuable concepts and norms in the field of administrative law. Despite the fact that some chapters of this law, including the chapter of people's rights (chapter 3), are considered as innovations; however, some of the goals of the law in this chapter have not yet been achieved. As a result, this chapter of the law needs further scrutiny and implementation. Therefore, this study intends to take an important step towards the growth of the country's administrative system by identifying the pathologies of this chapter and providing corrective solutions.

METHODS: The research is inductive and qualitative. The interviewees in the present study are members of parliament, managers and experts, who were selected by snowball sampling method. The data collection tool is a semi-structured interview and the "Theme Analysis" approach is used to analyze the data. The coding is done by MAXQDA quality software.

FINDINGS: The findings of the study showed that the content deficiencies identified in the chapter on people's rights are: "Lack of attention to the needs of society, lack of law enforcement trustee, lack of trustee for public awareness, lack of mechanism for accountability Citizens, failure to specify and specify the bodies supervising the implementation of the chapter on people's rights, suffice to express the generalities in the provisions of the law and the lack of expression of the law in a common language between users and legislators and etc. These findings indicate that the observance of transverse features in the Civil Service Management Law, such as: "Responding to the needs of society, efficiency, focus on justice, feasibility and progress, etc." is ambiguous.

CONCLUSION: Given that a rule lacks transversal features, it may be called a law, but it may not have the power to persuade citizens or executors to enforce it. On the other hand, considering the importance and key role of the chapter 3 of the Civil Service Management Law on citizenship rights, which includes: "Duties and responsibilities of citizens towards each other, duties and responsibilities of citizens towards the city and the ruling forces of the country, duties of the government towards citizens and people." In order to increase the quality of the law and protect the rights of the people in the quality of public administration, it is necessary to eliminate the deficiencies identified in this study. Also, the method and model considered in this research, to review the law, can be considered in other laws and public policies, including urban management laws.

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INTRODUCTION

The Civil Service Management Law (CSML), as the most important administrative document, contains strategies and requirements that deserve special attention and consideration. CSML in the administrative system of the country is a public policy and the mother law (Varasteh baz galeh and Faghih Iarjani, 2015). Initially, the traditional idea was that policies would be implemented once they were legalized and legitimized. But the issues that have arisen in the implementation and confrontation of policy makers with a multitude of unimplemented policies made them think that they believe that policies will not be implemented or will not be implemented well without providing the necessary ground (Daneshfard, 2016). In fact, there are problems and obstacles in the implementation of the policy, which cause the developed policies to not be implemented well (Ansell et al., 2017); As a result, these barriers must be identified so that, if possible, policies can be implemented in the best possible way by removing these barriers. The CSML is a policy that was proposed in contrast to a series of general problems and difficulties that has provided a solution for each public issue in the form of a chapter (Hajipour et al., 2015). Since CSML has been passed and has become law. However, some articles of the law have not been fully implemented, despite the fact that several years have passed since its adoption, As a result, it needs to be studied and carefully so that the administrative system in the country can be transformed by removing obstacles in its implementation (Darvishvand et al., 2018). Therefore, this study intends to take an important step towards the growth of the country's administrative system by examining the content deficiencies of CSML and providing corrective solutions (Tehrani et al., 2014).

Problem Statement

One of the activities carried out by the government to reform the country's administrative system has been the development of a CSML (Mortazavi et al., 2012). The CSML is a policy that was presented in the face of a series of public problems and issues, which has provided a solution for each public issue in the form of a chapter (Gholipour and Gholampour Ahangar, 2017). The administration of the affairs of each country is based on the basic and general policies of that country. Policies need legal legitimacy

to be implemented, and in this sense, policies that are approved by parliament are called laws (Maliki, 1400). There are several factors in the implementation of the law without which the realization of the law is not possible (Mortazavi et al., 2012). The Civil Service Law has ambiguities that "since the implementation of this law these ambiguities have caused, various organizations to consider more payments for their collection than what is provided in the law" (Haghighi Aminabadi, 2019). The Research Center of the Islamic Consultative Assembly has also considered the CSML in need of study, review and pathology, in order to be able to analyze the issues and obstacles to the implementation of this law or policy based on the correct methodology and information collection in the executive organs of the country (Jajarmizadeh, 2014). On the other hand, considering the inability to implement the mentioned law, despite the existence of numerous additional instructions and regulations issued during the years 2015 to 2018, the need for evaluation and pathology of the above law in the dimensions under consideration seems twofold. And it is necessary to examine the reasons and obstacles for its non-implementation of some articles of the law (Haghighi Aminabadi, 2019). Undoubtedly, the CSML, due to its innovations, shows and promises prominence that is used for the first time in the structure of the Iranian bureaucracy to change the foundation of relations and norms of the country's administrative system. But has what was expected of the foundation of the law been achieved? Or it has not been able to achieve its defined goals and estimate the expected results in terms of content, form, content and implementation problems. Considering that the law was made permanent in January 2016 without major changes, therefore, it is necessary to comprehensively examine why, despite the numerous efforts that have been made to formulate the CSML, and considering the scientific basis on which the law is based, including: "Good governance, new government management with a focus on the principle of justice, policy-making, government guidance and oversight", instead of "the previous approach, i.e. government management by applying market rules", the law has not been successful in implementation. Therefore, this article intends to examine the damages and inadequacies in the CSML in the chapter on people's rights (Chapter 3) in terms of content (substantive), based on the

transverse features of the law. In order to achieve this important it is necessary to answer the following specific question: "What are the content deficiencies of the CSML in the chapter on people's rights from the perspective of transverse features of the law"?

Research Aims

Examining the laws and identifying and resolving the problems in them can be an effective step in achieving the reform of the administrative system. Therefore, the purpose of this article was to identify and investigate the deficiencies in the law (Chapter 3), in order to be able to fully analyze the issues and deficiencies of the content of this law (chapter of people's rights) based on the collection of information from the executive bodies of the country and the correct methodology. Therefore, the purpose of this study are:

- To increase the quality of the CSML by providing corrective suggestions;
- To identify the content Pathology and deficiencies of the CSML (Chapter 3) based on the transverse features of the law.

Literature review

In this section, the theoretical framework of the research is reviewed:

Definitions

● *Urban management*: Urban management and the structure of legal institutions and organizations governing the city differ from country to country and each society has a different definition of urban management according to its economic, social and political structure (Chourabi *et al.*, 2012). Urban management refers to all, organizations, institutions and individuals that are formally or informally influential in the process of urban management (Turley and Zaman, 2007). Therefore, urban management does not include only the municipality and the city council, and any element that has an impact on the city management process is in this area (Hosseinzadeh *et al.*, 2015).

● *Urban management and people's rights*: Urban laws and regulations can be considered as one of the most important points of connection between urban management and people (citizens) (Hardoy and Satterthwaite, 2014). In other words, the actors, the main elements of urban management in the

light of urban laws and regulations, while defining the role for themselves and other members, can involve citizens in managing affairs and realize the concept of citizenship (Hendriks, 2014). A citizen is an official member of a city, state or country (Lotfi *et al.*, 2009). This view reminds the citizen of the rights and responsibilities that are provided for in the country's laws. Legally, society needs to regulate trade, property, urban planning, politics, and even family matters (Roweis, 2018). Therefore, from the urban point of view, the subject of citizenship rights is the relations of the people of the city, their rights and duties towards each other, and the principles, goals, duties and methods of doing it (Lorabi, 2020). In relation to each other, the city and the government or the ruling powers and the state, as well as the rights and privileges that are the responsibility of the city managers (municipality), the government or the ruling powers in general (Lorabi, 2020). One of these laws, which is between citizens and the government, is the CSML.

● *Civil Service Management Law*: The CSML was approved by the Islamic Consultative Assembly and the Guardian Council in 2007 (Civil Service Management Law, 2007) as an alternative to the National Employment Law and was communicated by the President to various organizations for implementation. This law has been compiled in 15 chapters and consists of 128 articles and a large number of notes (Civil Service Management Law, 2017). The third chapter of the mentioned law has considered the legal rights of the people and the duties and responsibilities of the managers and employees of the executive bodies in observing the rights of the clients and honoring them and includes articles 25 to 28 of the law (Civil Service Management Law, 2017).

The principles governing the 3rd chapter of this law are:

- reserving the dignity and honor of the people,
 - Familiarity of people with their rights and duties in the interaction of executive bodies,
 - Ensuring the rights of the people and the clients to the executive bodies (Majlis Research Center of the Islamic Republic of Iran, 2007).

The most important expected results from the execution of the sentences of the third chapter can be listed as follows:

- Improving the level of awareness of the people

about their legal rights in referring to the executive bodies;

- Establishing a system of accountability of government employees towards the people within the framework of administrative and employment laws;
- Familiarity of managers and employees of executive departments with their legal duties and responsibilities towards the people in the form of ethical and administrative charter (Majlis Research Center of Iran, 2007).

Law is one of the most important fundamental issues of any society (Luhmann and Albrow, 2013). Because it is the law that determines the framework for a society to move towards its goals. In other words, each society, in accordance with the goals it has set for itself, makes laws to achieve them, on the other hand, one of the most important issues in law and quality legislation. Experts have explained various reasons for the decline in the quality of the law and, from different perspectives, have made recommendations to increase the quality of the law (Francis, 2004). For instance, "Winterpool" considers the quality of the law on the one hand in its ability to achieve the set goals and on the other hand, the ambiguity and comprehensibility of the law (Aitken, 2013). "Parizi" divides the quality of the law into content and formality. Content quality means correctly identifying the problem and researching the right response to it, so that the desired result is achieved. Formal quality means choosing the appropriate legislative format and using language that is understandable and clear to the executors and the audience of the law in general. This requires clarity, simplicity, accuracy and the absence of ambiguity in the text of the law. Of course, the correct publication of the law can be added to the aforementioned features in a way that is easily accessible to the presenters and the audience (Aitken, 2013). In general, "Carpen" measures the quality of law by the following principles: necessity, appropriateness, transparency, accountability, participation, Availability, predictability, clarity, comprehensibility, simplicity, consistency, legality, accuracy, consistency, non-ambiguity, and Coherent structure (Vakilian *et al.*, 2016). In addition to these principles, "Carpen" believes that the law in question should have three other important features: First, if implemented, the legislator's intent will be achieved (conclusion). Second, the law passed by its audience

as far as possible to be implemented or the law can be imposed on them (impact) Third, law enforcement is cost-effective, meaning that its implementation costs do not outweigh its benefits (Efficiency) (Aitken, 2013). In order for a rule to become law in the first place, it must have a minimum condition, that is, it must have at least some characteristics, and otherwise it is not called law. More precisely, it is not essentially recognized as a law. These features are called "intrinsic" features of the law. In contrast, there are transverse features without which the law can be made. However, the presence of transverse features adds to the validity, meaning and better functioning of the law. The second type of attributes actually refer to the maximum functions of law and are entirely dependent on supporting theories about the concept of law. However, both groups of features are ultimately must-see and therefore theoretical and controversial in nature. As a result, the list of law features is open and flexible (Rasekh, 2006). According to the above definitions and one of the criteria that experts have explained for quality law, are the transverse features of the law, in the absence of which the validity, meaning and better functioning of the law and the maximum functions of the law will be overshadowed (Vakilian *et al.*, 2016). Therefore, in this article, in order to investigate the content Pathologies of the CSML, criteria related to the transverse features of the law have been considered Transverse features of the law. In order to examine the Pathologies and deficiencies of the CSML, it is necessary to analyze the transverse features of that law. The transverse features of law are those features which, if a rule lacks it, it may nevertheless still be called law. Since these attributes are located in the flexible sections of the list of properties of the law, it can be called transverse. In addition to the inherent features of the law, the law must be able to persuade citizens, otherwise in practice no one will follow it (Rasekh, 2006).

The transversal features of the law are:

- *Accountability To the needs of the community:* According to Rousseau, it can be harmful if the laws do not meet the needs of society. According to this thinker, the best legal system is a system that is adjusted according to the geographical and human characteristics of a country and respond to the present and future needs of that society (Katozian, 2019).

- *Reflecting the opinion of the majority*: On the other hand, most of the laws that define social and economic policy must express the opinion of the majority about the public good. The law must be in accordance with the nature of the people and the wise legislator follows the public morality and the demands of the people and does not take steps against them (Katouzian, 2016). But alongside them, the minority must be assured that their equality will be maintained. In this way, the laws enjoy an inner respect that the citizens, as subjects of the law, follow with good pleasure (Dworkin, 2013).

- *Provider of public interest*: The laws of the country must be enacted in accordance with reason and it is a rational law that takes into account the interests of the majority and the minority (Rasekh, 2002). "Thomas Hobbes" considers a good law to be a law that is necessary for the good of all people and they agree on such a thing (Katouzian, 2016). Raz (1979) sees the public and individual interests as intertwined. In his opinion, public good means the good of all and therefore, by supporting the good and the benefit of the individual, we have in fact preserved and protected the public interest. On the other hand, we have helped to achieve individual good by guaranteeing the public interest.

- In this regard, "Plato" also believes that the job of the legislature is to provide a decent life for all citizens (Hobbes and Bashrieh, 2002). From all that has been said, this feature means that the law must take into account the interests of the public, whether majority or minority.

- *Compliant with ethics*: Laws must comply with ethics to satisfy human conscience (Durkin, 2002). Of course, since the law relies on political authority, the emptiness of the law from its moral content will undoubtedly make it an ineffective order or "must". Because the law must be in accordance with public morality or morality accepted by the majority of society so that citizens are satisfied and obedient to obey its orders (Rasekh, 2006).

- *Focus on justice*: The law should seek to achieve justice and one of the ways to determine the realization of justice is to ensure the rights of minorities (Dworkin and Rasekh, 2002). According to the mentioned characteristics, at first, with the enactment of the law, the authoritarian period is transferred to the period of the rule of law. Then, by adding the constraint of reflecting the opinion of

the majority, the rule of law is placed in a democratic situation and Finally, if the law is enacted in such a way as to guarantee the rights and freedoms of the minority of society along with the rights and freedoms of the majority, then a righteous situation will be established (Dworkin and Rasekh, 2002).

- *Continuous*: Law enforcement must be done continuously. This means that the implementation of the law should not be suspended until the law is repealed or repealed by another law. Of course, this does not mean that the law is permanent and that it lasts forever; because there is no legislative art with which a law can be enacted forever, it means that the law should not be changed too soon and should be stable (Stockhammer, 2007). In this context, Aristotle refers to the formation of the habit of following the law. According to him, it takes a long time for citizens to get used to following a law. Accordingly, the law should not be reduced by creating new laws (Rasekh, 2006).

- *Efficient*: In terms of efficiency, it is an effective law that can achieve its desired goal. In other words, if the law fails to function and its intended purpose, at least one bad law and at most one problem will be in addition to the other problems of an illegal society. Therefore, some legal and political theorists have mentioned one of the features of law as efficiency (Schuck, 2000).

- *Effectual and progressive*: The law must be commensurate with the ability of the people for whom it is imposed. If a law is enacted that commands a man to perform difficult tasks or causes disobedience for its subjects due to its implementation, it will be a failed law or basically a dead and unenforceable law. A rule that is beyond human power may be called law, but its implementation will most likely require a repressive structure. In addition, the legal and political system that includes such laws will undoubtedly face a crisis of legitimacy (Rasekh, 2006). On the other hand, just as laws must conform to facts, they must move ahead of events. In addition, a leading legal system uses continuous legal teachings to create principles and rules that are relevant and appropriate to the new circumstances (Rasekh, 2006).

MATERIALS AND METHODS

Since the purpose of this study is to identify the shortcomings of CSML content, therefore, in terms purpose is of exploratory-developmental and as its

purpose is to find answers to legal problems and provide corrective suggestions, it is considered as of an applied research, and it can be considered a field research due to the method of data collection which was performed through semi-structured interviews. Consultative Assembly (legislators); managers, consultants and experts of the Research Center of the Islamic Consultative Assembly and the Administrative and Employment Affairs Organization; a number of managers and experts of agencies and organizations subject to the CSML, including the Ministry of Interior, were selected and interviewed based on their mastery and knowledge of the CSML and using the Snowball Method. From the twelfth interview onwards, the information received was repeated. But to be surer, it went on until the 15th interviewee. Reliability of the interviews were also tested using retest method. Also, according to the criteria provided (Creswell and Miller, 2000), the following measures were taken to ensure the validity of the research:

Adaptation by members: Three of the interviewees of the final report reviewed the first stage of the process of analyzing the obtained themes and categories, and their suggestions were included in the finalization of the report. **Peer review:** Three professors and two knowledgeable experts in the Islamic Consultative Assembly and the Research Center of the Paradigm Assembly compared the classification of topics and the relationship between

them, and their views were examined in presenting the model. Theme analysis and coding techniques were used to analyze the data obtained from the interviews. Also, the quality software used in the present study was MAXQDA11.

Analytical framework

In order to investigate and identify the deficiencies in the CSML (Chapter 3), the researcher intends to examine the CSML (Chapter 3) in various dimensions in the conceptual model (Fig. 1)

RESULTS AND DISCUSSION

In 2007, the MRC OF Iran introduced a chapter entitled “People’s Rights”, which includes four articles (Articles 25 to 28 of the law) in the CSML. The main subject of this chapter is the administration and organization of the government administrative and employment system. Also, this chapter is one of the innovations of the “Civil Service Management Law” approved in 2007. The center also stated that the reason for compiling the chapter on people’s rights in the most important and comprehensive administrative and employment law of the country is due to the change in the view of the administration and its managers and employees, and basically the government, towards the people;

The change in approach that seems to have been more visible and effective in some of the early

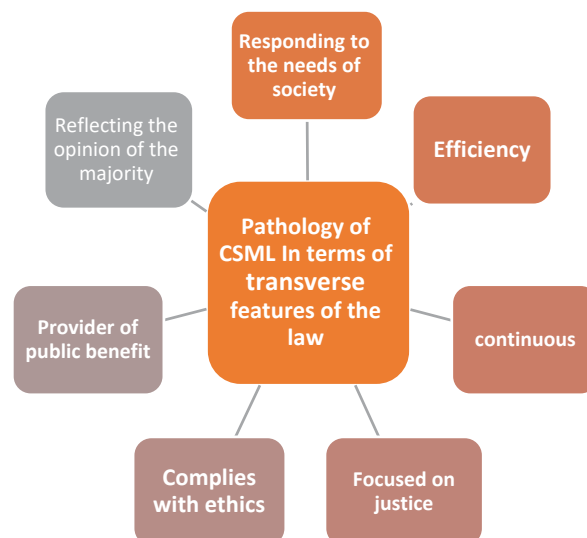


Fig. 1: Conceptual model of research)

chapters of the law, including this chapter. In this study, the pathologies of this chapter have been studied. According to experts and interviewees, the Pathologies and content deficiencies of the third chapter of the CSML - People's Rights based on the transverse features of the law are:

1- One of the identification damages for the third chapter of the law is the incompleteness and comprehensiveness of the provisions contained in this chapter. In fact, in order for the law to be considered as a comprehensive administrative document or a law for the management of the country's services, it must be complete and comprehensive. The text of Chapter 3 of the CSML is incomplete and does not refer to all the laws that are required to respect the rights of the people. Also, the rules in this chapter are very general and do not guarantee implementation. In fact, the legislature has not specified what will happen to the offender if the rules are not followed in this chapter (Darvishvand *et al.*, 2018). Therefore, considering that this law is more about the issue of wages and salaries of government employees, it is necessary to complete this chapter or remove items not related to the CSML (Najafbagy, 2019).

2- One of the most important Pathologies identified in the chapter of people's rights from the expert's point of view is the "lack of a clear scientific basis." Therefore, it is necessary to consider a sound and transparent scientific basis for this chapter of the law, and based on it, some of the rights of the people should be considered and clarified in it. One of these scientific principles for respecting the rights of the people is the "principles of procedural justice"; Some of the most important principles of procedural justice that can play an important role in protecting the rights of the people in the administrative apparatus are: Principle of the right to be heard" for the client in the administrative decision-making process, "Principle of the need to state the reasons and documents of the administrative decision regarding the legality of administrative decisions", "Principles of equality and non-discrimination, proportionality, impartiality, speed of response, obligation The reasons and grounds for the decision, the continuity of administrative services, access to administrative information, fairness of administrative proceedings and jurisdiction" should also be considered in the law or executive instructions of this chapter (Alizadeh, 2014).

3- In "Article 26" of the law, organizations are obliged to acquaint people with their rights and duties in interaction with the executive apparatus. One of the most important violations identified for Article 26 mentioned by the interviewees was "lack of a trustee for the implementation of this article of the law" and "lack of a trustee for public awareness of the people". In this section, in order to acquaint the people with the executive apparatus, the legislator only referred to "mass media, especially radio and television", but due to the exorbitant costs of this method in the normal case, the legislator needed to use more appropriate mechanisms to use this method and sources of financing were also mentioned. In addition to other methods of informing through the sites of organizations, creating a section called Client Assistant in organizations, using messaging software to inform clients to know what the steps are and what stage their work is at, and in the law and its executive instructions, has been neglected.

4- Another Pathology identified in this chapter of the law is "the use of vague words and concepts". Some of these words and phrases are:

- Mentioning the phrase "executive bodies can add items to it in accordance with the duties and special conditions of the relevant body in addition to the above, in accordance with the ethical charter approved by the Cabinet" in Article 25 reduces the transparency of the law. It was also better to add the principles governing the ethical charter of government employees that are stated in government regulations for the sake of transparency and public awareness, at the end of this article;

- Not paying attention to the clarity of specialized words and concepts in the law, such as the word "equality" or "people have equal rights" in Articles 27 and 90 (Civil Service Management Law, 2017);

- According to Article 27 of the CSML (Civil Service Management Law, 2007), "People have the same rights to use the services of the executive apparatus on equal terms. According to article 90 of this law (Civil Service Management Law, 2007), discriminatory behavior of employees with the client is considered a violation and can be prosecuted in the competent authorities.

However, the legislator has not used negative words in this chapter. Also, in the whole law, there is no reliable mechanism for fulfilling the provisions of Articles 27 and 90 (Civil Service Management

Law, 2017). In addition, there were no solutions to measure the achievement of the objectives of this chapter in the law and executive instructions.

5. Failure to use the rules of jurisprudence in this chapter is another injury that most of the interviewees mentioned. The law is divided into mandatory laws and voluntary laws in terms of executive power (Katozian, 2019). Sometimes in the CSML, in some laws, the spirit of benevolent laws is seen, such as the word "equality" or "people have the same rights". People with different attitudes can adopt different behaviors, depending on the existence of parallel and imperfect rules become more colorful. It seems that the executor can choose the law voluntarily and it is feared that the executors will use different rules for different people, according to their decision. Since the CSML is a mother Law, it should be a "mandatory law", not an "optional law". Mandatory Law A commanding or enforcing law is a law that is absolutely binding, and the legislature expresses the matter with the help of news sentences and the use of words such as "must, is necessary, is obligatory, will be obliged, and ...". Sometimes in the form of negative news sentences and using words such as: should not, cannot, is not allowed, has no right, etc., expresses the prohibition like that. Optional law is a law that, based on the authority and will imposed, in fact guides the method of exercising the right and ruling and relative justice, and paves the way for it and provides the right way. Optional law is apparently no command or prohibition. Does not include and does not create an obligation for individuals. For instance: "The laws in question regarding punishments are more of an optional law, and it seems that the legislator has wanted to leave the judge free to determine the punishment more or less, depending on the case and in proportion to the crime." While in parts of the law this has been forgotten. One of the ways to achieve this is to explicitly state the punishment in the law. For instance, the use of restrictive words such as "is prohibited", "is considered a violation", etc. It is necessary for the legislator to use the mandatory laws in this chapter of the law instead of the optional laws. Laws also need to be drafted as a deterrent. That is, the words "prohibited", "punished", "considered a violation", etc. should be used in the law. It is also necessary to specify in the law, guaranteeing the administrative implementation of the law and the criminal dimensions of the violation resulting from

non-implementation of the law. This prevents the arbitrary actions of administrative officials and this shortcoming will be eliminated to a large extent in the administrative law system of the country. Therefore, the existence of effective and accurate enforcement guarantees to guarantee the rights of the people is very important in this chapter of the law.

6. Another Pathology disadvantage is lack of attention to administrative principles and rules and the rights of individuals in drafting the law. For instance, in the performed interview, it is stated: "One of the most inalienable rights of the people is that administrative affairs should not be stopped or closed under the influence of human factors, and the existence of any kind of interruption and for any reason in the country's administrations causes a kind of distrust and dissatisfaction in the society." Also in another interview it is mentioned: "... It should be said that one of the inalienable rights of people who refer to the office is to ensure accountability and provide administrative services continuously during the week and any absence of administrative staff on site work and service for various reasons, including illness, leave, mission, etc., is inconsistent with the provision of services in the office, which despite the continuation of the provision of administrative services will be a step towards protecting the rights of the people. In cases such as leave, administrative mission, illness, travel and death of an administrative official or staff, as well as holding necessary administrative meetings, an arrangement should be made by the highest administrative official so as not to interrupt the administrative affairs." This can be done on a case-by-case basis, such as anticipating a successor or delegating authority. It is pointed out that the above cases are in accordance with the "principle of continuity of public services" considered in the laws and rulings of the Court of Administrative Justice of Iran.

7- Not mentioning the appropriate authorities for protest: One of the issues that has been neglected in the law is not mentioning the appropriate authorities for citizens to protest. In this regard, the legislator should have indicated where the clients can go to complain if there is any complain.

8 - Incomplete modeling of other parallel laws to formulate the law: for instance, in the third chapter of the constitution (Constitution of the Islamic Republic of Iran, 1979) and in several clauses of the policies

of the administrative system and in the resolution "Citizenship rights in the administrative system" (Iran Cabinet of Ministers, 2017), approved by the supreme administrative council on 2017/03/18, some provisions of the third chapter are referred to as "people's right; Such as: "Principle 19, Principle Twenty-eight, Principle Twenty-nine, Principle 34, Principle Forty-six, Principle Forty-seven, Constitution " The sentence: "Paragraphs 14, 15, 16, 17, 18, 19, 23, etc." (Constitution of the Islamic Republic of Iran, 1979). In most interviews, it is stated that this chapter is an incomplete interpretation of these rules.

9. Pursuant to Article 28, the government is obliged to ensure the rights of the people and its clients. Consider people's satisfaction and dissatisfaction with employees' performance in promoting, appointing and renewing employment contracts and benefiting from other employment privileges and applying incentives and punishments. And consider all by-laws, procedures, administrative and employment regulations related to government employees as an effective factor. As can be seen, the last sentence of this article does not have a meaning in terms of form, nor can it conceptually address the issue of people's satisfaction or dissatisfaction in all by-laws, procedures, administrative-employment rules related to employees in consider.

10. Employment of individuals in the form of fixed and hourly employment contracts as one of the types of employment of human resources in the executive apparatus has been proposed in the form of a note to Article (32) of the CSML. An approach that is currently mentioned as one of the challenges of the country's administrative system (Kaviani, Ghofrani, 2021). However, in the chapter on people's rights, there is no mention of how the people's rights are observed by the hourly employees and the employment contract.

Table 1 shows a sample of the selected codes resulting from the interviews conducted. Accordingly, the identified disadvantages (shortcomings) in chapter 3 of the CSML are as follow:

Based on the research findings and identified Pathologies, the following can be discussed in the chapter on people's rights:

- In the constitution and the general policies of the system, there are different sections dealing with different instances of the rights of the nation. However, in this chapter, several sections of the third chapter of the Constitution of the Islamic Republic

of Iran, which is dedicated to the issue of the rights of the nation, such as "paragraph 10" of the third principle of the Constitution, which "considers one of the duties of the system to establish a proper administrative system has been neglected. In addition, when the constitution mentions the establishment of a proper administrative system, it also includes all the components of the administrative system that the CSML seeks to organize, however, in this chapter, none of the dimensions and principles of administrative justice are mentioned. Including "The principle of being heard right", "Principle of the need to provide reasons and documentation of administrative decisions" "Principle of continuity of administrative services", "Principle of access to administrative information

- One of the weaknesses of the administrative system of the country is the existence of various interruptions in the provision of administrative services to the clients, which in addition to causing delays and disruptions in the administrative service system, it can cause their rights to be violated and citizens to be dissatisfied with the way organizations are run. Even such delays may in some cases cause damage to persons referring to the administrative apparatus. From this point of view, it seems necessary to clarify the law on the continuation of administrative services during office hours and to prohibit the cessation of services to clients;

- In this chapter, the contents are stated in general and only a series of charters, statements and slogans are included in this chapter;

- Regarding the identified deficiencies related to the failure to determine appropriate penalties and its inclusion in the law, it was stated in the interview: "Mentioning the imposition of punishments explicitly in the law, as well as specifying the guarantee of administrative and criminal enforcement of violations, etc., prevents the arbitrary actions of administrative officials and eliminates the deficiencies of non-implementation of laws to a large extent in the administrative law system";

- One of the important issues that the CSML, as the main law in the administrative law system of the country, is expected to pay attention to in the chapter on the rights of people, emphasis is on the need for the administration to be accountable to the citizens. This response must be such that it can be relied upon there may also be the possibility of judicial oversight

Table 1: Key points obtained from open-axial and selective coding by MAXQDA quality software for the third chapter of the law

Content Disadvantages Chapter 3 (People's Rights)	
Content deficiencies of Chapter III of the law	Lack of attention to the needs of society Weak legal bases in some materials and not paying attention to the real needs of society and not being useful to the people Lack of comprehensiveness of laws, due to the existence of several laws on one particular subject, in each of which they have dealt only with one dimensions of that subject. Failure to determine appropriate mechanisms to be implemented to obtain sufficient knowledge from the clients;
	Efficiency Lack of comprehensiveness of the provisions of a chapter of the law to consider the law as a comprehensive administrative or legal document for the management of the country's services Incomplete modeling of other parallel laws to formulate the law Incompatibility of issues in the law that are not compatible with its main purpose Failure to state the law in a common language between users and the legislator and to state generalities in the provisions of the law Non-compliance of the provisions of the law with each other Lack of proper timing for activities and processes Failure to delegate tasks to government-controlled organizations Lack of attention to the tools and prerequisites needed to enforce the law (Such as documenting the processes and determining the time of each work process) Uncertainty of the scope of the law to respect the rights of the people Inaccuracy in determining the limits of freedom of action of organizations and creating a balance between freedom and restrictions imposed on organizations Failure to mention the basic and important points of the law in the circulars and instructions required to emphasize and create transparency. Lack of proper enforcement guarantees to ensure law enforcement Failure to determine the appropriate penalties and include them in the law or refer to the legal provisions in which the punishment is stated
	Provider of public benefit Lack of appropriate mechanisms for access to administrative information Lack of mechanism for publishing parallel rules in order to use the original law correctly Failure to determine the type of laws and the number of laws required to provide citizens with information about their rights Failure to provide documents and circulars in organizations in chapters other than the chapter on people's rights The need necessity to specify the need for written and documented notification of decisions made about the client and the reasons for it. The need to emphasize the compliance of all administrative decisions in the executive bodies based on the documents of the law.
	Compliance with ethics Lack of attention to the scientific basis of administrative principles and rules in drafting the law Lack of motivation and commitment of executors to strict implementation of the law
	Focusing on justice Failure to mention appropriate authorities for protest Lack of determining the mechanism for organizations to respond to citizens Ignoring environmental factors in drafting the CSML Existence of various interruptions in providing administrative services to the client Lack of determination of mechanisms for monitoring the implementation of the CSML

or hierarchical oversight in the future;

- The CSML does not consider the principle of accountability to the client. Also, no legal article can be found that explicitly refers to this principle and obliges administrative employees to follow that principle in responding to the client;

- In this law, only the word accountability is used in Article 27, Article 96 and Article 114 (in the definition of the powers of the “Supreme Administrative Council

and the Council for the Development of Management and Human Capital”). But nowhere in the law is the word accountability defined or there is no talk of how to respond to people. Also, in case of non-response for reasons such as: “Attending meetings of officials, leave, mission, illness, travel, etc.” measures are not considered in the law and relevant instructions. In this regard, it is necessary for the highest administrative official to make arrangements so as not to interrupt the

administrative affairs This can be done following the assignment of all contract forces, contractors, specific employment contracts, etc., as the case may be, by means such as providing a successor or delegating authority; (Majlis Research Center of Iran, 1400)

- One of the identified Pathologies is "not specifying the need for written notification of all administrative decisions in the executive apparatus" and "providing legal documents" in the text of the law in order to protect the rights of the people. In this regard, it is necessary for the legislature to oblige the executive bodies in cases where they make a decision regarding the citizens or respond to the citizens' requests; Legal documents, the reasons for the decision, whether it is final or objectionable, and the authority to object to the decision in writing and clearly to the interested person. In case of non-observance of the law by the executors and the complaint of the beneficiary, it is necessary to specify the type of punishment in the law;

- In order to protect the rights of the people in the third chapter, it is necessary for all executive organizations to be obliged; Article (608) of the Islamic Penal Code, which is related to the right of citizens to complain about the behavior and insulting words of employees towards them, should be exposed to the clients. Violators of the law should be sentenced to one of the usual punishments in the Executive agencies;

- In order to increase the effectiveness of the law, Articles 26 and 27 refer to raising the level of public awareness of their rights and duties in executive organizations through the public media. However, in this article of the law, the legislator has only mentioned information through radio and television. In this regard, in order to be able to respond to the people, it is necessary to clarify and explain the administrative steps and schedule these steps in organizations. Also, the need to publish information related to the steps, time, quality and standard of providing services and their changes and providing this information to the public through the site of the organization and appropriate information software, should be emphasized in order to be transparent;

- In order to amend the provisions of Article 27, which states that " people have equal rights to use the services of the executive apparatus on equal terms" It is administrative, to be defined in the first chapter with the theme that the word "equality" in

the word has various meanings, the most obvious of which are "Equal" and "Justice". It is the duty of legislators to eliminate any discrimination, whether racial, religious, political, etc. The issue of equality should not be mentioned in just one sentence and in one chapter, and the spirit of equality should rule the law. In order to guarantee its implementation, the legislator must explicitly determine the punishment for violating it;

- It is necessary for the legislator in this chapter of the law to use mandatory laws instead of optional laws and also formulate laws as a deterrent. That is, the words "is forbidden", "is punished", etc. should be used. In addition, in order to prevent offenders from violating the law, it is necessary to determine the type of punishment.

Elimination of content Pathologies identified in the chapter on people's rights, including: "Lack of attention to the needs of society, lack of law enforcement trustee, lack of trustee for public awareness to the public, failure to determine the mechanism for accountability to citizens, failure to determine And specifying to the bodies supervising the implementation of the chapter on the rights of the people, suffice to state the generalities in the provisions of the law and not to express the law in a common language between the users and the legislator. It can increase the quality of the law. It also causes the law to have transversal features such as: "responding to the needs of society", "efficiency and realization of the goals set for the law, including" raising the level of awareness of the people about their legal rights in referring to the executive apparatus "and" creating a system " Accountability of government employees to the people within the framework of administrative and employment laws "and" morality and fairness of the law "and be recognized as a useful law for citizens and increase citizen satisfaction. Because if a rule does not have transversal features, it may be called a "law," but it may not be able to persuade citizens or executors to enforce it. Therefore, a law that does not have the mentioned characteristics will not be able to protect civil rights such as "duties and responsibilities of citizens towards each other, duties and responsibilities of citizens towards the city and the ruling forces, duties of the government towards citizens and people". Therefore, in order to increase the quality of the law and protect the rights of the people in the quality of public administration, it is

necessary to eliminate the shortcomings identified in this study. It should be noted that the method and model considered in this study (considering the transverse features of the law to measure the quality of laws), can be considered in other laws and public policies, including urban management laws.

CONCLUSION

Law and legislation is one of the most important fundamental issues of any society. Because the law determines the framework for a society to move towards its goals. In other words, each society makes laws in accordance with its goals. In this regard, one of the most important issues in law and legislation is the quality of law. Examining the quality and functions of the law can be very helpful in understanding the law. In other words, it can be said that the law must perform a number of tasks and meet a series of needs. Identifying these duties and needs will be the basis for judging the law and, in a sense, the criterion for distinguishing it from other adjacent or similar rules. On the other hand, the characteristics of the law represent the various functions of the law. A series of these features are known as transverse features of the law. The transverse features of the law are those features that, if a rule lacks it, it might be called a law, but it cannot convince citizens and persuade to enforce the law. As a result, in practice no one will follow it. In other words, all enacted laws must have transverse features of the law in order to be recognized as a quality law. These characteristics are: "Responding to the needs of society, reflecting the opinion of the majority, serving the public interest, complying with ethics, focusing on justice, continuity, efficiency of law. It is therefore necessary, all laws, especially the laws of urban management that govern the city and its citizens Be written to match these features to be able to achieve the main goals for which they are intended. Because if the law cannot fulfill its function and purpose; At least, a bad law, and at most, one problem will be in addition to the other problems of a lawless society. While the presence of these features in the law causes the law to have an inner respect and the citizens as subjects of the law to follow it with peace of mind.

Suggestions

According to the research findings, it is suggested, in drafting laws, especially city laws, to ensure the

fulfillment of the following:

- Codification of the law according to the real needs of the society and its usefulness for the people;
- Lack of use of general words, incomprehensible and with the possibility of different interpretations in the law;
- Expressing the law in a common language between users and legislators;
- Ensuring that there are no multiple rules on a subject;
- In the CSML, only some aspects of people's rights are considered, and this law is not comprehensive on people's rights alone;
- Explicitly refer to the administrative enforcement guarantee in the law; to achieve this, it is necessary to use the words "command" instead of "optional" in the law. Including: the use of restrictive words such as "prohibited", "considered a violation", etc.;
- The need to determine the criminal dimensions of violations resulting from non-implementation of the law;
- Paying attention to the scientific foundations of administrative principles and rules in drafting the law;
- Mention appropriate authorities for protest (in case of violation);
- It is necessary to specify in the law, the organizations in charge of law enforcement and the organizations that provide public information about the law to the people;
- Laws need to be formulated in such a way that the principle of "continuity of public services" is observed and the accountability and provision of administrative services is ensured continuously during the week. In other words, administrative affairs should not be stopped or closed under the influence of human factors;
- Consider appropriate mechanisms for people to access information, documents and circulars in offices.

AUTHOR CONTRIBUTIONS

Z. Farasat reviewed the literature, collected, analyzed, and interpreted the data. A. Amirkabiri, in charge of correspondence, reviewed the results and the text editing. R. Najafbagy was responsible for reviewing the literature and interpreting the data.

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CONFLICT OF INTEREST

The authors of this article do not declare any conflict of interest with the publication of this article. Various ethical issues such as plagiarism, fabrication, data forgery, informed consent, duplication, submission and redundancy have been controlled.

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ABBREVIATIONS

CSML	Civil Service Management Law
MRC OF Iran	Majlis Research Center of Islamic Republic of Iran

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ORIGINAL RESEARCH PAPER

Investigation of the exterior skin proportions of urban district buildings with a climatic management approach

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ABSTRACT

BACKGROUND AND OBJECTIVES: Lack of paying attention of contemporary architecture and urban planning to the environment and adaptation to the climate of the region has caused many environmental problems. To solve a part of the problem, the present paper was conducted to achieve the proportions governing the exterior skin of open spaces of urban districts that have unique characteristics to adapt to the climate of their region, since about 2/3 of Iran is covered by arid climate, it was examined. The old texture of Yazd is one of the best architectural models compatible with arid climate of Iran, which its teachings can give suitable guidelines for contemporary architecture and urban planning. In this regard, three districts from the historical texture of Yazd were selected as research samples.

METHODS: This research is of applied in terms of aim and its methodology is descriptive-analytical conducted by library method and field survey. The method of research and data analysis is a combination of quantitative and qualitative, in which the geometric properties of 143 plots were studied first and then, by comparing and analyzing the results, the fit was obtained.

FINDINGS: The results showed that the average height of the exterior skin in the squares was more than that in the passages and entrances; this ratio is 1.22 for the entrances and 1.35 for the passages. The average width of the exterior skin is greater in the squares, followed by the passages and entrances, respectively, with ratios of about 2.3 and 12, respectively. The ratio of height to exterior skin width is 1 to 5.7 in the squares and 1 to 39 in passages, exterior skin width is about 6 times in the squares and 39 times in passages. These proportions are a sign of the influence of the region's climate, the generalization of which in similar climates will increase the harmony with the climate.

CONCLUSION: Results suggest the existence of proportions and relations in the exterior skin that are affected by the climatic characteristics of the arid region of Iran and can be managed in the open spaces of urban districts.

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INTRODUCTION

Climatic architecture with the least destructive effects on its environment and paying attention to existing natural resources and saving on the use of non-renewable resources and preserving it for the future and its impact on the surrounding environment is a key step towards sustainable development (Nolson, 2016). The issue of climatic architecture in Iran has a long history. Historical architecture of Iran can be considered as a clear example of climatic architecture. However, in contemporary Iranian architecture, with superficial and slogan-like approaches that result from misunderstanding and fundamental principles and concepts of climate architecture in this area, its position has reduced to ephemeral styles and in they are in contrast to the environment and climate. Thus, planning and design based on climate and following the appropriate patterns of climatic conditions of each region are the requirements for achieving sustainable architecture and subsequently sustainable development (Pordeihimi, 2011). This paper was an attempt to obtain some of these relations and patterns in one of the dominant climates of Iran. Since about 2/3 of Iran is covered by arid climate, this climate was examined to evaluate and achieve the mentioned patterns in the exterior skin of its districts. Iran is a vast country with different climatic zones, and, in the past, traditional builders have presented several logical climatic solutions in order to enhance human comfort (Pakzad and Asadi Khansari, 2018). In fact, this emphasis has been one of the most important and fundamental features of Iranian architecture. To a significant extent, Iranian architecture has been based on climate, geography, available materials, and cultural beliefs. Therefore, traditional Iranian masons and builders had to devise various techniques to enhance architectural sustainability through the use of natural materials, and they had to do so in the absence of modern technologies (Keshtkaran, 2011). Most modern buildings are designed without adequate attention to environmental impacts. The history of architecture exhibits a positive correlation between the environment and traditional buildings, which have been designed with careful attention to climatic requirements and sociocultural contexts (Soflaei et al., 2016). Based on one of the theories, some of the reasons for climate change in statistical periods are associated with excessive human

activities, particularly industrial activities and greenhouse gases (Samuel et al., 2017). During the 20th century, amounts of greenhouse gases such as CO₂, CH₄ and NO₂, have considerably increased in the atmosphere. As much as 5 to 6.2 billion tons of dioxide enters the atmosphere annually. According to the forecasts by the Intergovernmental Panel on Climate Change (IPCC), about the population growth and the increase in the human need for energy, the amount of Carbon Dioxide will increase from 3.1 billion tons in 1985 to 4.7 billion tons in 2025 (Buzasi et al., 2021). Successive droughts, severe and sudden floods, cold and hot airwaves are one of the consequences of climate change, which have caused the earth to face various crises. So, recognizing the present and future climate situation is significant for urban planners and designers (Darabi et al., 2016). In previous studies, traditional Iranian architecture and urban planning has been recognized as one of the most complete forms of contextualism in the world (Tabarsa et al., 2017). Economic and environmental challenges have contributed to intensify, in recent years, national and international efforts to promote sustainable growth. Building sector can help to accelerate progress towards sustainable development through, for example, more sustainable use of natural resources, efficiency in the use of energy and valuation of ecosystem impacts (Ascione et al., 2016). A city requires favorable natural conditions, cultural and social relations and economic life to survive. Regarding the natural factors, traditional Iranian cities have adapted to the environment as if they were the environment itself. In fact, Iran is one of the few countries in the world that historically could create a diverse architecture in light of its cultural and geographical characteristics (Mofidi Shemirani and Moztarzadeh, 2015). This diversity can be observed even in the geographical divisions of a limited area. In general, various factors such as topography, climatic characteristics, economic capabilities, and livelihood and water resources in Iran have contributed to the emergence of different physical textures. This special geographical and climatic situation along with the intelligence of the past of this land in using natural energies such as wind and sun, both in arid regions and in humid area of this country, has led to the emergence of this unique architecture (Ziabakhsh et al., 2011). Traditional Iranian architecture has a strong background of various aspects of sustainability,

Iranian art and culture and reflects a special value of this art and culture (Hadianpour *et al.*, 2014). Research suggests that the techniques and rules used in Iranian indigenous architecture have all the characteristics of sustainability and clearly have many new concepts in the field of sustainable architecture and can respond to environmental issues appropriately. One of the effective steps taken in the area of optimizing energy consumption in residential buildings is the use of natural energy and climatic design of buildings based on the principles of sustainable architecture in each region. Climatic design has been the main theme of architecture in the past (Hekmatnia and Ansari, 2012). In recent decades, rapid unrestrained increasing of building has strongly affected on disorderly of heterogeneous proximity of bodies, activities and events in overall city (Atarod and Kashi, 2017). In Iran, the useful life of a building is 20 to 25 years. Today's cities are like construction workshops, where a large number of buildings are being built or demolished every day in every alley. A large part of the national capital, energy and environmental resources is wasted every year, resulting in damage to the country and even the world. Moreover, lack of models to achieve adaptation to the climate has left the designer, builder, operator and all construction stakeholders with a kind of ambiguity and confusion. The only official action in Iran in this regard is Article 19 of the National Regulations, which summarizes energy savings only in the form of thermal and acoustic insulation of buildings and presents the same pattern for the whole of Iran, despite its climatic and geographical diversity (Office of National Building Regulations of Iran, 2020). Other steps taken in this regard are objective translations of the experiences of countries that sometimes have no similarity to Iran (Camyabi and Ahmadi, 2013). The occupants decide an acceptable thermal comfort range by adapting to the internal environment of the building. This indirectly minimizes the energy usage and running costs of the building, thus enhancing its economic, environmental and sustainable performance (Albatayneh *et al.*, 2016). Adaptation of the artificial environment to the natural environment, ecosystem and climate is one of the criteria of the city ecosystem (Sharifian Barforosh and Mofidi Shemirani, 2014). Based on the studies conducted so far, some of which were presented in this section, the need to develop completely

indigenous models and compatible with Iran's climate is quite clear. Since Iran's past architecture is the best model compatible with climate conditions, its experiences should be used to achieve models that respond to the climatic characteristics of a given region and then use them as a reference for use in areas with similar climates in Iran (Tavasoli, 2012). An indigenous view of such research and conducting it based on the climatic characteristics of the Iranian region is the best solution to achieve these principles and models, since the existing and successful models of the world today cannot be effective for other countries, especially developing countries such as Iran. Even if its technical infrastructure is provided to use renewable energy, very important and fundamental issues such as economic issues, maintenance methods, operation, etc., will remain unresolved. Given the spatial value of the historical city of Yazd and its location on the central plateau of Iran with arid climate, and according to previous studies, this city is one of the best examples of climatic architecture that has been registered by UNESCO, so city was selected as a sample of study. The present study was an attempt to examine geometric exterior skin proportions in Yazd districts of arid climate of Iran. Its results help to achieve relations and proportions in design of exterior skin to achieve climatic management in this region. The present study differs from other studies in terms of subject matter and innovation. The present study is the basis of a diverse range of geometric features of the exterior skin of the buildings in the area in 143 plots from three different districts to study the skin proportions and identify the principles that govern their structure. The climatic characteristics of the arid region are unique, based on which a suitable climatic model is included based on the ratios and relationships in the skins. Therefore, the weakness and lack of identification of the principles governing the skin, influenced by climatic characteristics based on the ratios and relationships between them, is evident as one of the shortcomings of theoretical studies in this field. To achieve these up-to-date and innovative objectives, the research survey was conducted in Yazd, Iran in 2019 to 2021.

MATERIALS AND METHODS

Methods

The present study is an attempt to achieve the

proportions governing the exterior skin of urban districts that have unique characteristics to adapt to the climate of their region and climatic management through this skins of districts. The methodology of this research is descriptive-analytical based on qualitative analysis and the research strategy is a combination of descriptive method and case study. Data were collected and analyzed by direct view, drawing as built facades and photography. Then, by using logical, deductive and inductive reasoning, differences and similarities with other examples were obtained. The aim of deductive research is to help explain the research findings in the form of relations, formulas and proportions governing exterior skin similar to climate of the studied area. So, the case study of three districts of Yazd with historical and local value was studied and evaluated, which is the best suitable model for the arid climate of Iran. Then, the results were plotted and analyzed in the form of analytical sketches based on the characteristics affecting the formation of skins in terms of climate, and from their deductive reasoning, models for skins in this climate were presented.

Research variables and indicators

Library studies and field methods were used to collect data. The method of research and data analysis is mixed (a combination of qualitative and quantitative methods) and a comparative causal method was used in this regard. Several cities in arid climate of Iran were considered for study in the present study. According to views of experts and UNESCO, which considered Yazd as the best climatic and historical model, the districts of this city were studied as a case study. The three districts of Shah Abolghasem, Sahl Ibn Ali and Vaqat al-Saat, which are old and inner districts of the historical texture of Yazd city and have valuable buildings, and are historically and strategically important in the passageways, squares and entrances, geometric characteristics of their exterior skin such as length and width and height were selected for the study. By comparing and analyzing the results, the geometric proportions governing the exterior skin in this climate were obtained. Data collection tools in this study included note-taking sheets, tables, detailed maps of districts that were prepared from the cultural heritage of Yazd and passageways and numbered plaques, sketches of facades taken with measuring

devices and after matching with the photos taken by the camera, were carefully drawn in the tables. Then, the plaques were drawn in each passageway and the bodies were displayed accurately, and then by examining, comparing and analyzing the skins in the passageways, squares and entrances, the governing geometric proportions of the exterior skin in the districts of this city were obtained. The characteristics and results of the analyses can be generalized to the same climate. In other words, the case study has an external validity.

Geographical scope of research

The study area in the present study is the city of Yazd in Yazd province. This province has an area of about 74493 square kilometers and covers four and a half percent of the total area of Iran. Yazd city is located in the center of Yazd province with an area of 2491 square kilometers. This city is located in the east of Isfahan and in the south of Lut desert in the center of Iran. It is surrounded by mountains on three sides, north, south and east, and has access from the west. Being located in the central part of the Iranian plateau has provided the most unfavorable natural factors governing the central plateau of Iran. Low rainfall with severe evaporation, distance from the sea, proximity to the vast dry and salt desert, low relative humidity with high heat, extreme temperature fluctuations are some of the factors that make Yazd one of the driest regions of Iran (Almutairi *et al.*, 2021). The City of Yazd is located in the deserts of Iran close to the Spice and Silk Roads. It is a living testimony to intelligent use of limited available resources in the desert for survival. Water is brought to the city by the qanat system. Each district of the city is built on a qanat and has a communal centre. Buildings are built of earth. The use of earth in buildings includes walls, and roofs by the construction of vaults and domes. Houses are built with courtyards below ground level, serving underground areas. Wind-catchers, courtyards, and thick earthen walls create a pleasant microclimate. Partially covered alleyways together with streets, public squares and courtyards contribute to a pleasant urban quality. The city escaped the modernization trends that destroyed many traditional earthen cities. It survives today with its traditional districts, the qanat system, traditional houses, bazars, hammams, water cisterns, mosques, synagogues, Zoroastrian temples and the historic

garden of Dolat-abad (unesco, 2020). Fig. 1 shows the location of the city of Yazd in the center of Iran.

With its history and indigenous architecture, it has undergone several changes in different periods and accordingly is divided into three parts: 1- The historical part of the city, including the old and inner part, related to before the ninth century AH that has a physically intensive composition. 2- The historical part of the city, including the middle part, which shows the city complex until the establishment of the Pahlavi government in 1920, which is relatively open in terms of physical composition. 3- The new and outer parts of the historical walls of city that their expansion was accelerated in 1958-1968 and during the Islamic Revolution and it has a diverse physical composition (Tavasoli *et al.*, 2007). In the present study, the old and inner historical part of the city was selected due to its spatial values and indigenous architecture. The historical texture of Yazd with 43 districts has been registered by UNESCO. Its three districts were selected and studied due to their different valuable characteristics and their impact on the formation of the old texture of Yazd and having passageways, squares and buildings with historical value. Fig. 2 shows three different districts of the Yazd city and the location of the districts studied in this study.

Finally, it can be said that data analysis in the present study was performed in three steps: In

the first step, graphs and tables were obtained by descriptive statistical method of quantitative data. In the second step, using a logical reasoning strategy, the applied research frameworks were explained and the results of these two steps led to the extraction of findings according to Table. 1 to Table.10 and Fig. 3 to Fig. 15 and in the final step, the final interpretation of the findings was performed.

RESULTS AND DISCUSSION

The results show that the exterior skin is suitable for the climate of this region in the open spaces of Yazd as one of the best examples of arid climate architecture in Iran. All images taken and sketches of the exterior skin in this section have been done by the author.

A: Samples of Shah Abolghasem district

In this district, the square and the two main passageways leading to the square were selected. Hosseinieh Shah Abolghasem surrounded the square, and passageway 001, including 16 plaques, 12 residential land uses, one water storage and 3 ruined place, and passageway 002, including 19 plaques, 16 residential land uses, 2 commercial land uses, a tomb, which all of them were taken and drawn according to Figs. 4, 5 and 6. After examining and evaluating their results, the exterior skin proportions of this district were presented in Table 1.

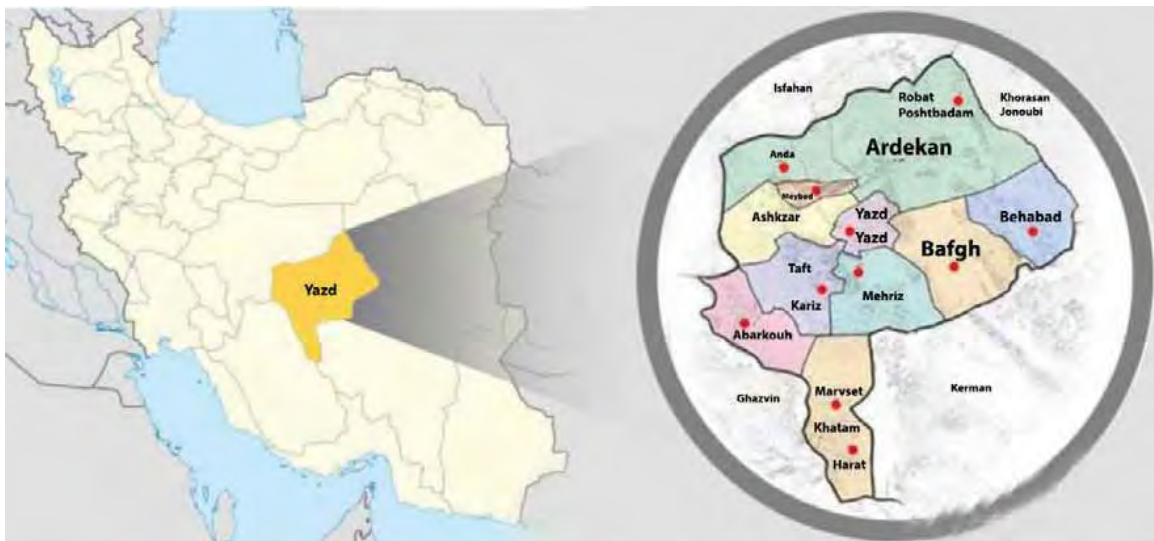


Fig. 1: Location of the study area (Archive of Yazd Cultural Heritage Organization, 2020)

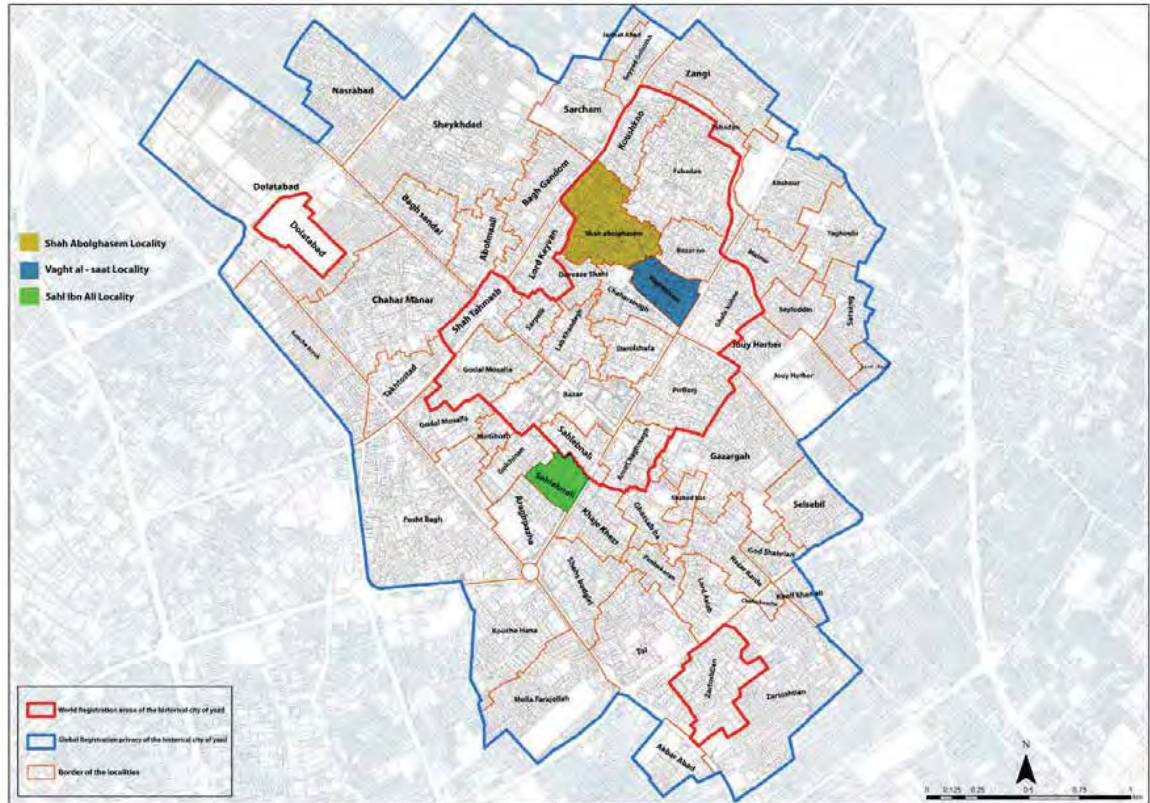


Fig. 2: Area and privacy of the historical texture of Yazd and the location of the three surveyed studied districts (Archive of Yazd Cultural Heritage Organization, 2020)

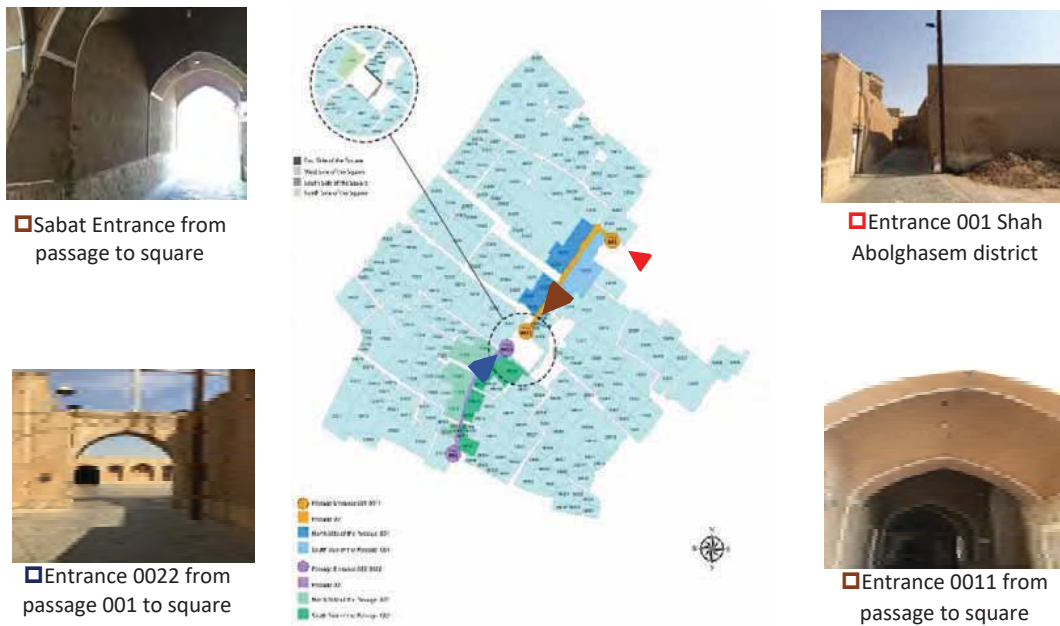


Fig. 3: Location of the square, passages, and main entrances of Shah Abolghasem district of Yazd



Fig. 4: exterior skin of Shah Abolghasem Square in Yazd

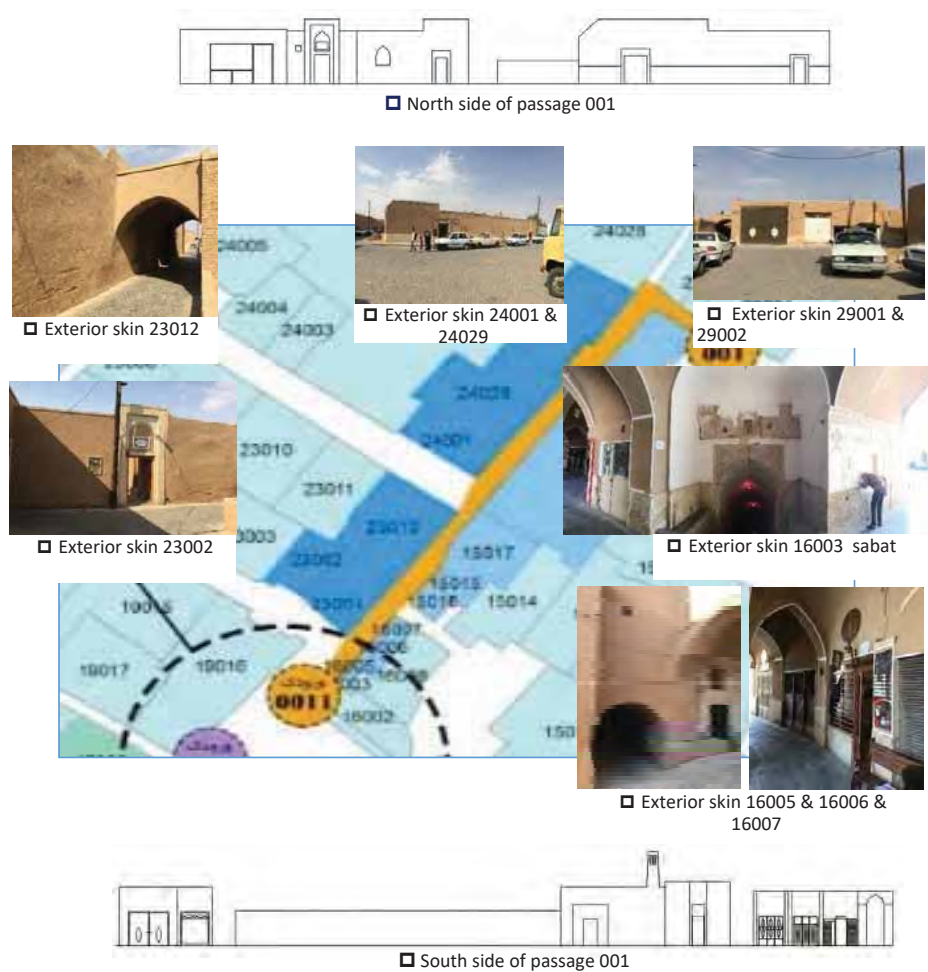


Fig. 5: Passage exterior skin of 001 Shah Abolghasem district of Yazd

Exterior skin proportions of urban districts

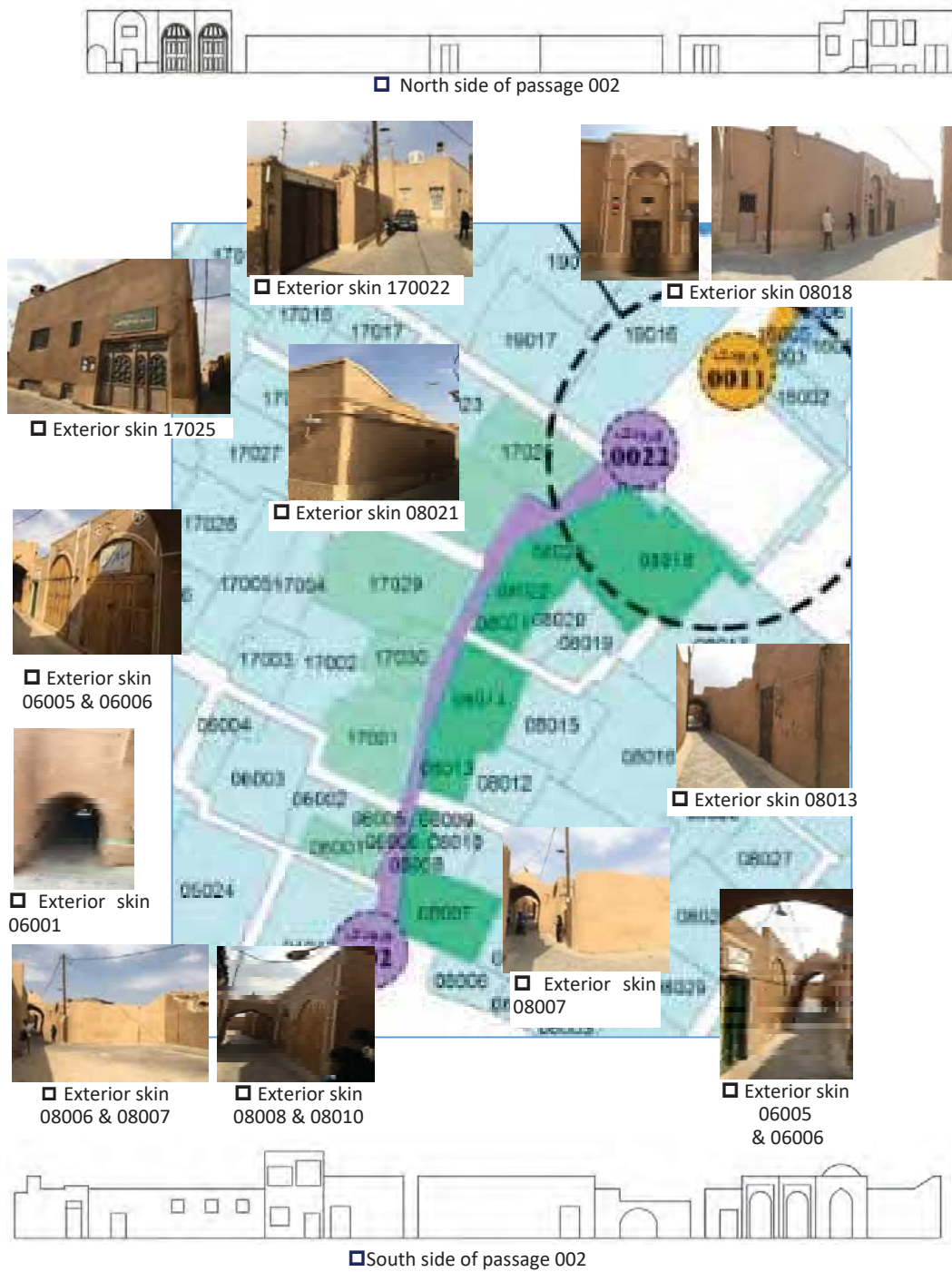


Fig. 6: Passage exterior skin of 002 Shah Abolghasem district of Yazd

Table 1: Summary of the proportions of Shah Abolghasem exterior skin district of Yazd

Average height of square exterior skin (meter)	Average width of square exterior skin (meter)	Average height of district entrance exterior skin (meter)	Average width of district entrance exterior skin (meter)	Average height of passage exterior skin 001 (meter)	Average width of plots passage 001 (meter)	Average height of passage exterior skin 002 (meter)	Average width of plots passage002 (meter)
7 Min: 5/5 Max: 10	23 Min: 22 Max: 25	4/16 Min: 3/51 Max: 5	2/46 Min: 1/74 Max: 3/18	5	6	5	8

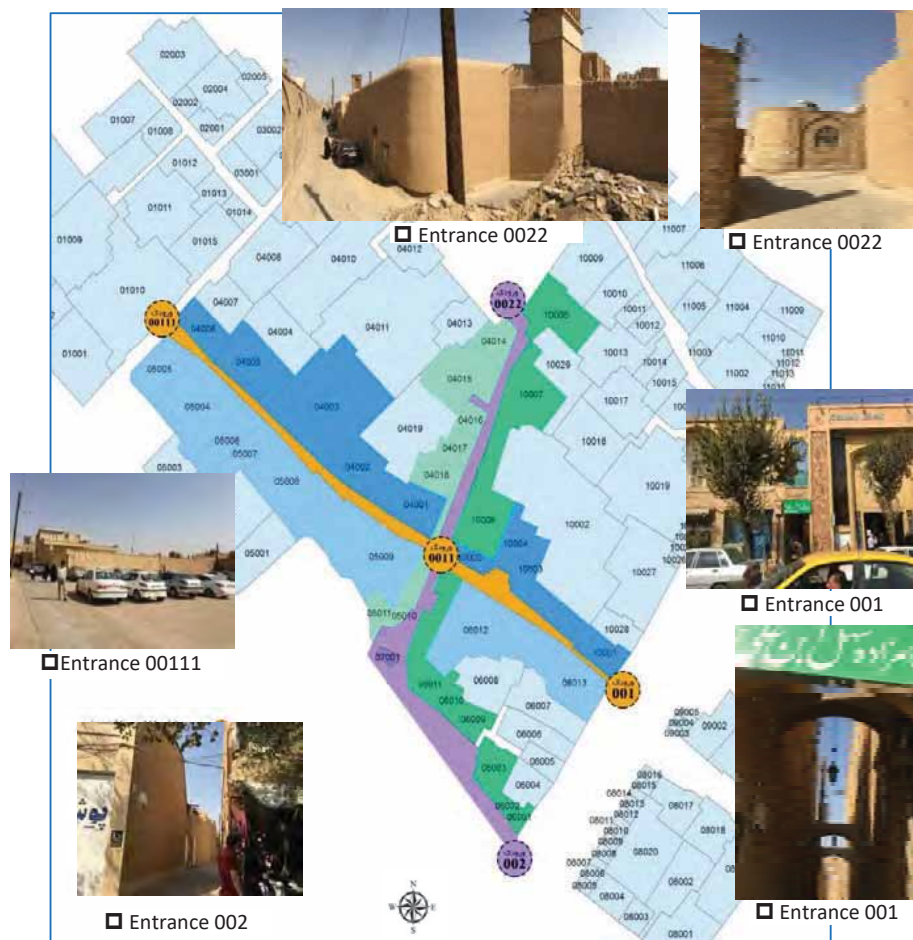


Fig. 7: Location of the passages, and main entrances of Sahl Ibn Ali district of Yazd

B: Samples of Sahl Ibn Ali district

In this district, two passageways that connected this district to the main street and parking lots were selected. Passageway 001 includes 20 plaques, 15 residential land uses, Sheikh Sadoughi House, Pirnia House, Yazd University of Arts, University Library, and Imamzadeh

Sahl Ibn Ali building. Passageway 002 includes 20 plaques, 18 residential land uses; Sahl Ibn Ali Mosque and one ruined place, which all of them were taken and drawn according to Figs. 7, 8 and 9. After examining and evaluating their results, the exterior skin proportions of this district were presented in Table 2.

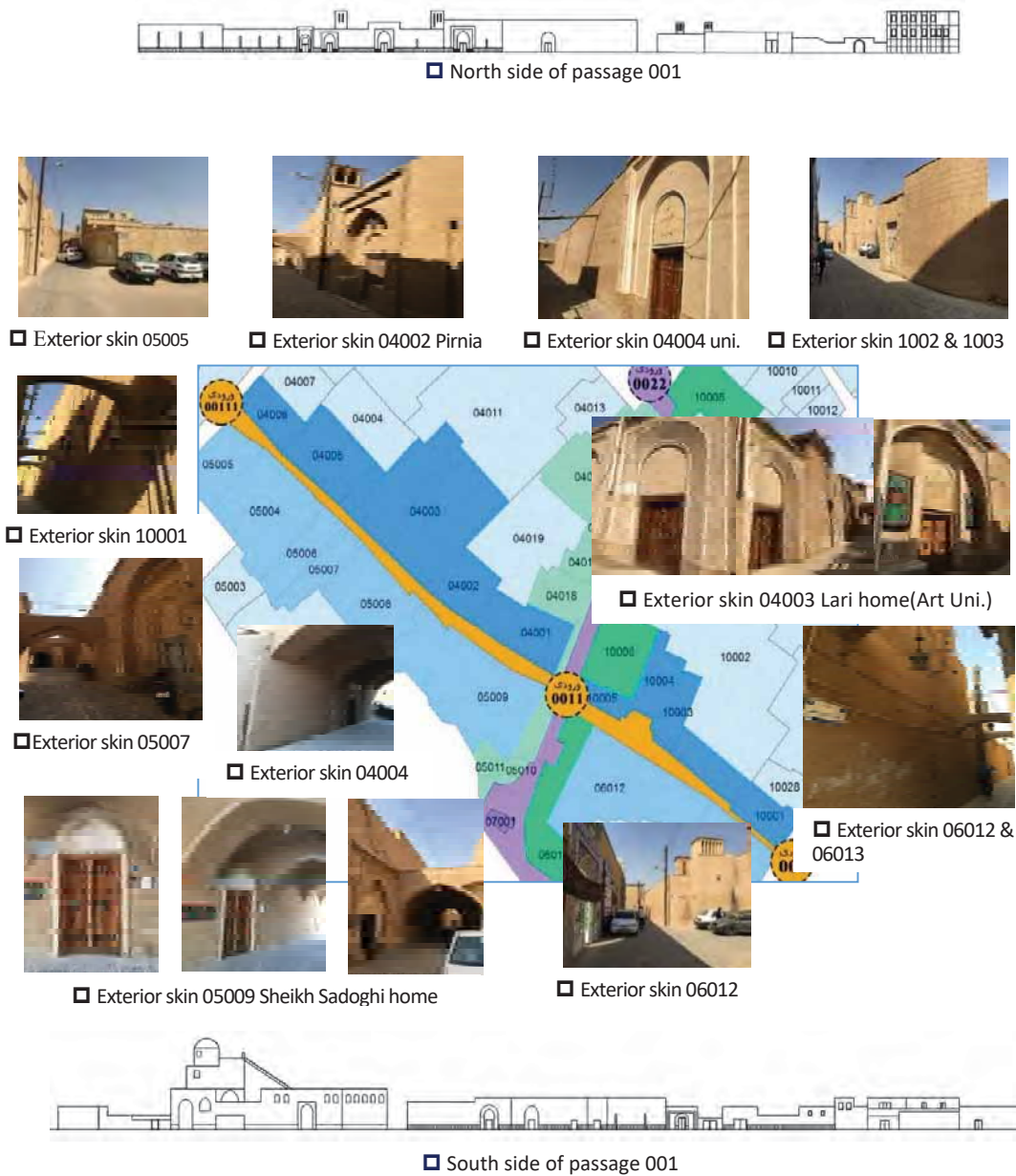


Fig. 8: Passage exterior skin of 001 Sahl Ibn Ali district of Yazd

C: Samples of Vaqt al-Saat district

The square and 4 passageways leading to it were selected in this district. Four bodies of the square includes 12 plaques, including 7 buildings with residential land use, 3 buildings with caravanserai land use, one restaurant and one tomb of Sayed Rakneddin. Passageway 001 starts from the boulevard leading to the Grand Mosque Yazd includes 12 plaques, 10 residential land uses, one hotel and one

tomb of Sayed Rakneddin. Passageway 002 started from the bazaar includes 11 plaques that of them have residential land uses. Passageway 003 started from the border of Shah Abolghasem and Vaqt al-Saat districts include 4 plaques with residential land uses located under Sabat. Passageway 004 includes 25 plaques that had 18 residential land uses, one hotel, two cafes, one restaurant and 3 ruined places, all of which were taken and drawn according to

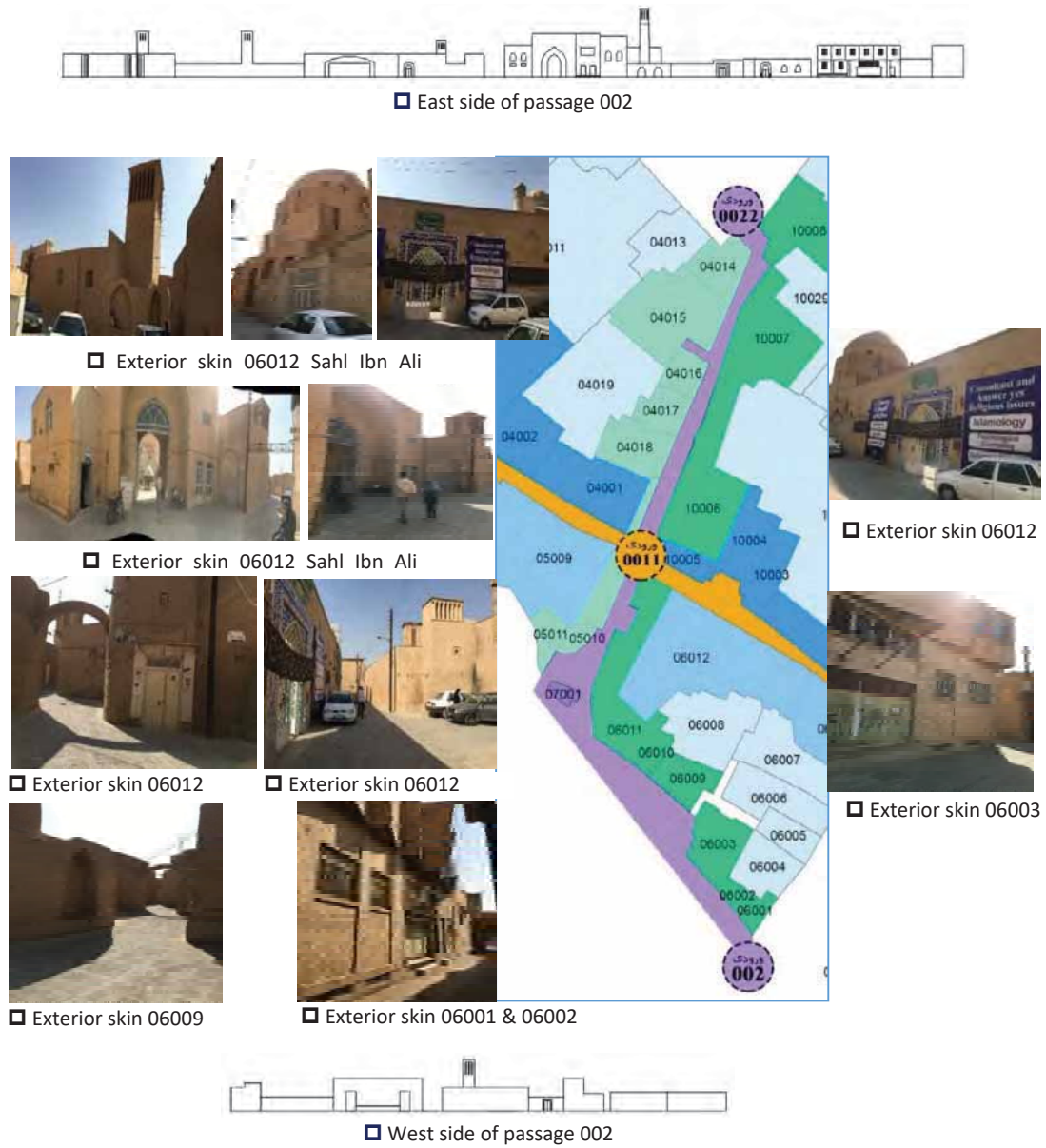


Fig. 9: Passage exterior skin of 002 Sahl Ibn Ali district of Yazd

Table 2: Summary of the proportions of Sahl Ibn Ali exterior skin district of Yazd

Average height of district entrance exterior skin (meter)	Average width of district entrance exterior skin (meter)	Average height of plots passage 001 (meter)	Average width of plots passage 001 (meter)	Average height of passage exterior skin 002 (meter)	Average width of passage exterior skin 002 (meter)
5/40 Min: 3/20 Max: 7	3 Min: 1/7 Max: 4/7	5/8	17/5	5	21/5

Figs. 10, 11, 12, 13, 14 and 15. After examining and evaluating their results, the exterior skin proportions of this district were presented in Table 3.

D: Analysis obtained from the comparison of the proportions governing the square exterior skin, entrances and passageways of Yazd districts

By examining and comparing the results of the findings in the previous section according to Tables 4, 5 and 6, and analyzing them, the following results and

proportions were obtained:

- The minimum and maximum height of the exterior skin in the passageways is more than the squares and are 1.36 times and 1.2 times, respectively.
- The average height of the exterior skin in the squares is more than the passageways and is 1.3 times.
- The minimum and maximum width of the exterior skin in the passageways is more than the squares and are 1.9 times and 6.7 times, respectively.

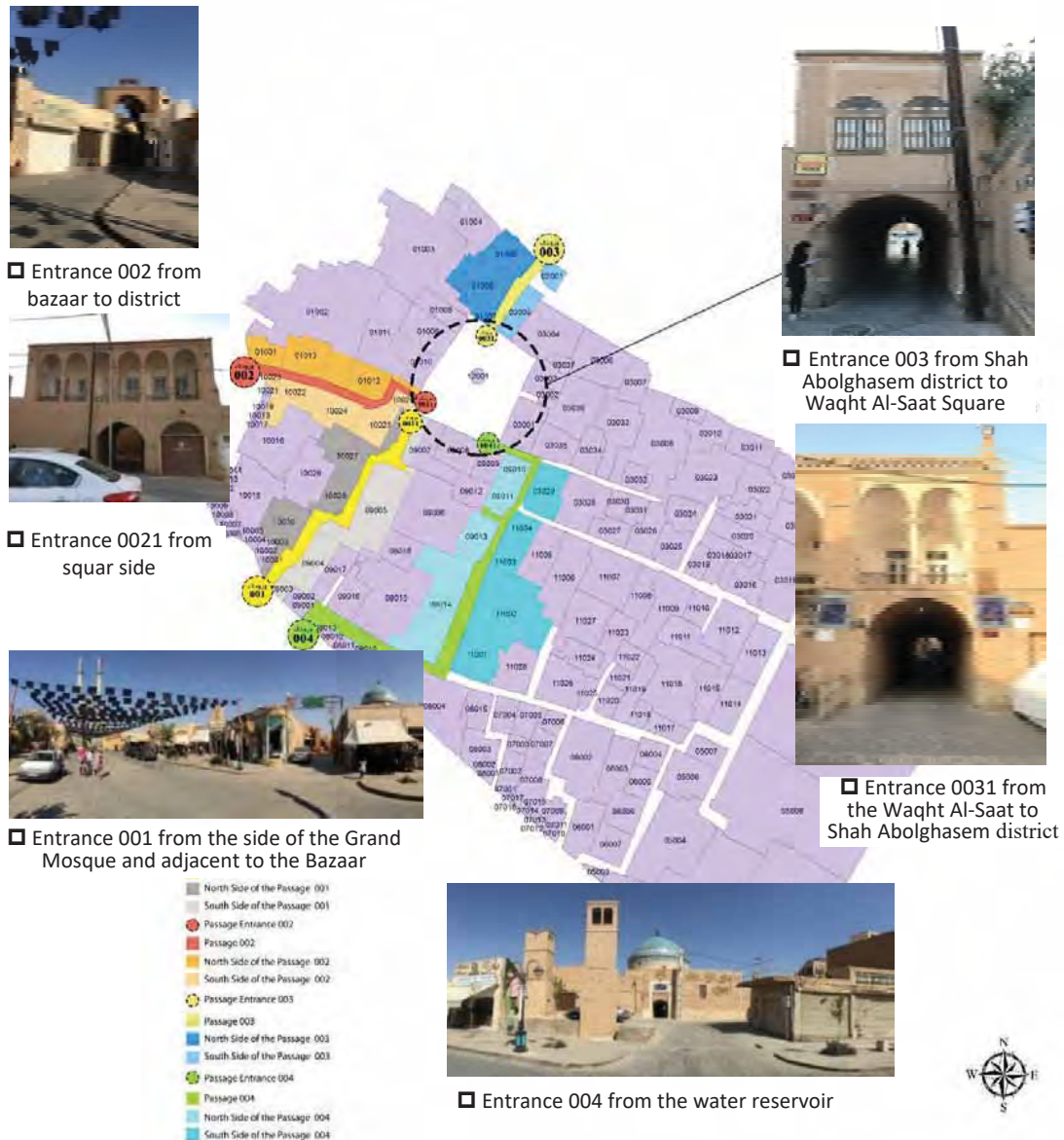


Fig. 10: Location of the square, passages, and main entrances of Waqht al-Saat district of Yazd

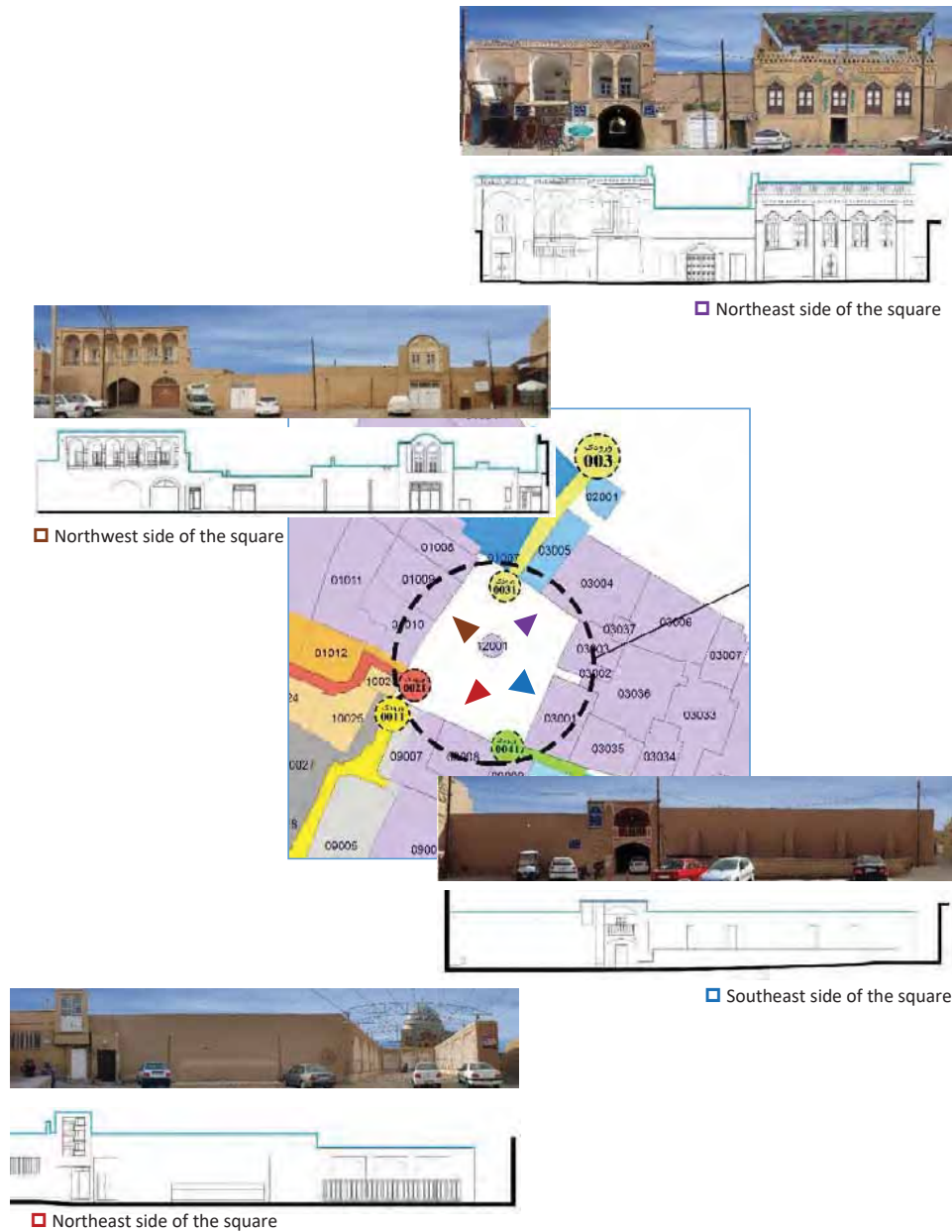


Fig. 11: Exterior skin of Waqht al-Saat Square in Yazd

- The average width of the exterior skin in the passageways is more than the squares and is 5.24 times.
- The height to width ratio of exterior skin in squares is 1 to 5.7 and the height to width ratio of passageway is 1 to 39, and the exterior skin width is about 6 times higher than height in squares and 39 times higher than height in passageways.

E: The proportions and relations obtained from the analyses are as follows:

- Average exterior skin height in districts Square > Average exterior skin height of districts considered in the passageways and districts entrance of the study

$$\frac{1}{2} = \frac{\text{Average height of the district square exterior skin}}{\text{Average height of the district entrance exterior skin}}$$

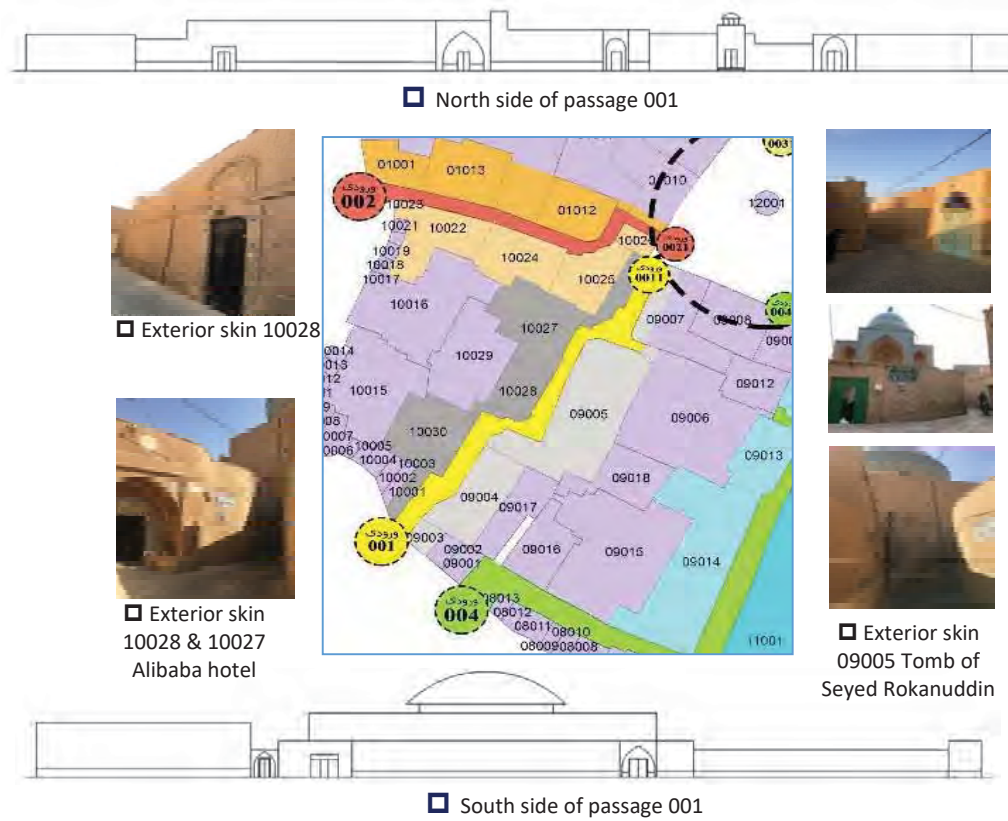


Fig. 12: Passage exterior skin of 001 Waqht al-Saat district of Yazd

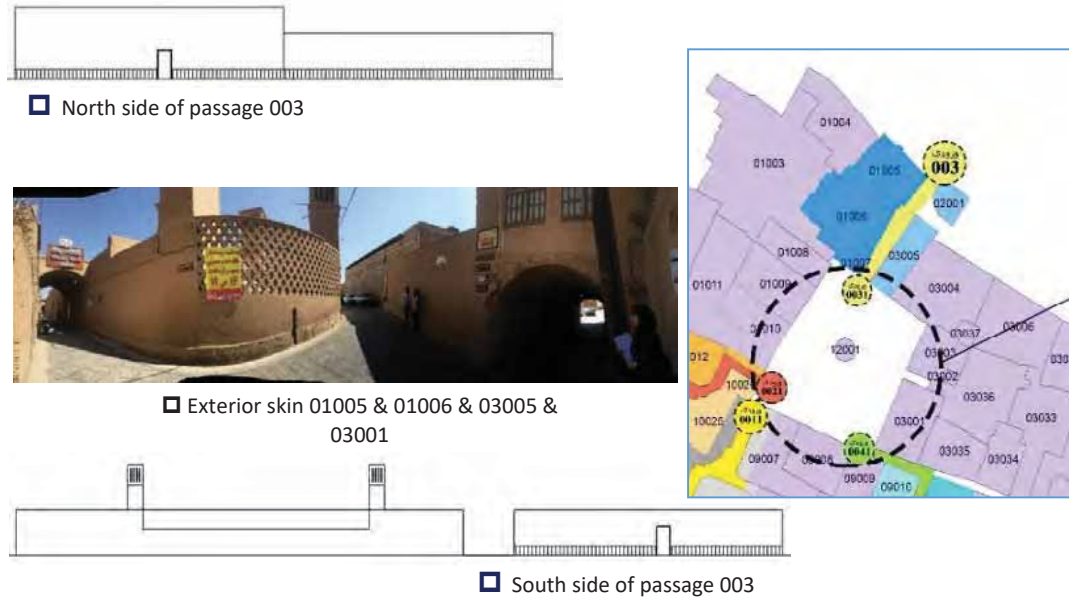


Fig. 13: Passage exterior skin of 003 Waqht al-Saat district of Yazd

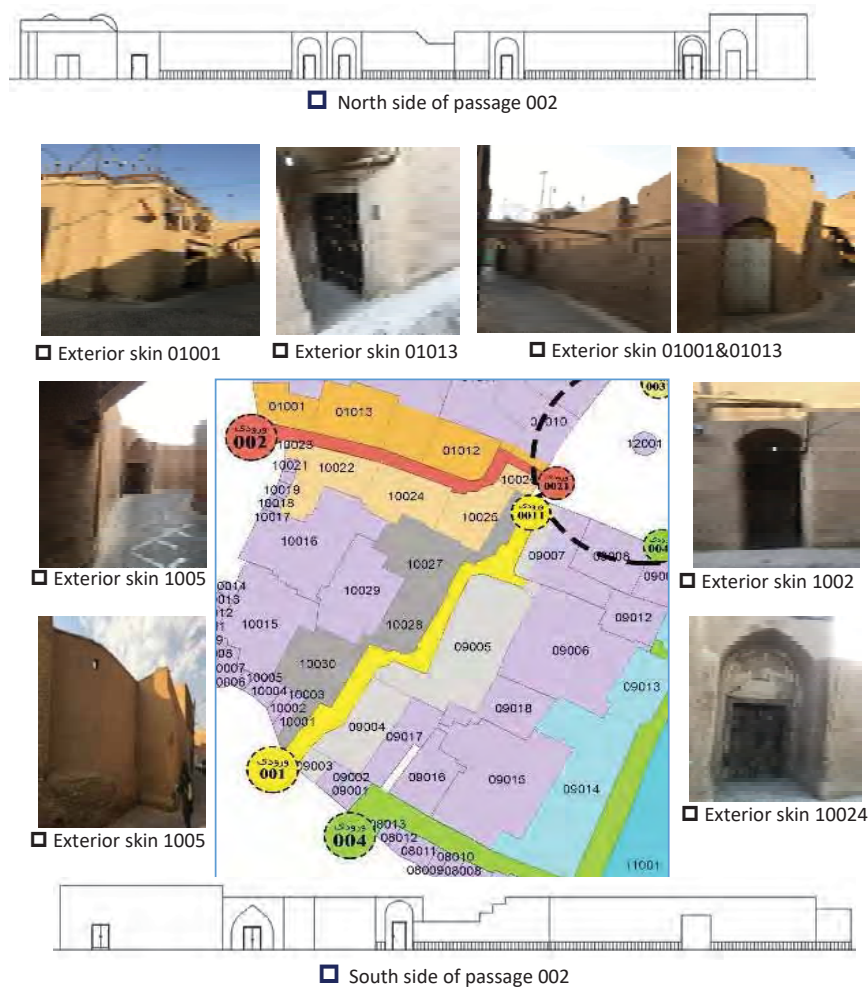


Fig. 14: Passage exterior skin of 002 Waqht al-Saat district of Yazd

$1/3 = \frac{\text{The average height of the district square exterior skin}}{\text{The average height of the district passage exterior skin}}$	$5/2 = \frac{\text{Average exterior skin width in passages}}{\text{Average exterior skin width in squares}}$
$2/3 = \frac{\text{Average exterior skin width in squares}}{\text{Average exterior skin width in passages}}$	<p>• Minimum and maximum exterior skin height in the district passageway > Minimum and maximum exterior skin height in the district square</p>
$12 = \frac{\text{Average exterior skin width in squares}}{\text{Average exterior skin width at entrances}}$	$= 3/1 \frac{\text{Minimum passage exterior skin height}}{\text{Minimum square exterior skin height}}$

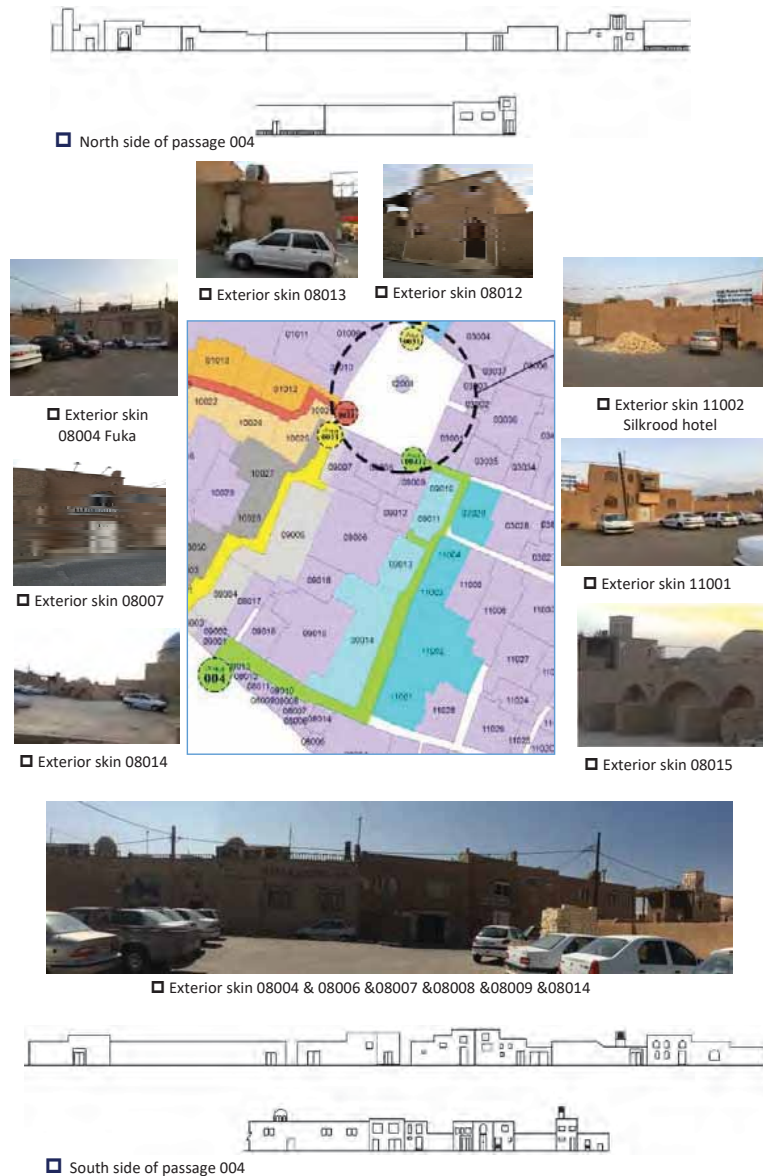


Fig. 15: Passage exterior skin of 004 Waqht al-Saat district of Yazd

$$\frac{1}{2} = \frac{\text{Maximum passage exterior skin height}}{\text{Maximum square exterior skin height}}$$

$$= \frac{9}{1} = \frac{\text{Minimum passage exterior skin width}}{\text{Minimum square exterior skin width}}$$

$$= \frac{7}{6} = \frac{\text{Maximum passage exterior skin width}}{\text{Maximum square exterior skin width}}$$

- Minimum and maximum exterior skin width in the district passageway > Minimum and maximum exterior skin width in the district square

Table 3: Summary of the proportions of Waqht al-Saat exterior skin district of Yazd

Average height of square exterior skin (meter)	Average width of square exterior skin (meter)	Average height of district entrance exterior skin (meter)	Average width of district entrance exterior skin (meter)	Average height of passage exterior skin 001 (m)	Average width of plots passage 001 (m)	Average height of passage exterior skin 002 (m)	Average width of plots passage 002 (m)	Average height of passage exterior skin 003 (m)	Average width of plots passage 003 (m)	Average height of passage exterior skin 004 (m)	Average width of plots passage 004 (m)
5/20 Min: 20/2 Max: 7	41 Min: 361 Max: 48	5/65 Min: 3 Max: 7	3/60 Min: 2 Max: 6/51	4/84	17/4	4/72	12/3	4/5	24/5	5	12

Table 4: Proportions of Yazd district Square exterior skin

Minimum height(Meter)	Maximum height (Meter)	Medium height(Meter)	Minimum width(Meter)	Maximum width (Meter)	Medium width (Meter)	Height to width exterior skin proportion (meter)
2/20	10	6/10	22	48	35	1 to 5/7

Table 5: Proportions of Yazd district passages exterior skin

Minimum height(Meter)	Maximum height (Meter)	Medium height(Meter)	Minimum width(Meter)	Maximum width (Meter)	Medium width (Meter)	Height to width exterior skin proportion (meter)
3	12	4/70	42	325/2	183/6	1 to 39

Table 6: Comparison of the proportions governing the squares and passages exterior skin of Yazd district

Compared exterior skin	Minimum height (Meter)	Maximum height (Meter)	Medium height (Meter)	Minimum width (Meter)	Maximum width (Meter)	Medium width (Meter)	Height to width exterior skin proportion (meter)
Squares	20/2	10	10/6	22	48	35	1 to 5/7
Passages	3	12	4/70	42	325/2	183/6	1 to 39
Total	In the square less than the passage	In the square less than the passage	In passage less than the square	In the square less than the passage	In the square less than the passage	In passage more than the square	The width of the exterior skin in the square is about 6 times the height and in the passage is 39 times the height

- The ratio of height to exterior skin width in square is 1 to 5.7

$$\frac{1}{7/5} = \frac{\text{Square exterior skin height}}{\text{Square exterior skin width}}$$

Sustainability in ancient urban contexts is a model for new urban planning (Lashkari and Khalaj, 2011).

The argument of this research is based on the proportions and characteristics of the passageways and squares studied in the districts of Yazd city and the patterns obtained from their exterior skin and they

are presented in Tables 7, 8, 9 and 10. Accordingly, it is necessary to use patterns and principles of indigenous architecture in arid climates to achieve climatic management.

By controlling the proportions governing the exterior skin of Yazd districts, as one of the best architectural models compatible with arid climate of Iran, and according to the characteristics that exist in the relations between length, width and height of exterior skin, proportions, relations and formulas for arid climate of Iran were obtained in this study that can be generalized to cities with similar climatic characteristics. So far, no similar research has been

Table 7: The pattern of the square exterior skin of Yazd districts





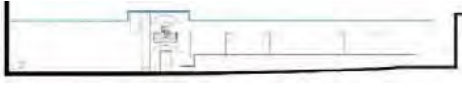



The pattern of the square exterior skin	Waght Al-Saat square exterior skin	The pattern of the square exterior skin	Shah Abolghasem square exterior skin
	North East side		North side
	North West side		South side
	South East side		East side
	South West side		West side

Table 8: The pattern of passageways exterior skin in Shah Abolghasem district of Yazd

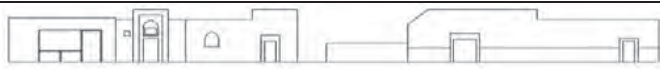



The pattern of the passageways 001 & 002 exterior skin	passageways exterior skin
	North side of passage 001
	South side of passage 001
	North side of passage 002
	South side of passage 002

Table 9: The pattern of passageways exterior skin in Sahl Ibn Ali district of Yazd



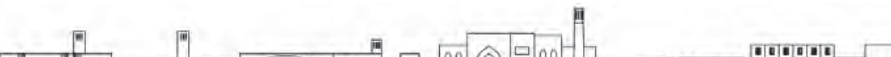




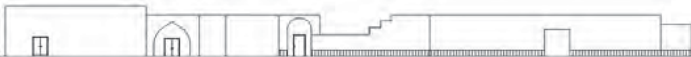
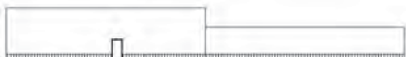





The pattern of the passageways 001 and 002 exterior skin	passageways exterior skin
	North side of passage 001
	South side of passage 001
	East side of passage 002
	West side of passage 002

Table 10: The pattern of passageways exterior skin in Waght Al-Saat district of Yazd

The pattern of the passageways 001, 002, 003 and 004 exterior skin	passageways exterior skin
	North side of passage 001
	South side of passage 001
	North side of passage 002
	South side of passage 002
	North side of passage 003
	South side of passage 003
	North side of passage 004
	South side of passage 004
	South side of passage 004
	

published in Iran, and research conducted in other countries cannot be generalized to Iran due to geographical and climatic differences. Therefore, the results of the present study are novel and similar previous articles have not examined this issue. In general, the proportions and relations obtained from the analysis of the characteristics of passageways and squares of the three selected districts of Yazd are classified in the following three characteristics:

1. Average exterior skin height in squares of districts > Average exterior skin height in the passageways and entrances of districts

This characteristic is due to the functional differences between the passageways and the square in the districts of this city. Squares are usually static places and open spaces for holding religious, historical and ritual events, ceremonies and gatherings, and the uses around them were usually public on at least two stories such as hotel, guest house, tomb, Hosseiniyah, etc., but the passageways are dynamic and narrow and the only place for entrance of the mostly residential buildings, placed with an height of one or two stories next to the passageway, and their shadow on the passageways moderated the extreme temperature of the area.

2. Minimum and maximum height of the exterior skin in the passageways of districts > Minimum and maximum height of exterior skin in squares of districts

This characteristic was also due to the uniformity of land use in the passageways, which were mostly residential, compared to the squares that had various land uses, so the minimum and maximum height of the exterior skin of the passages were more than those of the squares.

3. Minimum and maximum width of exterior skin in passageways of districts > Minimum and maximum width of exterior skin in squares of districts

In the squares of the districts, the land uses were diverse with a small width of openings so that they could be next to each other and around the main gathering space of the district, so in the passageways, the exterior skin width of plaques was more.

Based on the results of the present study, a number of formulas were obtained that are listed here and in the previous section.

- *Width square = 5 * square exterior skin height*

- *Passage exterior skin height = 4 * width passage*
- *Passage exterior skin width = 39 * passage exterior skin height*

- *Square exterior skin width = 6 * square exterior skin height*

Considering such patterns and proportions that govern the architecture of the exterior skin of our urban districts in the past and have been quite successful and compatible with the climate of their region, it is appropriate to use these characteristics and patterns in contemporary architecture to form a new approach in architecture appropriate to the type of climate.

CONCLUSION

Designing with climate, and not against it, is nothing new. It is the way in which buildings were constructed for thousands of years. However, in the recent past, architects have been led to ignore the climatic context of buildings, relying on abundant fuel and sophisticated technology when designing for human comfort. Now that the demands on architects are changing the most pressing challenge is to create and adopt an architecture which shelters people in sustainable manner. Achieving climatic architecture and preventing energy wastage in contemporary buildings, patterns that have given the best answers to those climatic conditions should be followed, and by carefully looking at the past architecture of Iran, which corresponds to the climatic characteristics of its region, these patterns can be acquired. Therefore, the current study investigates the proportions of the exterior skin of the ancient districts of Yazd, which is one of the best examples of arid climate architecture. This research started with field surveys and accurate drawings of the samples in Yazd districts and after summarizing, comparing and analyzing them, the results were obtained that indicated the existence of relations and proportions between the length, width and height of the building exterior skin as mentioned. The relations and proportions obtained in this research provided patterns for planning and designing exterior skin of districts that are in accordance with the arid climate of Iran. The results of this current study are novel and have not been addressed in similar prior articles and using these relations and proportions, can help improve the visual and climatic quality of urban skins. Therefore, it is suggested that in the design of urban spaces: the average height of the square skin

more than the average height of the passage skin, the minimum and maximum height of the passage more than the minimum and maximum height of the square, minimum and maximum width of the passage more than the minimum and maximum width of the square, the square width should be considered five times the height of the square skin, the height of the passage skin four times the width of the passage, the width of the passage skin thirty nine times the height of the passage skin and the width of the square skin six times the height of the square skin. Finally, it is recommended that the proportions and patterns of exterior skin to be examined in other climates of Iran, including: hot and humid, temperate and humid and cold and dry, in future research to obtain appropriate patterns of those climates to take effective steps to solve the today's problems of architecture and urban planning.

AUTHOR CONTRIBUTIONS

R. Mesgaran Kermani performed the literature review, analyzed and interpreted the data, prepared the manuscript text, and manuscript edition. S. M. Mofidi Shemirani and N. Nikgadam performed the literature review and helped in the analysis and interpretation of the data and manuscript text preparation.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors.

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CASE STUDY

The sustainable semantic foundations of the traditional neighborhoods in the desert cities

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ABSTRACT

BACKGROUND AND OBJECTIVES: In cities with a hot and harsh climate, defining space and territory in a sustainable and environmentally manner in urban management and human capital is critical. Cultural values and climatic adaptation played a prominent role in the neighborhood's basic elements. The main objective of the research is to identify and clarify the semantic foundations of neighborhood design in desert cities of Iran which will be used in future improvement and rehabilitation plans.

METHODS: Naeen City, which has a particularly integrated neighborhood design structure, was chosen as the case study to support this concept. The grounded theory has been used to conduct this qualitative research and neighborhood design as a text has been considered in five physical, social, environmental, functional and aesthetic categories and identified in detail 73 themes as first level open coding. These themes were interpreted under each of the three classes of social, scientific, and aesthetic. Then as the second level open coding, 29 topics are identified in 5 categories. Finally, 10 core themes have been recognized as the Sustainable Semantic foundations of the traditional neighborhoods in the desert cities of Iran after integrating and reflecting on the collected themes.

FINDINGS: The results showed that in the category of physical structure, a focal point and hierarchy in neighborhoods; in the category of social structure, social capital and human and religious values; in the category of functional structure, functional stability and climate adaption; in the category of aesthetic structure, physical and visual identity are most important factors in the neighborhood design in desert cities of Iran.

CONCLUSION: The findings revealed that the neighborhood in traditional Iranian cities was formed by the connectivity of physical and social elements and components, and it was the community of these neighborhoods that gave meaning to the Iranian city. Cities and neighborhoods are defined in perfect agreement with their surroundings. Neighborhoods, unlike residential units, do not require physical boundaries, and the services that people require are supplied with an emphasis on ease of access. Both as a municipal center and as an informal arena for public gatherings, the neighborhood center has been highlighted and exploited. The concentration is on common public areas that have given neighborhoods a sense of life.

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INTRODUCTION

The Iranian desert cities have struggled with a lack of meaning and environmental resilience. The contemporary development of urbanization in such hot and harsh climates has fundamentally altered their spatial and social foundations, causing cities' spatial patterns to lose their human and sustainable dimensions (Tajbakhsh, 2020). In cities with such a hot and harsh climate, defining space and territory in a sustainable and environmentally manner, as well as designating it within the borders that distinguish the public from the private, is critical (Lazzarini *et al.*, 2015; Logan, 2006). Neighborhoods' physical texture, as a spatial crystallization of environmental and socioeconomic conditions, used to have a specific coherence and homogeneity, and it created an environment that reflected inhabitants' interactions in their daily relationships (Valibeigi and Shaneh, 2021). Traditional culture and climatic adaptation played a prominent role in the neighborhood's basic elements. Fundamental changes in urban space occurred as a result of the automotive industry expansion, the complexity of social labor division, and migration to cities. The destruction of the identity and structure of historic urban districts in Iran has resulted from changes in urban planning over the last few decades (Katouzian, 1981; Mehan, 2017; Souri *et al.*, 2020; Vlibeigi *et al.*, 2021). Leading to a shortage of knowledge of the notion of neighborhood and, as a result, the implementation of inefficient neighborhood systems, or simply spatial division on maps, neighborhood has frequently resulted in incorrect conclusions in contemporary urban planning of Iran. Obviously, paying attention to the neighborhood as a solution and necessity is effective when there is sufficient and correct knowledge of the concept of neighborhood in previous urban planning, as well as the optimal implementation of its principles and rules in accordance with contemporary conditions. The urban neighborhoods of Iran require a re-definition that preserves their cultural and environmental values while also meeting current requirements. As a consequence, it is vital to understand the semantic foundations of urban neighborhood organization and then design these concepts and symptoms in accordance with the new conditions. This is especially significant in desert cities of Iran, where the climate is hot and dry. One of the aspects of traditional urban planning in desert regions of Iran has been the separation of the

city into neighborhoods or local communities with distinct characteristics, which have been described using particular principles and rules and formed organically over time. A definite border and territory, a sense of solidarity and interrelationships among residents, collective identity, integration of space and activity, relative self-sufficiency, and a proportionate population have all been recurring themes in the definition of local community in several Iranian studies (Madanipour, 2003, 2006). Consequently, in the concept of local community, integrated spatial boundaries, the existence of physical boundaries based on mental perception or objective signs, a sense of spatial belonging and social solidarity, the possibility of face-to-face recognition, and the presence of local facilities and services are among the points that are crucial (Fazeli, 2006, 2008; Madanipour, 2011). According to the above points, a local community is a place with flexible and variable boundaries where people share their common and public interests in their lives and perform collective actions, and they have a sense of relative self-sufficiency, spatial belonging, place identity, and common history. In addition, it includes a network of organizations and institutions around local needs to meet the requirements of the community and provides a platform for collective action. Previous studies have discussed the notion of neighborhood and neighborhood design in Iranian cities, and have sometimes compared it to new models (Abbasi Harofteh and Sadeghian, 2020; Gharavi Khansari, 2018; Hosseini and Soltani, 2018; Khabiri *et al.*, 2021; Soleimani Meranjani *et al.*, 2021). They have emphasized neighborhood analysis and planning in general, using an external method and from an expert-oriented perspective, while reading and interpreting the principles of traditional neighborhoods require to achieve a model for exploitation in the present era. The purpose is to interpret and explain the principles and regulations that can be implemented in the urban planning of central regions of Iran by using a posteriori approach and then a priori and dealing with the features and details of the neighborhoods. In this paper attempted to reach the concepts and regulations that constitute the sustainable foundation for desert neighborhood construction by: 1) To formulate the sustainable semantic implications and their representation in Naeen City neighborhoods; 2) To read desert neighborhood as a text in order to comprehend the hidden themes and categories as well

as, the links and interactions between them; 3) To find out main sustainable concepts of urban planning and neighborhood design principles in central regions of Iran. To achieve these objectives, the research survey was conducted in old town of Naeen City, Iran in 2020.

MATERIALS AND METHODS

Survey design and data collection

The research has been implemented in a qualitative manner and based on the grounded theory. A qualitative sampling including field observations, plans, documents analysis and ethnographic methods has been considered for detailed knowledge of semantic foundations of the sustainable neighborhoods in the desert cities. In qualitative field research, qualitative sampling also known as purposeful sampling or theoretical sampling (a sample approach) has been used. The sample size is determined by the “theoretical saturation” of the contents, the culture and the context of the case study. Saturation means that no new and important content is obtained and the themes are well developed in terms of features and dimensions (Hennink and Kaiser, 2020; Lambert, 2019; Low, 2019). An open interview with 20 local residents was conducted in addition to field observations of neighborhood structures.

One of the central desert cities of Iran should be selected for this research as intensive research based on an in-depth interpretation of the sustainable design principles of the desert neighborhood of Iran. Therefore, based on the opinions of seven experts in the fields of architecture, urban design, and planning, a list of five cities including Kerman, Yazd, Naeen, Tabas, Shahdad was prepared. According to experts, the historical texture of Naeen City is one of the best samples of historical textures in Iran in terms of space organization, which even today remains part of this pristine texture and where the spatial logic of urban local communities can be found. So, historical urban communities in Naeen City were selected as the case study. Due to the numerous cultural and biological similarities in central regions of Iran, a distinct kind of local communities has emerged, with spatial characteristics from the other regions of the country. Naeen City is one of the mentioned cities which is located in the province of Isfahan in Iran. The most prominent feature of Naeen City is its location on the southern edge of the central desert of Iran, which has a hot and dry climate. The difficulty of supplying drinking water and agriculture is one of the city’s most pressing issues, and it is one of the key reasons for Naeen’s and its neighborhoods’

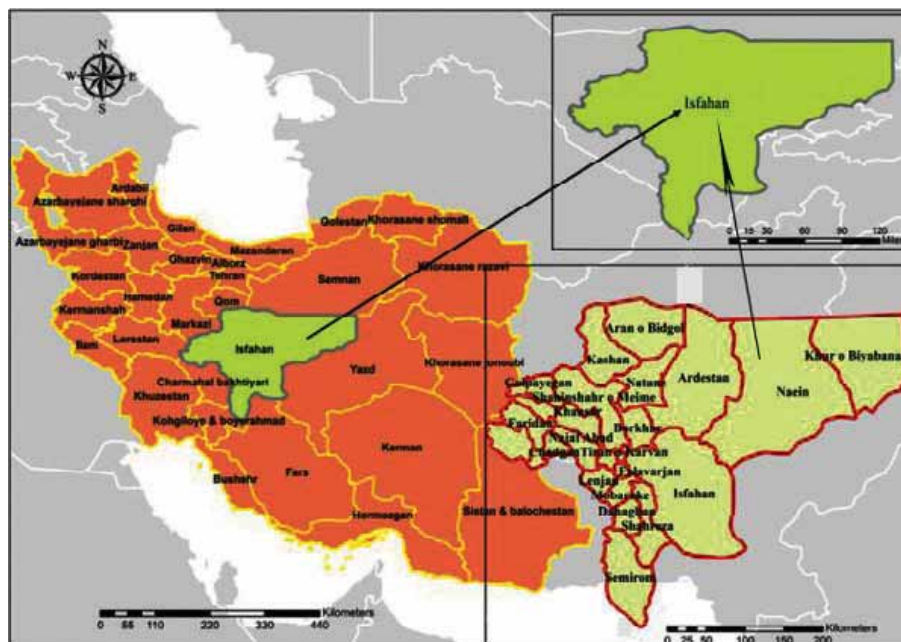


Fig. 1: Geographic location of the study area in Naeen City, Iran

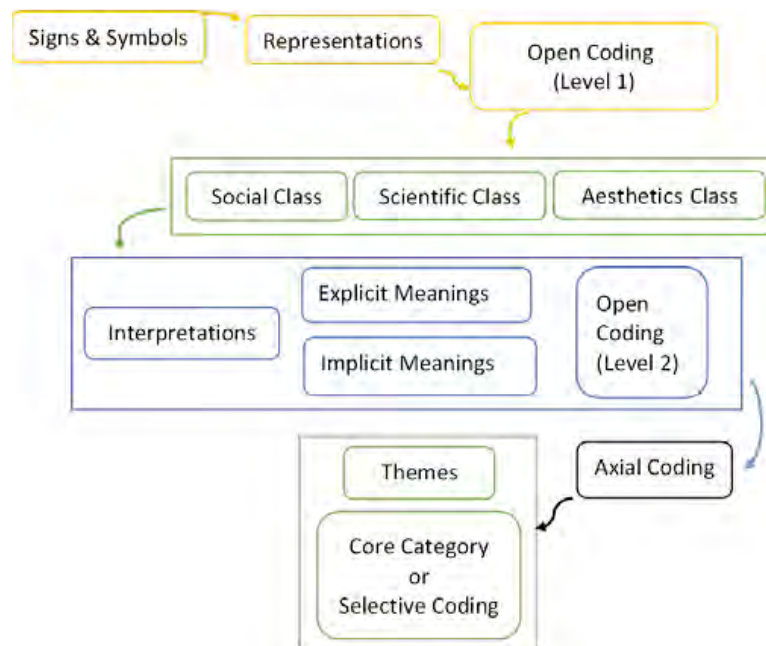


Fig. 2: Framework of the Study

lack of growth in terms of size and population. With these circumstances, the most important reason for the formation of this city can be considered its communication role in establishing communication between the central part of Iran and the northern and southern regions of the country, as well as the natural condition of the city, which has given it a continuous and cohesive texture. Kalvan, Bab Al-Masjed, Noabad, Saraye No, Panjaheh, Chehel Dokhtaran, Sang, or Godalo are among the city's seven historic districts. The location of Naeen City in Iran is represented in (Fig. 1).

Analytical framework

A study based on grounded theory is used, in that, interpretations is derived directly from the data and contents collected and analyzed on a regular basis during the survey. The collected contents, analysis, and final theory are all tightly related in this process (Chamberlain-Salaun *et al.*, 2013; Salvini, 2019). In the first phase, the signs and representations are recognized by the open coding process in five categories of neighborhood design principles and then with three classes of social, scientific and aesthetic are interpreted, summarized and their subjects are identified. In the second phase, by linking the identified

theme and categorizing them, explicit and implicit meanings, as well as axial coding, are achieved. The third level coding (core category or selective coding) is achieved by performing classification between the obtained themes, and it is attempted to construct a theoretical system, a collection of selective coding and core categories that constitute a discourse based on grounded theory. The use of semiotic methods in converting concepts and contents to core categories and selective coding, based on five categories of neighborhood design principles, is the focal point of this section, with the purpose of achieving a deeper reading of the fundamental sustainable concepts and their representation in desert city neighborhood design. The research framework is depicted in (Fig. 2)

RESULTS AND DISCUSSION

Naeen structure as a model of cities in central region of Iran can be characterized in five general structures including, physical, social, functional, environmental and aesthetic structure.

Physical structure

Amon the neighborhoods of Naeen, the central neighborhood includes the main constructions and functions of the city and the texture of the

neighborhoods around the center is very compact and includes buildings with residential use. The feature is now considered to a compact and stable city in which units and physical spaces are interconnected. As a result, each unit is connected to other units in two or three directions. There are also large units such as mosques, *Hosseiniyyeh* and caravanserais close to more modest units, such as residential spaces which leads to the creation of large and small units in an area. They are arranged close to one another, resulting in a smooth and consistent texture. The best performance against the climatic conditions of Naeen was achieved by a cohesive combination (Sultanzadeh, 1986, 2006). In order to smooth the movement in such a compact texture, space openings are created in selected areas of the city (most of the urban joints) generated by the collision of the main roads that modulate the observer's feeling in the best possible way. As a matter of fact, the center of Naeen is the center of the neighborhoods and the opening in front of the Grand Mosque. *Hosseiniyyeh* in the urban joints caused the new presence of these spaces to be constantly visible from various connection points across the city. The presence of these religious structures was so significant in many cities that the neighborhood's heart was named Tekiyeh (*Hosseiniyyeh*). Each of the *Hosseiniyyeh* exists not only as an urban joint and the center of the neighborhood, but also as a symbol of the existence of a neighborhood, because urban neighborhoods have certain edges that cannot be distinguished from each other and only when passing through One neighborhood center enters another neighborhood center, it feels like it has entered an area (Ghouchani and Taji, 2019; Nazarian and Baharlouei, 2013). One of the most important features of Naeen City's neighborhood design system is its physical and functional centrality (Fig. 3). The orientation of the all-side routes to the center of the neighborhood where the mosque and *Hosseiniyyeh* of the neighborhood are located. Moreover, the hierarchy of pathways in the old area of the Naeen City was carefully observed, such that three types of passages can be identified in each neighborhood, and each neighborhood has at least one main passageway adjacent to the *Hosseiniyyeh* (neighborhood center). These routes are frequently broader, more direct, and longer than other passages, and they operated as a linkage between different portions of the neighborhood

as well as a connection between the neighborhood and another neighborhood. A number of side routes exist in each neighborhood, and their purpose is to facilitate connectivity between different areas within the neighborhood. In addition, each neighborhood has a number of dead ends, which are designed to connect a restricted number of residential units with other places. The presence of a cohesive and compact texture (Fig. 4), dual residential units (Fig. 5), the formation of public spaces among enclosed buildings, the use of Sabats (Fig. 6), vertical blades for shading, and the use of clay mud and brick materials are some of the physical features of these neighborhoods. Furthermore, the presence of unique spaces and structures, as well as the use of materials that are suitable for hot and dry climates, have given this metropolis and the cities in central region of Iran a distinct identity.

Social structure

Due to social, economic, and cultural differences, the city of Naeen is divided into independent neighborhoods, which has resulted in a sense of solidarity and unity among neighbors, as well as an important role in supporting neighbors from each other through cooperation, collaboration, and partnership. There was a sense of belonging and loyalty to their community as a result of their participation in neighborhood affairs. With the formalization of the Shia Islam during the Safavid era, and the enthusiasm of the residents of Naeen in organizing religious rituals and ceremonies, as well as community competitions, each of the city's seven neighborhoods developed a *hosseiniyyeh* that was nearly identical (Ghouchani and Taji, 2019). It has been accompanied by the people's participation in the allocation of space in the form of endowments, its construction and maintenance, the preparation of space on days of grief, and the most spectacular performance of the ritual. This sense of belonging to the neighborhood and participation in holding ceremonies, which demonstrates people's sense of belonging to Imam Hussein, provides a connection between people, places, and rituals, as well as in the ceremonial return of residents from the city to the *Hosseiniyyeh*. The festivities, especially during Muharram, are based on the same local communities of the past, and the rituals are performed in the same manner. Another sociological element of these areas



Fig. 3: Physical and functional centrality



Fig. 4: Physical texture cohesion



Fig. 5: Introversion of private and public buildings View from inside the Pirnyia house



Fig. 6: Use sabats and shades

is the availability of social security. The existence of social security in the neighborhoods is due to the hierarchy of accesses and places, as well as social cohesion and solidarity. One of the most prominent sociological characteristics of the people of these neighborhoods is their collective participation in cultural activities, particularly religious activities, which are normally carried out autonomously but in collaboration and communication with other neighborhoods. It has manifested itself in various ways, such as the Muharram decade festivities held in local squares (Karimi and Madani, 2020; Shoaie et al., 2013). The influence of ethnicity, kinship, profession,

type, and religious orientations in the social system and neighborhood designs of this city are also discussed in this section. On the other hand, it can be referred to the social and class mixing within a neighborhood, where one can see an interconnected mix of residences belonging to the rich and the poor. Agriculture was not very lucrative due to the severe climatic conditions, but people began weaving carpets, cloaks, dyeing, and other crafts within local workshops or outside the city walls and even in their homes, and Historic Naeen neighborhoods grew as a result of this practice (Alalhesabi et al., 2012; Asayesh, 2021). In addition, it can be discovered

from field observations that each of the communities served a specific purpose in the past; for example, the Kalvan area was mostly populated by carpet weavers. Part of the neighborhood residents' communication has been due to their use of shared neighborhood uses. Uses such as bathroom (sanitary space), water storage (service space), mosque (ritual space). Proper distribution of these services, which were usually located on the outskirts of local squares, led to the presence of people in these centers (Fig. 7), the continued presence in these cases has created a common spirit and story among the residents of each neighborhood. During the Safavid and Qajar eras, with the religious changes (conversion of the Shafi Sunni Islam to the Shia Islam), the *Hosseiniyyeh* were also formed next to the square and made this role more colorful. The city bazaar, as the strongest and largest axis of the city, connected the neighborhoods like the backbone of the city (Fig. 8) and the people of Naeen neighborhoods made their daily purchases from the city bazaar, thus the market space and the Grand Mosque They were a trans-neighborhood element, linking neighborhoods (Babaie, 2008; Johnson, 1994; Scherberger, 2011). This case has not been considered in newer contexts and is only a sign of the spatial boundary of the neighborhoods where residents use the city's mosques. Of course, it should be noted that the inhabitants of the new texture mostly belong to the surrounding villages and other areas, so the social cohesion of traditional neighborhoods is not seen in them. And identification

of the space of the *Hosseiniyyeh* and also standing in them has been used. In the neighborhoods of such indoor spaces, the gathering place of neighbors or the place of children's play has been a neighborhood area.

Environmental structure

The city of Naeen with an altitude of about 1600 meters above sea level is located on the southern edge of the central desert of Iran, which of course creates a hot and dry climate in this region. The absolute maximum temperature in 1996 was 41.2 degrees Celsius and the absolute minimum temperature was 19.2 degrees Celsius. Also, the average annual rainfall in Naeen is about 109 mm. Therefore, this area is considered as part of low rainfall areas (Fig. 9). The average annual relative humidity in Naeen, according to what is recorded at Naeen station, is 36.6%, the driest month of September with an average relative humidity of 20.5%. Naeen region is one of the poorest regions in terms of water networks, which due to dry weather and lack of rainfall, no significant permanent river can be seen in it. In this area, recognizing and studying the wind is of great importance the prevailing wind is the westerly wind. The highest wind speed is related to the south wind with 7.1 meters per second, followed by the southwest winds in Naeen in terms of seasonality in all seasons. In the four climatic divisions in Iran, Naeen is mentioned in the Central Plateau climate, in which the dry southwest winds have caused dry air. The formation of climate-friendly



Fig. 7: Presence of people in squares and public



Fig. 8: Naeen City market as the backbone of the city



Fig 9: Part of the land that was previously cultivated



Fig. 10: Formation of climate-compatible architecture for more compatibility with the hot and dry climate of the region

architecture and the creation of enclosed spaces for the use of shadows have been among the solutions for adapting to the hot and dry climate of the region (Fig. 10).

Functional structure

The dimensions of residential and urban spaces were not specifically articulated, but they were acceptable for the role and position of the founder or users. Residential units have widely varying dimensions as a result, depending on the social status of their residents. Thus, mosques established by generous people to pray beside side passages are frequently tiny, whereas mosques with an urban function or created and completed by rulers and affluent persons, such as the Jame Mosque, Baba Abdullah, and the Khajeh Mosque, are often large. They were huge in relation to their function or their founder's economic status (Babaie, 2008; Sultanzadeh, 2006). It's worth noting that the proportion between the size of the land and the amount of infrastructure has remained fairly constant. It was also observed in the neighborhoods that pedestrian access is limited and dependent uses outside the neighborhood are located on the neighborhood boundaries.

Aesthetic structure

In the context of Naeen neighborhoods, as mentioned, due to factors such as the development and organic formation of the city, the buildings lack land with a geometric and regular shape. In this case, the usual method and principle in the design were such that the ebb and flow distortion was solved

in the lower part of the building and the interior space, i.e., the yard, was designed in an orderly and geometric way. The open space of the local *Hosseiniyyeh* is more or less the same, that is, the central open space of the *Hosseiniyyeh* has a regular and designed shape. Of course, open spaces of passages have an organic form and this principle does not apply to them. The reflection of this principle in the composition of the body texture has made the physical boundaries of many architectural units not easily visible. The non-geometric form of residential plaques and the winding passages within the texture, for which many reasons such as evolution over time and maintaining security can be considered, increase the quality of the environment by considering new principles of urban design, such as diversity. Here and there, there is a sequential view or spatial sequence. In the wall space of *Hosseiniyyeh*, all sides and walls are designed to create an independent space. The introverted texture of Naeen has turned its back on the outer spaces. The only part of the outer space that is an exception to this principle is the entrance spaces and *Hosseiniyyeh*. The facade of all *Hosseiniyyeh* has been designed because its space as an enclosed space has an introverted aspect. In designing these walls, the principle of symmetry, balance, rhythm and emphasis on the central element has been used. In order to completely enclose the space of the square, in front of all the passages that enter the fields, an arch has been built in proportion to the other arches, and in cases where the opening of the dormitory was smaller than the opening of the pavilion or arch, the proportions were maintained. The opening of the

pavilion is preferred to other booths in terms of the size of the dormitory in determining the opening of the pavilion. In addition, in order to emphasize the enclosure and independence of the square, they have covered part of the passages at the junction with *Hosseiniyyeh* (Ibid: 80). In a way that in the walls where it was not possible to create symmetry (the most complete type of order) with the help of these principles, the viewer does not notice the asymmetry at first glance. In the view of the Shahneshin, all the *Hosseiniyyeh* are individual divisions, and in this way, the element of the *Hosseiniyyeh* (Shahneshin) is emphasized, which is located on the axis of symmetry of space in all the *Hosseiniyyeh* in the *Hosseiniyyeh* of Bab al-Masjid, Kalwan and Panjah, which are better examples than other *Hosseiniyyeh* in terms of design principles, respectively, all four facades are divided into sections. It is noteworthy that the entrance of the closed space of *Hosseiniyyeh* is less important than that of the royal settlements. The surfaces and open space of the *Hosseiniyyeh* are more or less the same in terms of the manner and type of decoration. The rafters and elastics located on both sides of the pavilion arches and bumps are covered with bricks, the surface inside the arches has been plastered, and tiles have been used for decoration in different places. Narin Qala, the Jame Mosque and the cover of the *Hosseiniyyeh*, due to their dimensions, volumetric and shape characteristics, were indicative of their function, and in fact, in this way, they revealed their place in the city and gave a special readability to the city from inside and outside. Also, the use of a special application pattern on the roof covering of the *Hosseiniyyeh*, makes it possible for the observer to distinguish between the domes that belong to the *Hosseiniyyeh* and other domes. Obviously, in this clarity and readability, the role of the whole height system should not be ignored the city as seen in the reports note that in the historical context of Naeen, 82% of the buildings are one-story (it should be noted that the *Hosseiniyyeh* and some prominent buildings such as the Grand Mosque and Baba Abdullah, Fatemi House, Pirnia Traditional House, etc. are considered two-story buildings). Have been seen as urban indicators in the city skyline). In the whole city of Naeen (a collection of valuable and new textures), 69.82% of the buildings are one-story and only less than 1% (0.65%) of the buildings are 3-story and taller. Another important factor in the appearance of

Naeen is the existence of unity and diversity, the unity resulting from the similarity of gender, texture, height and volume of the building and the diversity arising from the height and volumetric distinction of urban landmark elements. The thatched and brick material, which is combined with white brick and gypsum in certain places, in addition to the visual aspects that have caused unity and diversity, also offers the best possible option against the harsh thermal conditions of this region, because it prevents intense reflection of sunlight (Figs. 11, 12, 13).

Conceptualization of Neighborhood structures in Naeen

In order to identify more textually the dimensions of human and social life that have been used in the structure and body of the neighborhood units of Naeen City, five dimensions as the categories of the research have been collected including physical structure, social structure, functional structure, environmental structure, aesthetic structure (Carey, 2010; Fricano, 2011; Jabareen, 2006). Based on the contents analysis of the five categories of neighborhood design principles in the desert cities of Iran, it can be coded as follows (Table 1).

After the first open level coding, the themes are recoded according to the three types of selected interpretations (logical, social and aesthetic). The 73 themes from the first open level coding have been condensed into 31 themes (Table 2). If it is considered each of the elements used in the construction of historical desert cities of Iran as a kind of sign and the meaning, including special codes, and also if asked discovering the meanings and the signs, in any cultural network, the use of codes specific to that system is inevitable. Scientific (logical), social, and artistic are some of the classifications of sign-vehicles that can be matched by Peirce's Theory of Signs, which is used in the current research. Peirce thought signs indicate their objects not through all their features, but in virtue of some particular feature. By 1903, for reasons related to his work on phenomenology, Peirce thought the central features of sign-vehicles could be classified into three broad areas, and consequently, that signs could be classified accordingly. This classification depends on whether the sign- vehicles are represented on the basis of qualities, existential facts, or contracts and laws. Furthermore, signs with these sign-vehicles



Fig. 11: Regular and geometric interior design and independent wall space



Fig. 12: Organic design of open spaces of passages



Fig. 13: The principle of symmetry, balance, rhythm in the design of walls

are classified as qualisigns, sinsigns, and legisigns respectively (Albert, 2013; Marais, 2018; Zhang and Sheng, 2017; Zhao, 2019; Cuccio and Gallese, 2018).

Selective coding and core categories are carried out after the axial coding which has been presented in Fig. 2, which is the basis of the research theory. The 31 themes that were provided at the axial coding stage have now been altered to 10 selective themes in five categories. According to Table 3, the results showed that second-level codes reflect some of the underlying themes. The most important underlying themes in the

physical structure category are the existence of a focal point and hierarchy in neighborhoods. In the category of social structure, the emphasis on cultural and local values can form a continuous social interaction in neighborhoods. The origin of sustainable efficiency and performance in neighborhoods is environmental and functional stability enhancement. A definition of visual and physical identity in neighborhoods leads to sensational richness and readability. The basis of such a definition in desert areas can be a creative use of local materials and design.

Table 1: contents analysis of neighborhood design principles in desert cities of Iran

Category	Themes and Signs of the First level open coding	codes
Physical structure	Existence of Mosque, <i>Hoseiniyyeh</i> , Saqakhaneh, Bazar, Mosques and baths in the center of neighborhood	A1
	Existence of commercial, religious, educational, sanitary and service land uses in the center of the neighborhood	A2
	Walling in neighborhood squares in order to emphasize the centrality in the neighborhood	A3
	Access to all side passages to the <i>Hoseiniyyeh</i> or the main mosque in the center of the neighborhood	A4
	The main mosque and <i>Hoseiniyyeh</i> in the center of the neighborhood and secondary mosques next to the side passages in the middle of the neighborhood	A5
	Larger-scale open spaces in the center of the neighborhood (inside or around the mosque or <i>Hoseiniyyeh</i>) and smaller-scale open spaces within the texture	A6
	Existence of three types of passages in each neighborhood	A7
	The main passage is the most direct and main passage that the main uses of the neighborhood are located next to and this passage connects the neighborhood to another neighborhood.	A8
	Existence of many secondary crossings inside the neighborhoods, all of which have access to the main pass way	A9
	Existence of many passages and dead-end alleys inside the neighborhood that lead to secondary passages	A10
	Securing the home through a porch, sash, and shed	A11
	Introversion and closure of the home environment as the cells that make up the neighborhood and the lack of nobility of neighboring units	A12
	Existence of <i>Hoseiniyyeh</i> , main mosque or shrine in each neighborhood	A13
	Existence of covered and roofed paths (Sabat, porch)	A14
	The roof of the covered part of all the <i>Hoseiniyyeh</i> is placed on an octagonal background, which is a symbol of Imam Hussein's tent.	A15
	Use of local materials and special construction methods	A16
	Observance of the appropriate height for residential units	A17
	Distinguish and identify the entrances of each neighborhood	A18
	Existence of domes, windbreaks, water reservoirs, glaciers, special landscape of city neighborhoods	A19
	Large parcels such as mosques, <i>Hoseiniyyeh</i> and caravanserais are located next to smaller grains, i.e. residential spaces.	A20
	Distinguish the texture of the neighborhood with the non-geometric form of residential plaques and winding passages	A21
Social structure	Lives of people of different ethnicities, religions and classes in a neighborhood	B1
	Mixing the poor and the rich in one neighborhood	B2
	Existence of local trustees to solve the social and economic issues of the neighborhood	B3
	Respect for the rights of neighbors and the existence of strong neighborhood ties and kinship	B4
	The simplicity of the exterior wall of houses to prevent arrogance and induce an economic difference in the neighborhood	B5
	The existence of <i>Hoseiniyyeh</i> , mosques and religious delegations caused the consistency of people's relations and interactions	B6
	Holding cultural and religious ceremonies in urban spaces	B7
	Preparing the space during the days of mourning and performing the most glorious religious and ritual ceremonies by the locals	B8
	People's participation in allocating space in the form of an endowment, construction and maintenance	B9
	Neighborhood support for each other, cooperation, cooperation and participation when each resident need	B10
	Return of people who have left the neighborhood to this place on various occasions such as rituals, especially during Muharram and Shaaban	B11
	Establishment of religious rites and ceremonies, along with neighborhood competitions to make the ceremonies of each neighborhood more glorious than the other neighborhood	B12
	Independence and relative self-sufficiency of the neighborhood in social, economic, service and administrative dimensions	B13
	Narrow passages to deal with bandits and thieves	B14
	Existence of numerous gates and fences for the city and sometimes for the neighborhood that was closed at night	B15
	Impossibility of easy access of strangers to the place due to the type of communication network design and the existence of side routes and deadlocks	B16
	Existence of openings and windows for social monitoring (street eyes)	B17
	Existence of mental perception of the absence of crime in the neighborhood	B18
	The roof of the covered part of all these <i>Hoseiniyyeh</i> is placed on an octagonal background.	B19
	Reflecting the common attitudes and tendencies of society in physical-spatial symbols, these ideals have been able to be transmitted to future generations.	B20
	Holding Muharram and Safar mourning ceremonies in public spaces such as <i>Hoseiniyyeh</i> and the main thoroughfares of the neighborhood with the presence of local residents	B21

Continued Table 1: contents analysis of neighborhood design principles in desert cities of Iran

Category	Themes and Signs of the First level open coding	codes
Functional structure	Gradual formation tailored to needs, spatial and climatic constraints	C1
	Organic texture and adaptation to climate and community	C2
	Functional centrality in the center of the neighborhood	C3
	Type and quality of providing services and facilities suitable for the needs of different strata of the neighborhood	C4
	Mixing and multiplicity of land uses	C5
	Restriction of riding access to pedestrians	C6
	Dimensions of local spaces appropriate to the social and functional status and status of the founder or user	C7
	Proportion between the dimensions of the land and the amount of built-up area	C8
Environmental structure	Avoid developing neighborhoods in agriculturally prone lands	D1
	Aqueduct rehabilitation and watering of neighborhood trees and vegetation with aqueduct water	D2
	Planting fruitful and non-fruitful trees compatible or resident in the area	D3
	Creating natural barriers in the direction of the city's southwest winds	D4
	Use of skylights and vertical windows located on the western front	D5
	Use deciduous trees to provide shade in the summer and benefit from sunlight in the autumn and winter.	D6
	Existence of narrow passages to create shade in summer	D7
	Use of windshield for natural flow of air conditioning in buildings	D8
Aesthetic structure	Wider main thoroughfares (less enclosure), more direct and with more diverse uses, forming the main structure of the neighborhood	E1
	The general and main elements of each neighborhood have a distinct body from the residential units	E2
	Physical and visual communication of the main route, squares and local landmark elements in a neighborhood and in the continuation of its relationship with other neighborhoods as a whole readable	E3
	Narrow and organic paths that are sometimes covered in conjunction with larger squares create contrasting spaces.	E4
	The main passages, small and large local squares connected the neighborhoods and created an interconnected complex.	E5
	Creating a coherent whole with the presence of local and local components in the physical and functional composition together	E6
	The domes and minarets of mosques and <i>Hosenjyeh</i> illustrate the manifestation of religious values in the body	E7
	Windbreaks, reservoirs, refrigerators, and other city facilities relevant to the region's specific climate	E8
	Variety in the occurrence of privacy in space through porches, sash, etc.	E9
	Use of special materials in building construction	E10
	Distinguish and identify neighborhood entrances	E11

The results showed an example of a sustainability model. it can be stated, the principle of adapting the environment to human needs is one of the most basic lessons learned from Naeen neighborhoods. Attention to climatic constraints and especially water shortage, development commensurate with nature, recycling, the use of sustainable technical methods, and the use of natural flows such as water and wind to create pleasant urban spaces have been effective factors in the sustainability of the Naeen neighborhoods. Compact textures are the construction pattern of such neighborhoods and have moderator areas in population and construction densities, urban land uses and functions, and environmental conditions between urban centers and surrounding textures. Also, it seems a compact city design with density and appropriate functions has led to an optimal economic environment in Naeen City. Appropriate

density, suitable landscape, defined access patterns, and susceptibility to locating cultural and educational centers are combined in physical, functional, and aesthetic structures and make sociable places. It can be declared, there is an effort to maximize the optimal use of urban lands, especially vacant lands in old structures. Efforts have been made to avoid unreasonable developments that caused the scattering and disintegration of the structure of the city. Emphasis on the principles of access hierarchy and walkability has been an efficient way to reduce urban traffic problems. These methods can significantly reduce fuel consumption and thus reduce pollution. Savings have been made by diversifying urban land uses as well as activities at all levels from the city to neighborhoods and avoiding zoning activities. And this in itself has helped to create flexibility, freshness, and vitality in the city.

Table 2: The Second level open coding at three levels: scientific, social and aesthetic

Category	codes	Classes	Themes
Physical structure	A1	<ul style="list-style-type: none"> Scientific (logical) social Aesthetics 	Concentration of landmark buildings in the center of the neighborhood
	A2		Concentration of main functions in the center of the neighborhood
	A3		Orientation of all side roads to the center of the neighborhood
	A4		Hierarchy of spaces and accesses
	A5		Introversion (securing residential homes)
	A6		Existence of special buildings and spaces
	A7		Existence of distinct elements and materials
	A8		Cohesion and compactness of physical texture
	A9		The complexity of the texture
Social structure	B1	<ul style="list-style-type: none"> Scientific (logical) social 	Diversity of social and economic strata of residents
	B2		social trust
	B3		Social correlation and vicinity ties
	B4		Social participation
	B5		Sence of belonging to the neighborhood
	B6		Independent social identity
	B7		Objective and mental security
	B8		Manifestation of religious and cultural values in physical forms
	B9		Attention to religious and cultural activities collectively
Functional structure	C1	<ul style="list-style-type: none"> Scientific (logical) social 	Functional efficiency
	C2		Functional effectiveness
	C3		Functional centralism
	C4		Value-oriented and culture-oriented in practices
Environmental structure	D1	<ul style="list-style-type: none"> Scientific (logical) social Aesthetics 	Attention to water sources
	D2		Attention to soil sources
	D3		Adaptation of the buildings and spaces architecture to climate
Aesthetic structure	E1	<ul style="list-style-type: none"> Scientific (logical) social Aesthetics 	Readability
	E2		Sensational richness
	E3		The unity of the part and the whole
	E4		Physical identification

Table 3: Selective Coding in the neighborhood design principles of desert areas

Category	codes	Second level codes	Selective Coding and Themes
Physical structure	A1	Concentration of landmark buildings in the center of the neighborhood	<ul style="list-style-type: none"> Neighborhood center as a focal point in urban neighborhoods Hierarchy in city neighborhoods Confidentiality Physical identity
	A2	Concentration of main functions in the center of the neighborhood	
	A3	Orientation of all side roads to the center of the neighborhood	
	A4	Hierarchy of spaces and accesses	
	A5	Introversion (securing residential homes)	
	A6	Existence of special buildings and spaces	
	A7	Existence of distinct elements and materials	
	A8	Cohesion and compactness of physical texture	
	A9	The complexity of the texture	
Social structure	B1	Diversity of social and economic strata of residents	<ul style="list-style-type: none"> Social capital Social Security Emphasis on cultural and religious values
	B2	social trust	
	B3	Social correlation and vicinity ties	
	B4	Social participation	
	B5	Sense of belonging to the neighborhood	
	B6	Independent social identity	
	B7	Objective and mental security	
	B8	Manifestation of religious and cultural values in physical forms	
	B9	Attention to religious and cultural activities collectively	
Functional structure	C1	Functional efficiency	<ul style="list-style-type: none"> Functional stability
	C2	Functional effectiveness	
	C3	Functional centralism	
	C4	Value-oriented and culture-oriented in practices	
Environmental structure	D1	Attention to water sources	<ul style="list-style-type: none"> Environmental sustainability
	D2	Attention to soil sources	
	D3	Adaptation of the buildings and spaces architecture to climate	
Aesthetic structure	E1	Readability	<ul style="list-style-type: none"> Physical and visual identity
	E2	Sensational richness	
	E3	The unity of the part and the whole	
	E4	Physical identification	

CONCLUSION

The neighborhood in traditional Iranian cities was formed by the connectivity of physical and social elements and components, and it was the community of these neighborhoods that gave meaning to the Iranian city. A study based on grounded theory was used to identify sustainable design principles in Desert neighborhoods. Based on the opinions of seven experts in the fields of architecture, urban design, and planning, Naeen City because of its very coherent neighborhood design was selected as a case study. Contents collected from various texts and sources, field studies, and interviews in five categories including physical, social, environmental, functional, and aesthetic categories were examined. And then the initial codes were interpreted based on the social, scientific, and aesthetic classes. Finally, the main themes in the sustainable design of desert neighborhoods were identified. The results showed that neighborhoods are defined in perfect agreement with their surroundings. The principles of sustainable architecture gleaned from Naeen local communities showed that old cities can be manifestations of a culture of sustainability, passing on the general guidelines of urban stewardship from generation to generation in a friendship relation with nature. Both as a municipal center and as an informal arena for public gatherings, the neighborhood center has been highlighted and exploited. The concentration is on common public areas that have given neighborhoods a sense of life. Residents have contributed in the construction, management, and maintenance of facilities and locations needed in the community, and social life and local nexus have been extremely essential. In the neighborhoods that can be referred to as affordable housing, a pattern of a combination of types of housing for all classes can be seen. With the support of residents and benefactors, the preservation and reinforcement of traditional structures and historical buildings has long been a priority. The notion of hierarchy in the spatial organization of neighborhood, and the system of access and distribution of urban services has been completely observed, and climate-appropriate design has received substantial attention both in the construction of houses and in the design of neighborhoods. The size of the passages has a human scale in terms of length, width, and height, as do most buildings. The presence of numerous urban landmarks with local traits adds to the neighborhood's sense of

orientation. In the urban texture, the way the texture is designed, taking into account climatic issues and local materials, all contribute to a sense of recognition and orientation. The utilization of local materials has resulted in the unity and coordination of the building's external surfaces. Most roads and pathways are indirect and winding, and neighborhood forms are organic. Each type of road had a nearly fixed position, allowing for the monitoring and control of present actions and behaviors, and neighborhoods had side streets and main major roads which connected to the squares. In the neighborhoods, it was observed simple and harmonious views of buildings, and the structures do not differ in appearance whether they belong to a wealthy person or a person from the lower economic class. The internal architectural style of these structures distinguishes them from one another. This introversion is a result of the residents of this context's historical experiences across many periods, and the neighborhood's external parts have at least a physical and visible link with the outside world. The presence of minimum openings in alleys, the identification of units by entrances, and the design of rest areas as platforms at the entrances of houses all contribute to the neighborhood's recognition and comfort. Although high permeability is now considered one of the attributes of urban design in desert cities, the quantity of permeability should be regulated according to the climatic conditions and culture of such areas. Moreover, in such a climate, alleys with human scale and often shady, as well as the shortage of aristocracy of buildings, have provided residential privacy. In other words, in such neighborhoods, should be paid special attention to climate adoptions, compact neighborhood design, and social participation in resource supplies, using local building materials, organic structures, access hierarchy, cultural values, human scale, and easy sense of orientation. The design principles of Naeen neighborhoods show that they are significantly in line with the sustainability development. This environmental coordination is the product of a long process of repeated trials and errors that have occurred throughout history and during the design and construction of buildings and urban textures. These features can be used to plan, design and popularize today's living environment. Desert cities have been severely exposed to scattered and irregular growth based on modern principles of urban design over the past few decades. Modern interventions

such as urban complex plans, road widening projects, etc. have had adverse consequences on the spatial scale and physical organization of desert cities. Some of the adverse consequences include the prevalence of buildings that are inconsistent with the hot and dry climate of these cities, water and energy waste, damage to environmental resources such as the destruction of potential agricultural lands due to a wasteful and uncontrolled expansion of cities in the form of dense development. Knowing the sustainable design principles of desert cities and applying them in accordance with current conditions is a big step towards the sustainable development of such cities.

AUTHOR CONTRIBUTIONS

S. Maroofi and M. Valibeigi performed the literature review, research design, analyzed and interpreted the data, prepared the manuscript text, and manuscript edition. A. Shaneh performed the manuscript preparation and helped in the literature review.

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CONFLICT OF INTEREST

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REVIEW PAPER

Policy and societal relevance of traffic noise models in urban zones

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ABSTRACT

BACKGROUND AND OBJECTIVES: Road traffic noise is a matter of challenge for both people and policymakers. For instance, the price of lands/houses which are close to road traffic noise is reduced. The key objective of this study is to propose a conceptual model to illustrate details of a road traffic noise model along with its policy and societal relevance. The second objective is to consider the honking of horns in such a conceptual model, as honking is a remarkable traffic noise factor, however, it has been neglected in some noise abatement policies.

METHODS: By the use of previously proposed traffic noise models, some attempts were made to figure out how the models were applicable in minimizing road noise and how they would be helpful for environmentalists in conducting Environmental Impact Assessment. The proposed models were used to design a conceptual model explaining how policy makers and people in the urban areas may implement the traffic noise models.

FINDINGS: 5 groups of policy makers including roadway engineers, acoustical engineers, acoustic specialists, expert witnesses, and traffic engineers; and 5 groups in the society comprising drivers, people, health practitioners, property owners, and ecosystem may benefit from the traffic noise models. Finally, a conceptual model entailing 3 actors of a traffic noise model (meteorological, traffic, and infrastructure factors) and its 2 outputs i.e. equivalent and maximum noise levels were obtained.

CONCLUSION: Given the conceptual model derived from the road traffic noise models, one is capable of understanding their policy and societal relevance. It is recommended dynamic road noise maps of urban areas be obtained using the models during various times of day and night so that number of inhabitants in different noise spectrums of the map to be specified. Such a noise map is beneficial for both people and policymakers.

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INTRODUCTION

Approximately 70 percent of total noise pollution in urban regions is caused by road traffic noise (Calixto *et al.*, 2003; European Environment Agency (EEA), 2019; Manea *et al.*, 2017; Younes *et al.*, 2017). It has always been a motivation to carry out diverse research on road traffic noise models which are performed in the urban areas (Abo-Qudais and Alhiary, 2007; Avşar *et al.*, 2004; Barry and Reagan, 1978; Cammarata *et al.*, 1995; Der Bundesminister für Verkehr, 1990; Galloway *et al.*, 1969; Gilani and Mir, 2021; Givargis and Karimi, 2010; Golmohammadi *et al.*, 2009; Gundogdu *et al.*, 2005; Rahmani *et al.*, 2011; Welsh Office, 1988). In the research, normally three individual models for day time, evening time, and night time are designed by which traffic noise pollution is predicted at any location of the urban zones based on a decibel scale (dB). Using the three models traffic noise levels are calculated in any time period during the day, evening, and night which is relatively a common approach. Obviously, the designer of the model needs to clarify in what time of year, the noise model is calculated. For example, if the traffic and noise data are collected during summer and autumn, and, based on the collected data a noise model is obtained, then the model designer should mention the two seasons in the related report. Another point is that each road traffic noise model for day, evening, and night may include either traffic factors or infrastructure factors or meteorological factors or a combination of the aforementioned factors which are representing various predictor/independent variables. In most cases, each model entails one traffic noise descriptor (dependent variable) i.e. equivalent sound level, LA_{eq} . Although honking is a remarkable traffic noise factor, it has been ignored in the noise pollution control policies in urban regions. Therefore, the transport department of the municipalities in the urban zones and its policy makers should find a solution to control/minimize the honking. It is noteworthy to mention that in the recent 30 years some models have been designed to predict and assess the road traffic noise such as Federal Highway Administration, FHWA (Barry and Reagan, 1978), Calculation of Road Traffic Noise, CoRTN (Welsh Office, 1988), and Richtlinien für den Lärmschutz an Straßen, RLS-90

(Der Bundesminister für Verkehr, 1990). However, the latest versions of the models do not entail honking for the prediction of traffic noise (Sharma *et al.*, 2014). Some studies revealed that “honking increased the equivalent noise level (L_{eq}) from 2 to 13 dB(A) in urban highway (Aditya and Chowdary, 2020).” Also, Nassiri *et al.* (2013) showed that vehicles’ horn noise levels range between 78.6 and 102.4 dBA. Hence, new variables including ‘traffic load/speed of motorcycles’, ‘vehicle honking’, ‘number of traffic lanes on the road segments’, ‘level of service, LOS (Systems Implementation Office, 2020)’, and ‘altitude of each traffic noise metering station’ should be a trial for extending the traffic noise models in the urban areas. Besides a model for prediction of ‘equivalent traffic noise level (L_{eq})’, a model could be formulated for the estimation of ‘maximum traffic noise level (L_{max})’. Therefore, an appropriate traffic noise prediction model may calculate the two indices i.e. L_{eq} and L_{max} . The main aim of the current study is to present a conceptual model which indicates how traffic noise model components interact with political and social decision makings in urban areas. The second aim is to take into account the honking of horns in such a conceptual model, as honking is a significant traffic noise actor, nonetheless, it has been ignored in some noise abatement policies. This review study has been conducted in Sanandaj, Iran from September 2020 to July 2021.

MATERIALS AND METHODS

In 2018, the first author of this paper carried out a research project to design noise maps for two routes in the Netherlands by the use of three different traffic noise models (Ahmadi Dehrashid, 2018). The research was the basis of the idea for the author to do a literature review for discovering the role of traffic noise models in association with policymakers and society stakeholders. Therefore, the related literature was reviewed since September 2020 till July 2021. In preparing the current review paper the following materials were applied: journals’ articles, books, published results of conferences, and websites in relation to environmental issues focusing on the published works since 1970s till 2021. As for the methodology, a desk research method (Polak, 2021) was used to write this review article. In

doing so, the required information was gathered through investigating the existing resources. Then, traffic noise model stakeholders that have been categorized based on policy relevance and societal relevance, were shown in two tables. Finally, the attempt was made to design a conceptual model as a method to indicate how policymakers and society stakeholders are involved in utilizing a traffic noise model.

RESULTS AND DISCUSSION

Noise models and decision making

As a statistical tool, path analysis technique (Crossman, 2019; Douma and Shipley, 2021; Hoyle, 2012; Population Health Methods, 2021; Rastegar, 2006; Salkind, 2010; ScienceDirect, 2021; Strohmaier *et al.*, 2015; Thom, 1983; Walker *et al.*, 2008; Wu, 2019) could be used by decision makers to calculate the influence of all independent and dependent variables of a noise model as an integrated system. This technique reveals that how independent variables interact with each other and how they affect dependent variables both directly and indirectly. Fig. 1 illustrates an example which includes external independent variable (i.e. temperature), internal independent variables (i.e. traffic load of heavy, medium-weight, and light vehicles as well as total traffic flow), and dependent variable (i.e. L_{eq}):

Traffic noise assessment and management is a challenging task for urban planners. The traffic noise models are applicable in minimizing road noise by transport engineers in the urban areas and can be helpful for environmentalists in conducting Environmental Impact Assessment, EIA (Convention on Biological Diversity, 2021; Drishti, 2020; Rantakallio, 2021; Sharafi *et al.*,

2008; IISD, 2021) and more specifically, Noise Impact Assessment, NIA (Brown, 2006; ENL-Acoustic Consultants, 2013; Noise Solutions, 2020; NOVA Acoustics, 2021) in the cities. Furthermore, the traffic noise models can be applied by traffic engineers in intelligent transportation systems, ITS (Aindra Labs, 2019; Alrawi, 2017; Choudhary, 2019; Chowdhury and Sadek, 2021; Gordon, 2016; Monshaw, 2021; Pagano, 2016; Pina, 2021; Shaheen and Finson, 2004; WSP, 2021) in the urban zones all over the globe in future. Normally, a software package derived from the traffic noise prediction models, is developed by which all stakeholders in the urban zones may obtain a noise contour plot of the zone that they live or work in (Alam *et al.*, 2020; Aumond *et al.*, 2018; Bocher *et al.*, 2019; Golmohammadi *et al.*, 2009; Gulliver *et al.*, 2015). Therefore, people learn whether or not the noise levels in their region are low, medium, or high. If the noise levels were higher than World Health Organization (WHO) standards then municipality, environmental protection agency, and other related organizations present applicable policies to minimize and control road traffic noise. In major studies, Sound Level Meters placed in different locations along the routes measure the traffic noise levels directly by which designing noise maps is performed (Alam *et al.*, 2021; Altaweel, 2017; Cai *et al.*, 2017; Cho *et al.*, 2007; Golmohammadi *et al.*, 2009; McAlexander *et al.*, 2015; Oyedepo *et al.*, 2019). In doing so, much time and money should be spent. Therefore, traffic noise models make it feasible to compute noise levels from infrastructure and traffic data (for instance speed and flow) at less expense. Afterwards, the noise maps for the urban environments are designed. In such a situation, there is no need to establish Sound

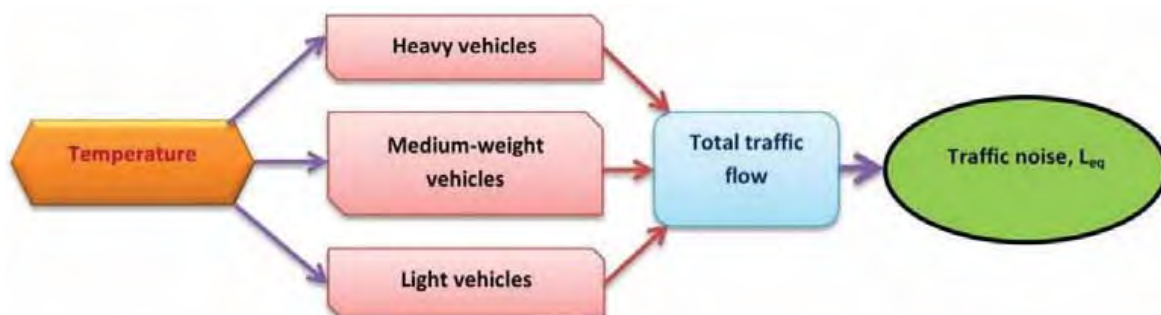


Fig. 1: Example of applying path analysis technique in a noise model by decision makers

Level Meters over the routes, so that much money and time could be saved (Ahmadi Dehrashid, 2018; Anachkova *et al.*, 2020; Kim *et al.*, 2021; Jeong *et al.*, 2010). Chen and Wang (2020) have compared noise maps derived from field measurements with those estimated by the traffic noise models and showed how the noise maps could be used by the landscape planners and designers to abate traffic noise in the environment of a city. All the noise maps of the urban areas should compare traffic noise levels in the cities with the WHO noise guidelines. Results of such research may be interesting for both academicians and non-academicians since its social and policy relevance is directly apparent. Ambühl (2015) states: “research provides the basis for decision-making and possible solutions. Decision-making, implementation, and negotiation are a matter of policy.” The aforementioned statement is also valid for traffic noise-related research. Hence, policy relevance and societal relevance of the noise-related research especially the research on the road traffic noise models, are discussed more comprehensively as follows:

Policy relevance

In general two main organizations in urban zones play the role of policy makers in the field of road traffic noise comprising Municipality and Environmental Protection Agency, which may utilize the three traffic noise models (day, evening, and night models) derived from the traffic noise research in decision-making and traffic noise abatement policies. The following experts who are involved (directly or indirectly) in the policies of the two above-mentioned organizations may benefit from the three traffic noise models:

Roadway engineers may implement the models to investigate whether or not infrastructure dimensions meet noise standards. The roadway engineers can also use the models to design screens and required spacing between structures and routes (FHWA, 2021; Steele, 2001). As an example, X Street in Y city with a surface of asphalt is adjacent to two hospitals. The three traffic noise models estimate that average road noise is 69 dB at the location of hospitals, which is higher than WHO noise standards. If the models estimate that using diamond ground on the surface of X street, road

noise will be 54 dB, then the asphalt will be replaced with the diamond ground (Cox, 2013; Gharabegian and Tuttle, 2002; Parsons Brinckerhoff Quade and Douglas Inc., 2000; Rawool and Stubstad, 2007; Skarabis and Stöckert, 2015).

Acoustical engineers (Steele, 2001) along with architects may use the models to calculate traffic noise levels close to the building’s walls so that they can design appropriate noise-absorbent panels for the building facade and special windows to minimize the traffic noise levels indoors in the cities (Pallett *et al.*, 1978; Precision, 2021). They may also design noise barriers along the roads which are in critical noise conditions (Ekici and Bougdah, 2003; Halim *et al.*, 2015; Kesten *et al.*, 2019). For example, if the traffic noise models show that the average noise level in Z highway in Y city is 81 dB, construction of noise barriers along the highway will be necessary to protect inhabitants affected by noise who live or work around the highway.

Acoustic specialists who write the acoustic-related report of Environmental Impact Statements (EIS) may benefit from the traffic noise models (Steele, 2001). “The environmental impact statement (EIS) is a government document that outlines the impact of a proposed project on its surrounding environment” (Middleton, 2021). As an example, if a new motorway is going to be built in Y city, using the traffic noise models the amounts of noise levels are estimated and assessed along the proposed motorway and will be reported in the EIS. In reality, EIS is applied to elaborate potential adverse effects of a project on the human environment (BOEM, 2021; USEPA, 2020).

Expert witnesses who need to provide a report for the civil courts aside from any noise regulations assessment, may apply the traffic noise models (Steele, 2001). For instance, by the use of the models, the experts can calculate unpleasant traffic noise in residential zones of the cities, which are adjacent to highways or other roads (Babic and Wheeler, 2015; eNoise Control, 2021).

Traffic engineers may utilize the three traffic noise models as a section of Intelligent

Table 1. Noise model stakeholders categorized based on policy relevance.

Policy relevance				
Roadway engineers Municipality	Acoustical engineers	Acoustic specialists Environmental protection agency	Expert witnesses	Traffic engineers Municipality

Transportation Systems (ITS) of the cities in future. As an example, noise monitoring stations using the models, could be set up in different locations along the city roads. Thus, dynamic noise maps of the roads are provided on the determined stations' screens. In doing so, the IT'S encompasses the noise models (Ahmadi Dehrashid, 2018; Wilmink and Vonk, 2015; Garrido Salcedo *et al.*, 2019). On the whole, it could be said that the three traffic noise models are helpful for Environmental Impact Assessment (EIA) of traffic noise pollution and also its management in the cities which is a challenging task for urban planners and other related policy makers. For the high amount of time and cost that should be spent for the measurement of road traffic noise and its complexity, and lack of its possibility at the design step of road, the traffic noise models are essential tools in designing new routes or recalculating traffic volume in current roads to provide convenient noise levels situation (Bendtsen, 1999; Gundogdu *et al.*, 2005). A noise contour plot (noise map) could be derived from a traffic noise model along the roads. In addition, "it should be noted that the main focus of noise maps is for the strategic management of environmental noise, based upon a notional annual average day. They should not be seen as representing what may be measured directly at any location within the map" (Ireland Environmental Protection Agency, 2021). A noise contour plot could also be advantageous for noise-related environmentalists (i.e. acoustical engineers, acoustic specialists, and expert witnesses), and transport-related policy makers (i.e. roadway engineers and traffic engineers) that have been indicated in Table 1. As for the official organizations, environmental protection agency and municipalities can implement the noise maps for considering suitable decisions to mitigate traffic-related noise pollution in the areas exceeding the WHO noise guidelines (Ahmadi Dehrashid, 2018; Breemen, 2008; Cueto *et al.*, 2010; Erwin and van Banda, 2015; Vogiatzis and Remy, 2019). In reality, Table 1 briefly indicates

traffic noise model stakeholders categorized based on policy relevance.

Societal relevance

Even in developed countries such as Germany and the Netherlands, people encounter noise pollution which disturbs everyone's life. Southern European countries such as Serbia (Jakovljevic *et al.*, 2009) and Bulgaria (Dzhambov and Dimitrova, 2015) are also involved in traffic noise pollution issue. Road traffic could be considered the most troublesome source of noise pollution in the Netherlands. Research revealed that 29% of the Dutch people whose age was 16 and over were exposed to traffic noise pollution in 2003. Moreover, in developed and developing European countries it was reckoned that up to 30% of European individuals in 2003 were bothered enormously by the traffic noise and regarding the fast urbanization, traffic noise nuisance may rise in urban areas (Wismans, 2012). Moreover, a study in 2013 in Kermanshah, Iran showed that the average traffic noise level in residential-commercial areas was 76.01 dB, higher than the Iranian noise standard in residential-commercial zones i.e. 60 dB (Noori and Zand, 2013). Therefore, all individuals of society are involved in traffic noise pollution as an environmental issue. Traffic noise lowers the property value for people living in the vicinity of urban roads. The price of lands/houses which are close to road traffic noise is reduced (Blanco and Flindell, 2011; Guijarro, 2019; Morano *et al.*, 2021; Wilhelmsson, 2000). Thus, using the three traffic noise models in urban zones it is possible to locate places of the cities in which traffic noise levels are higher than standards (or will be greater than standards in the future) for finding a solution to mitigate the traffic noise to prevent reducing properties values which belong to the people. As mentioned earlier, a remarkable application of the three models in the cities is to predict noise levels and then evaluate the impact of traffic noise on people in the urban areas. In reality, using the

Table 2. Noise model stakeholders are categorized based on societal relevance.

Societal relevance				
Drivers and traffic officers	Normal people	Health practitioners and patients	Property owners	Ecosystem

software package derived from the three models, first, a noise map for a specified zone is obtained. Thus, residents will learn whether or not the noise levels in their region are low, medium, or high. Then a number of inhabitants affected by various levels of traffic noise is calculated so that people can protect themselves against harmful noise levels using applicable solutions which can be given by public health experts. For instance, experts may advise people to wear earplugs during the day in critical noise zones. Drivers and traffic officers are another group who are persistently exposed to the highest amount of road traffic noise. Furthermore, animals, birds, plants, and trees are significantly affected by the road noise. So that, some species of animals move to other habitats which have low noise.

It should be stated that the newer models reveal that honking is one of the significant factors in producing road traffic noise in the cities (Abo-Qudais and Alhiary, 2007; Aditya and Chowdary, 2020; Guarnaccia *et al.*, 2018; Kalaiselvi and Ramachandraiah, 2016; Nassiri *et al.*, 2013; Singh *et al.*, 2021). Therefore, all drivers should be informed of this issue to reduce the amount of honking in urban areas. For instance, side effects of noise pollution caused by honking can be clarified for the drivers through media so that they will be encouraged not to use vehicle horn for unnecessary affairs. Table 2 briefly indicates traffic noise model stakeholders categorized based on societal relevance.

Conceptual model for noise models

In Fig. 2, a conceptual model has been included which illustrates details of a road traffic noise model with its policy and societal relevance as a flowchart. At the top of the flowchart two inputs of a transport model entailing travel demand and supply of infrastructure could be observed. The transport model has two outputs i.e. traffic volume and traffic speed, which along with honking will play the role of inputs for the road traffic noise

model. Other inputs of the traffic noise model including meteorological factors (e.g. temperature and relative humidity), traffic safety (e.g. number of road accidents), traffic congestion (e.g. level of service, LOS), and infrastructure factors (e.g. distance between traffic noise source and receiver) are shown in the flowchart. LA_{eq} and LAF_{max} are two outputs of the traffic noise model, which will be transferred to the Intelligent Transportation System (ITS). About the flowchart, LA_{eq} values are also entered into the Geographic Information System (GIS) to acquire a related noise map. Using the noise map, a number of inhabitants affected by traffic noise are calculated and transferred to the ITS. At the same time, prescriptions of public health experts like wearing earplugs are given to the people. It is noteworthy to mention that LA_{eq} and LAF_{max} are two sound indices. L_{eq} is in fact equivalent to continuous sound level namely logarithmic average of sound pressure levels over a specified time. If L_{eq} values are implemented with 'A' Frequency weighting, they are reported as LA_{eq} . " LAF_{max} is the maximum sound level with 'A' Frequency weighting and Fast Time weighting during the measurement period" (Cirrus Research plc., 2020). According to the aforementioned flowchart in Fig. 2, after obtaining LA_{eq} values using the traffic noise model, they are compared with WHO noise standards. If the values were less than the standards, no actions are required to be taken. If the LA_{eq} values were higher than WHO standards, traffic noise abatement policies should be taken comprising A) Technical solutions for vehicles such as designing more efficient mufflers, silencers, etc. B) Transportation and infrastructure management solutions such as limiting noisy vehicles, building noise barriers alongside the roads, planting noise absorber vegetation along the roadsides, etc.

With respect to this conceptual model, the first author of the present paper i.e. Ahmadi Dehrashid (2018) used the volume and speed of vehicles in three different traffic noise models, computed the noise levels, and in the end designed the related

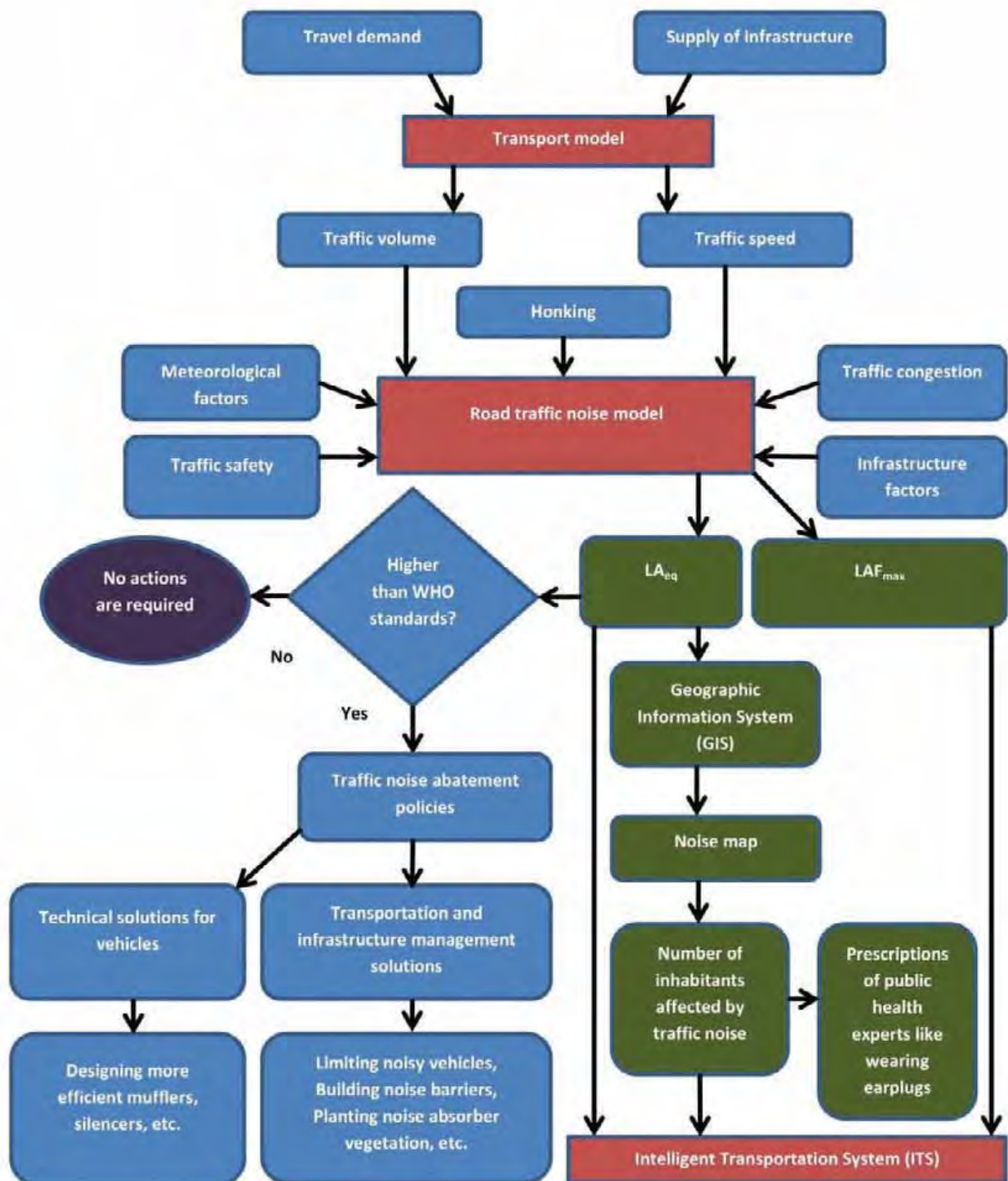


Fig. 2: Conceptual model illustrating traffic noise model with its policy and societal relevance

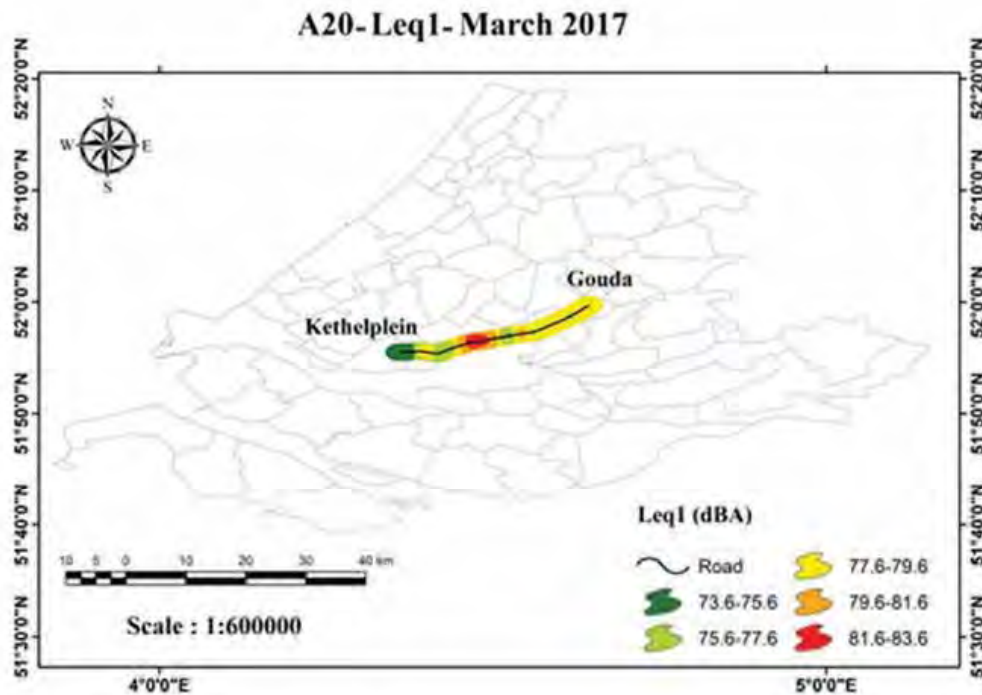


Fig. 3: Noise map (Leq1) in March 2017 for route A20 in the Netherlands (Ahmadi Dehrashid, 2018)

noise maps along two highways in the Netherlands. Nonetheless, it should be noted that the traffic volume and traffic speed were not computed using any transport model but through special instruments that were implemented to count traffic volume and measure its average speed. For instance, Fig. 3 depicts a so-called 'linear noise map' obtained by the noise model Leq1 for route A20 in March 2017 in the Netherlands.

Comparison

In contrast to other studies, Gilani and Mir (2021), introduced a traffic noise system by the use of Graph-theoretic approach (GTA) which takes a traffic noise as a single system that includes various subsystems. Their proposed traffic noise system comprises 4 subsystems with their related parameters: road traffic subsystem (traffic volume, traffic speed, honking, classified traffic volume, acceleration and deceleration, volume of heavy vehicles, and road gradient), human subsystem (driver's skill, driver's age, experience, driver's reaction time, and personality), environmental subsystem (ground effects, temperature, humidity,

atmospheric attenuation, rainfall, and greenery), and traffic network subsystem (highways, city roads, traffic signals, grade separators, commercial areas, and type of housing). Whereas the authors of the present paper considered their traffic noise model comprising 3 groups of factors: traffic factors (honking, traffic volume, traffic speed, traffic safety, and traffic congestion), infrastructure factors (road width, buildings' heights, etc.), and meteorological factors (relative humidity, temperature, etc.). Therefore, the authors did not take into account the human factors (driver's skill, driver's age, etc.) that have been used by Gilani and Mir (2021). Another point is that the authors of the current paper have mentioned the traffic network factors as supply of infrastructure (infrastructure factors) which is an input of a transport model. Nonetheless, Gilani and Mir (2021) did not use any transport model nor its input i.e. travel demand, that generates traffic volume and traffic speed (traffic factors). It is noteworthy to mention that traffic factors and meteorological factors in the traffic noise model presented in the current paper are the same as road traffic subsystem and environmental

subsystem in the traffic noise system proposed by Gilani and Mir (2021). In this paper the output of traffic noise model i.e. LA_{eq} could be used to design a noise map whereas in the proposed traffic noise system by Gilani and Mir (2021) nothing special said on how to apply its output i.e. LA_{eq} in the engineering works. Bravo *et al.* (2019) utilized the traffic noise model RLS-90 (Der Bundesminister für Verkehr, 1990) to develop a noise map which its algorithm is similar to that of the present paper, since the RLS-90 model applies a transport model to give the inputs of traffic noise model i.e. traffic volume and speed. However, the RLS-90 model does not cover some traffic factors (such as honking, classified vehicle groups, etc.) and lacks the meteorological factors especially temperature and relative humidity. Quiñones-Bolaños *et al.* (2016) changed the CoRTN model (Welsh Office, 1988) so that traffic factors (total traffic volume and classified vehicle counts comprising automobiles, motorcycles, and heavy vehicles), traffic volume adjustment, and meteorological conditions were considered. Nevertheless, Quiñones-Bolaños *et al.* (2016) did not include infrastructure factors and certain traffic factors (such as honking, traffic speed, etc.) in their noise model which were taken into account by the authors of the present paper. Another point is that conceptual model of traffic noise in the current article has implemented a transport model to give traffic volume and speed but Quiñones-Bolaños *et al.* (2016) did not utilize any transport model in designing their noise model. In this paper the output of traffic noise model i.e. LA_{eq} can be used to design a noise map but in the suggested traffic noise model by Quiñones-Bolaños *et al.* (2016) nothing stated on how to apply its output i.e. LA_{eq} in the engineering studies. Nassiri *et al.* (2013) proposed a traffic noise model entailing traffic factors (honking and traffic volume of trucks) and infrastructure factors. Thus, they did not utilize meteorological factors as used by the authors of the current paper. Furthermore, Nassiri *et al.* (2013) did not use transport model in the structure of their traffic noise model which was implemented by the authors of the current paper. In this article the output of traffic noise model i.e. LA_{eq} could be used to design a noise map whereas in the proposed traffic noise model by Nassiri *et al.* (2013) nothing mentioned on how to apply its

output i.e. LA_{eq} in the engineering affairs.

CONCLUSION

Road traffic noise is the main source of environmental noise pollution. Therefore, road noise is a matter of challenge for both people and policy makers in urban zones. Road traffic noise models are implemented as a tool to deal with such challenges in decision-making and traffic noise abatement policies. Roadway engineers, acoustical engineers, acoustic specialists, expert witnesses, and traffic engineers who are involved in policies of Municipality and Environmental Protection Agency may benefit from the traffic noise models (policy relevance). Using the models one may determine locations of the roads in which noise levels are higher than standards to mitigate the traffic noise to prevent reducing properties values belonging to the people. Hence, the noise models are helpful for 5 sectors of society comprising: drivers and traffic officers, normal people, health practitioners and patients, property owners, and ecosystem (societal relevance). Given the conceptual model in this study that entails all the actors of a traffic noise model (meteorological, traffic, and infrastructure factors) and its outputs (equivalent sound level and maximum sound level), one is capable of understanding its policy and societal relevance. The added value of this conceptual model is that it implements a transport model to compute traffic volume and speed (traffic factors) as the inputs of a traffic noise model. Such a noise model could be called hybrid model. Another added value of the conceptual model is that it covers new traffic factors comprising honking, traffic safety, and traffic congestion. Based on the previous research gaps, it is recommended dynamic road noise maps of urban areas be obtained using the noise models during various times of day and night so that number of inhabitants in different noise spectrums of the map to be specified. Such a noise map is beneficial for both people and policy makers. Thus, the noise researchers need to facilitate generating noise contour plots (noise maps) along the roads using the traffic noise models. In reality, the researchers should extend the existing research on noise mapping in two aspects. Firstly, they need to make attempt to produce noise maps indirectly by the use of traffic noise models, which is relatively a

new approach. Secondly, they need to focus on not only a specified area for noise mapping but also to focus on producing noise maps along the roads so that more detailed noise variations along the roads could easily be observed. Also, it is recommended to design some models for statistical noise levels (L_n values) and put them as set of the traffic noise models, resulting in having more ideal conceptual model.

AUTHOR CONTRIBUTIONS

S.S. Ahmadi Dehrashid worked on the literature review, interpreted the results of literature, designed the conceptual model, wrote the manuscript context, and revised the manuscript. H.R. Jafari studied the literature review, details of the conceptual model, and checked the manuscript to have it prepared. A. Amjadi aided in the literature review and manuscript revisions.

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CONFLICT OF INTEREST

The authors have no conflict of interest to be declared concerning this review paper. Also, the authors have checked all the ethical affairs comprising duplicates, misconduct, data making, informed consent, and plagiarism.

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ABBREVIATIONS

<i>CoRTN</i>	Calculation of Road Traffic Noise
<i>dB</i>	decibel scale
<i>EEA</i>	European Environment Agency
<i>EIA</i>	Environmental Impact Assessment
<i>EIS</i>	Environmental Impact Statements
<i>FHWA</i>	Federal Highway Administration
<i>GTA</i>	Graph-theoretic approach
<i>GIS</i>	Geographic Information System
<i>IISD</i>	International Institute for Sustainable Development
<i>ITS</i>	Intelligent Transportation Systems
LA_{eq} or L_{eq}	equivalent sound level
L_n	statistical noise levels
<i>LOS</i>	level of service
LAF_{max} or L_{max}	maximum sound level
<i>NIA</i>	Noise Impact Assessment
<i>RLS-90</i>	Richtlinien für den Lärmschutz an Straben
<i>WHO</i>	World Health Organization
<i>USEPA</i>	United States Environmental Protection Agency

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