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Original Research Article

Resilient Governance: A Fundamental Role in Addressing the Challenges of Future Societies in the Metropolis of Shiraz*

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Abstract | Despite the expansion of urban management programs, urban fragilities in the metropolis of Shiraz, resulting from weak citizen participation, transparency, justice, and accountability, are still observed. The issue of this research is to clarify the extent to which "good governance" strengthens urban resilience, and through what pathways. The main research question is as follows: What is the effect (in terms of magnitude and significance) of the components of good urban governance, participation, transparency, justice, and accountability, on the urban resilience of Shiraz? Which component has the greatest effect? What is the current level of urban resilience? And what changes will future scenarios bring to this indicator? This research is of an applied-explanatory nature; data were collected using a standard questionnaire and semi-structured interviews, and analyzed through descriptive statistics, Confirmatory Factor Analysis (CFA), and Structural Equation Modeling (SEM). The findings show that the average urban resilience is 3.82 with a standard deviation of 0.60, and all four governance components have a positive and significant effect on resilience. The path coefficients for participation, transparency, accountability, and justice are estimated as 0.35, 0.28, 0.25, and 0.22, respectively, indicating the prominent role of participation alongside transparency and accountability. Based on future-oriented scenario writing, simultaneous improvement of governance components can elevate resilience to an optimal level, while their decline leads to a significant reduction in resilience. These results provide a practical framework for policymaking: strengthening mechanisms for meaningful citizen participation, informational transparency, and institutional accountability to enhance urban resilience in the face of urban crises.

Keywords | *Urban resilience, Good urban governance, Public participation, Metropolis of Shiraz, Structural analysis.*

Introduction| In the past three decades, the world has experienced significant changes in economic, urban, technological, and environmental dimensions, which traditional management systems cannot address. The increase in population, unchecked urban growth, and natural and human crises have highlighted the need for a revision in urban governance. Urban resilience, as a key factor in empowering communities to deal with crises, refers to the capacity of a society to recover, adapt, and learn from crises. Given the complexity of urban issues, modern governance approaches that emphasize good urban governance, including participation, transparency, accountability, and responsibility,can play an important role in strengthening urban resilience. Studies have shown that institutional weaknesses and social challenges in many developing metropolises reduce resilience. For example, regional and national studies in Iran, as well as international reviews, have recorded these consequences (Li et al., 2022). This research analyzes the dimensions of urban resilience and the impact of good governance on it, examining the role of its components in strengthening social resilience.

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Literature Review

The purpose of this section is to review research that has examined the relationship between "good urban governance" and "social/urban resilience," using methods like CFA/SEM for modeling this relationship or employing future-oriented approaches for resilience

policymaking. This section focuses solely on reviewing the studies without defining the concepts. Recent studies in Iran have shown that components of good governance (participation, justice, transparency, and accountability) have a positive relationship with social resilience and collective action. For example, in Zanjan and Kermanshah, the impact of urban governance on the resilience of informal settlements has been studied. This study differs from previous research as it focuses on the metropolis of Shiraz and will use future-oriented approaches to interpret policy results. Internationally, the use of Structural Equation Modeling (SEM) for measuring urban resilience is expanding. Studies such as "Ecological Resilience Mapping of Tehran" and evaluating the social resilience of Tehran during COVID- 19 have employed these approaches. These studies have inspired the current research, which enables the measurement of the effects of governance components on social resilience. Domestic studies tend to focus more on the current situation, but some emphasize effective policymaking with a future-oriented approach. These studies show that most internal studies focus on neighborhoods or informal settlements, with fewer models combining governance components at the metropolitan level. This study addresses these gaps by using CFA/SEM and future studies to provide empirical evidence for urban policymaking. There are several significant gaps in the research: (a). most studies focus on either resilience or good governance, and an integrated framework to link the two has not been provided; (b). most research has been conducted in developed countries, with limited examples from developing metropolises; (c). the use of Structural Equation Modeling in this field is scarce; and (d). the use of future-oriented approaches in analyzing urban resilience is rare. These gaps emphasize the necessity of this research. In recent years, significant efforts have been made to define and measure urban resilience and link it with good governance. International frameworks such as "Indicators for Resilient Cities" (Figueiredo et al., 2018) and "UN-Habitat" (2022) have proposed suggestions for selecting indicators. Recent studies emphasize the validation of these indicators and the use of combined approaches, where integrating international frameworks with local validation improves the effectiveness of measurement tools. The innovation of the present research lies in integrating social/urban resilience with good governance components into a quantitative model, using a future-oriented approach for policymaking. The metropolis of Shiraz, as an example of developing cities, is examined.

Theoretical Framework

Urban resilience emerged in the 1970s as a key concept in crisis management and sustainable development. Holling (1993) introduced it as the system's ability to absorb disruption and maintain structure. Adger (2000) emphasized the necessity of adaptation, learning, and recovery in communities. Urban resilience refers to a city's ability to withstand shocks, adapt to changing conditions, and return to a path of sustainable development. Research has shown that cities with stronger social and institutional capital have greater resilience. Good governance, first introduced by the World Bank, refers to principles such as transparency, accountability, participation, and justice. Rhodes (1996) defines governance as a set of interactions among government, private sector, and civil society. In Iran, weaknesses in good governance components can increase urban vulnerability. Resilient governance combines good governance and resilience, emphasizing flexibility, learning, and adaptation to change. Walker et al. (2004) have shown that resilient governance can maintain a balance between sustainability and innovation. In Persian literature, this concept includes active participation, transparency, and justice in resource distribution. Foresight is presented as an analytical tool for predicting the consequences of decisions and enhancing resilience. Studies have shown that combining foresight with urban policymaking increases resilience. In Iran, the use of this approach in urban management is limited. The combination of resilience, good governance, and foresight forms the conceptual framework of this research. Resilience, as the capacity for adaptation, good governance as the management structure, and foresight as a tool for addressing uncertainties, constitute the three sides of the urban resilient governance triangle. This framework serves as the basis for the analytical model of this research, which uses Structural Equation Modeling (SEM) to examine the effects of good governance components on social resilience in Shiraz, analyzing its potential implications through future-oriented scenario writing. This theoretical framework not only clarifies the key concepts but also shows their linkages and the necessity of the research.

Research Methodology

This study is applied-analytical and explanatory, examining urban resilience within the framework of good governance. The future-oriented approach and scenario writing were used to predict future developments and formulate strategies to cope with crises. Structural analysis and Structural Equation Modeling (SEM) were employed to analyze the relationships between the components. The theoretical foundations of the research include urban resilience, good governance, and foresight. A standard questionnaire was designed to measure the indices of urban resilience (dependent variable) and the components of good urban governance (independent variables),

which includes sections to measure participation, transparency, justice, and accountability. Table 1 shows the questionnaire indices. The indices were derived from three sources: (1). reviewing international frameworks and studies, (2). thematic analysis of local interviews with experts from Shiraz, and (3). the fuzzy-Delphi process for final refinement of items. The primary source of each index is listed in Table 1 (Li et al., 2022).

To complete the quantitative data and gain a better understanding of expert viewpoints, interviews were conducted with urban managers, planners, and urban research experts. The target population included urban managers, experts, and active citizens in Shiraz's urban management, with purposive sampling of individuals with relevant experience and knowledge. The data collection tools included:

- Standard questionnaire: measuring urban resilience indices and components of good urban governance.
- Interview form: to extract qualitative insights on challenges and solutions for resilience.

Basic statistics (mean, standard deviation, frequency, and percentage) were used to examine the status of the indices, and LISREL or AMOS software was used for conceptual structure validation and to determine factor loadings.

• Qualitative method for extracting and validating indices

To assess the validity and reliability of the indices, a qualitative phase was conducted, consisting of two parts: (a). thematic analysis of semi-structured interviews and (b). a fuzzy-Delphi process with experts. The steps are as follows:

- Sampling and Data Collection: Eighteen urban management experts and resilience researchers from metropolises were purposefully selected and participated in semi-structured interviews.

Table 1. Questionnaire indices. Source: Authors.

	Index	Definition	Measurement Method
1	Public Participation	The extent of citizen involvement in urban decision-making processes	5-point Likert scale
2	Transparency	The level of accurate and timely information provided by urban institutions	Multiple-choice questions
3	Justice and Equality	Ensuring equitable access to urban services and equal opportunities	Qualitative and quantitative evaluation
4	Accountability	The degree of responsiveness of urban officials and institutions to citizens' needs	Standard questionnaire

- Thematic Analysis: The interviews were analyzed using thematic analysis (open coding → themes → categories), which resulted in the extraction of 46 proposed items.
- Fuzzy-Delphi for Consensus and Refining Indices: A panel of 20 experts (12 urban managers and 8 researchers) participated in two rounds of the fuzzy-Delphi process. The consensus criteria were: mean ranking ≥ 3.5, IQR ≤ 1.0, or agreement level ≥ 70%. Ultimately, 30 indices were approved and used as the final questionnaire items.
- Content Validity (CVR/CVI) and Pilot Testing: Content validity was assessed using Lawshe's formula (CVR) and CVI. Items with low CVR or CVI were revised or removed. The questionnaire was then tested on a pilot sample of 40 participants, and Cronbach's alpha was calculated for the dimensions (threshold $\alpha \geq 0.70$).
- The fuzzy-Delphi methods and consensus criteria have been reported as standards in similar studies (Zeng et al., 2023).

After the qualitative refinement, the final questionnaire was tested in the pilot study (n=40) and applied in the main sample. Construct reliability was assessed using Cronbach's alpha and Confirmatory Factor Analysis (CFA). The reference thresholds included $\alpha \geq 0.70$ for internal reliability and factor loadings ≥ 0.50 for strong constructs. The model fit indices (CFI, TLI, RMSEA, SRMR) were reported following the reference guidelines. To select the indices and validation methods, recent review studies and guidelines were consulted (Gu et al., 2023). Structural Equation Modeling (SEM): To examine the causal relationships between independent variables (components of good urban governance) and the dependent variable (urban resilience), Structural Equation Modeling (SEM) was employed. The main equation of the model is as follows:

$$\eta = \Lambda_y \xi + \epsilon \quad (1)$$

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k + \epsilon \quad (2)$$

In these equations, Y represents the dependent variable (urban resilience), X_1, X_2, ..., X_k represent the different indices of good governance (such as participation, transparency, justice, accountability), β_0 is the constant value, β_1, β_2, ..., β_k are the regression coefficients, and ϵ represents the model error. Using statistical analysis data and qualitative insights, different future scenarios of urban resilience in Shiraz were formulated. Each scenario was based on changes in key indices and their mutual effects on resilience. The path diagram of the SEM model illustrates both direct and indirect relationships between governance components and urban resilience. Fig. 1 presents an example of the model's path chart, where four independent variables (participation, transparency, justice, accountability) are connected to the dependent variable (urban resilience) via directional

arrows. The relationships between independent variables (such as participation and transparency) are shown with bidirectional arrows.

To ensure the accuracy and reliability of the data collection tools, the following steps were conducted:

- Face and Content Validity: The questionnaire and interview form were reviewed and revised by a group of urban planning experts and university professors (including professors from urban planning and management fields).
- Structural Validity: The structure of the questionnaire was evaluated through Confirmatory Factor Analysis (CFA), and the factor loadings for the indices were obtained.
- Reliability: The reliability of the tool was determined by calculating Cronbach's alpha for each dimension of the questionnaire. Weak items were revised or removed when necessary.

The general regression equation of the proposed model is as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon \quad (3)$$

In Equation 3, Y represents the overall urban resilience index, X_1 represents the level of public participation, X_2 represents the level of transparency, X_3 represents justice and equality, and X_4 represents the accountability of urban managers. β_0 is the constant value, and β_1, β_2, β_3, and β_4 are the coefficients for each of the indices, while ϵ represents the model error.

Using path analysis, the SEM model is presented graphically, showing both direct and indirect relationships between the components of good urban governance and urban resilience. The path diagram of the model (Fig. 1) includes:

- Independent Variables: Participation, transparency, justice, and accountability.

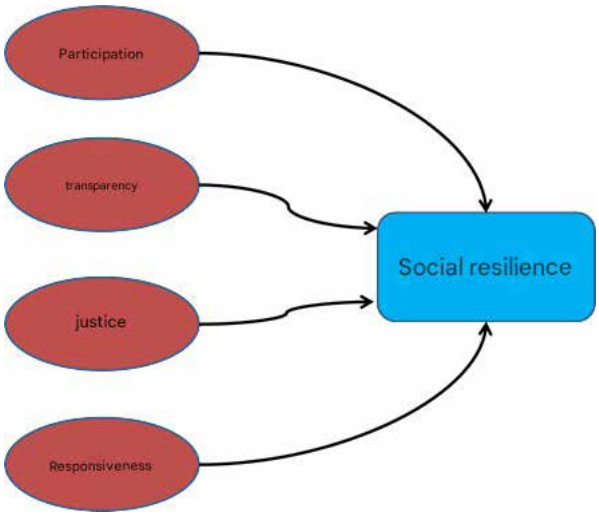

Fig. 1. Path diagram of the structural model for urban resilience within the framework of good urban governance. Source: Authors.

- Dependent Variable: Urban resilience.

The directional arrows represent the direct impact of the independent variables on urban resilience and the correlations between these variables. Each governance component (participation, transparency, justice, and accountability) influences the urban resilience index through directional arrows. Additionally, relationships between independent variables (such as the correlation between participation and transparency) are examined using bidirectional arrows. The effect coefficients (from SEM analysis) for each path will be determined and interpreted.

This study, with its mixed (qualitative and quantitative) approach and using structural analysis and foresight methods, aims to model the relationships between the components of good urban governance and urban resilience. This methodology allows for the formulation of various future scenarios and provides a practical framework to enhance resilience in response to the challenges posed by rapid urban changes.

Discussion

In this section, the results of the research are comprehensively and in detail examined. The results of descriptive statistical analyses are presented first, followed by Confirmatory Factor Analysis (CFA), and finally, Structural Equation Modeling (SEM) and future scenario writing are discussed. All results derived from the data collection and both quantitative and qualitative analyses are fully explained, with the relevant tables, equations, and charts provided.

After the field data collection via standardized questionnaires and semi-structured interviews, the data were analyzed using descriptive statistical methods in SPSS software. In this section, the mean, standard deviation, minimum, and maximum scores of key indices such as public participation, transparency, justice, accountability, and the overall urban resilience index were extracted.

Table 2 shows that the mean scores of the good governance indices and urban resilience are at a moderately high level. However, due to the standard deviations, there is notable disagreement among respondents in some cases. This indicates significant variations in citizens' evaluations of governance and resilience in the metropolis of Shiraz.

To assess the structural validity and reliability of the questionnaire, Confirmatory Factor Analysis (CFA) was performed using AMOS software. The initial conceptual model included four independent dimensions (participation, transparency, justice, accountability) and one dependent dimension (urban resilience). The model fit indices were as follows:

- Comparative Fit Index (CFI): 0.93
- Tucker-Lewis Index (TLI): 0.91

- Root Mean Square Error of Approximation (RMSEA): 0.055
- Standardized Root Mean Square Residual (SRMR): 0.047

These indices indicate that the theoretical model fits the data well. Additionally, the factor loadings for each component were recorded as Table 3.

Given that the factor loadings are above 0.70 and the significance values ($p < 0.001$), the construct validity of the data collection tool is confirmed. Moreover, the relationships between the independent and dependent dimensions were statistically significant.

Structural Equation Analysis (SEM)

To examine the causal relationships between the components of good urban governance (participation, transparency, justice, and accountability) and the urban resilience index, Structural Equation Modeling (SEM) was employed. The analytical model is expressed in the following general regression equation:

$$[Y = \beta\_0 + \beta\_1 X\_1 + \beta\_2 X\_2 + \beta\_3 X\_3 + \beta\_4 X\_4 + \epsilon]$$

Y represents the overall urban resilience index, X_1 represents public participation, X_2 represents transparency, X_3 represents justice and equality, X_4 represents accountability, β_0 is the constant term, β_1, β_2, β_3, and β_4 are the path coefficients, and ϵ represents the model error. The SEM analysis, in Table 4, shows that all independent variables significantly and positively influence urban resilience. In other words, increasing any of the indices of participation, transparency, justice, and accountability leads to an increase in the urban resilience index in the metropolis of Shiraz. The higher path coefficient of participation (0.35) indicates the special importance of involving citizens in urban decision-making processes.

In the Fig. 2, the directional arrows represent the direct effect of each governance component on urban resilience. Additionally, the correlations between the independent components are also examined in the model.

• Scenario analysis and future research

Based on the results of quantitative analyses and qualitative insights from the interviews, three potential future scenarios for urban resilience within the framework of good urban governance in Shiraz were developed:

1-Optimistic Improvement Scenario: In this scenario (Table 5), with significant improvements in the indices of participation, transparency, justice, and accountability,

Table 2. Descriptive statistics of the indices under study. Source: Authors.

Index	Mean	Standard Deviation	Min	Max
Public Participation	3.78	0.65	2.1	5
Transparency	3.65	0.7	1.9	5
Justice & Equality	3.52	0.68	2	4.9
Accountability	3.6	0.72	2.05	5
Urban Resilience	3.82	0.6	2.3	5

Table 3. Factor loadings of the indices. Source: Authors.

Index	Factor Loading	p-Value
Public Participation	0.78	<0.001
Transparency	0.82	<0.001
Justice & Equality	0.76	<0.001
Accountability	0.79	<0.001
Urban Resilience	0.85	<0.001

Table 4. Path coefficients and significance of effects. Source: Authors.

Path	Path Coefficient (β)	t-Value	p-Value
Public Participation → Urban Resilience	0.35	4.85	< 0.001
Transparency → Urban Resilience	0.28	4.10	< 0.001
Justice → Urban Resilience	0.22	3.75	< 0.001
Accountability → Urban Resilience	0.25	4.00	< 0.001

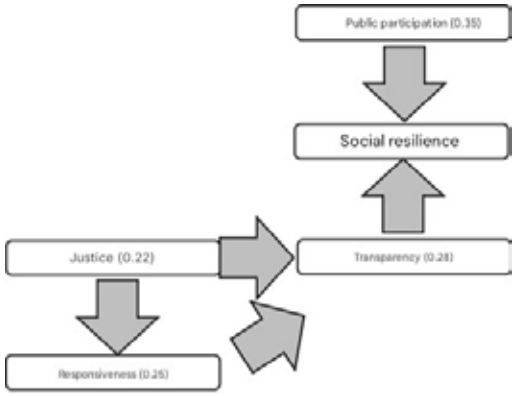

Fig. 2. Path diagram of the SEM Model. Source: Authors.

Table 5. Predicted urban resilience index in the optimistic improvement scenario. Source: Authors.

Governance Index	Predicted Increase (%)	Predicted Resilience Index
Public Participation	20%	4.6
Transparency	18%	4.55
Justice & Equality	15%	4.5
Accountability	17%	4.57
Overall Average	-	4.57

and the adoption of innovative management policies, the urban resilience index improves to a higher level. The predicted models show that in this scenario, the average urban resilience could exceed 4.5 out of 5.

2-Base Scenario: In this scenario (Table 6), the current situation is maintained to some extent, with gradual changes occurring without fundamental reforms. Under these conditions, the urban resilience index will remain around 3.8 to 4.0.

3-Crisis Scenario: In the event of severe crises and inadequate responses from urban institutions, governance indices may decline, and urban resilience will significantly drop. Predictions show that in this scenario (Table 7), the average urban resilience index could fall below 3.0.

The scenarios are based on the sensitivity analysis of the SEM model and qualitative insights and are used as strategic decision-making tools for improving urban resilience. The results indicate that the components of good governance, particularly participation (0.35), transparency (0.28), accountability (0.25), and justice (0.22), have a significant impact on urban resilience. Citizen participation is a key factor in increasing resilience, while transparency and accountability strengthen trust and further participation.

Scenario writing shows that reform policies can significantly improve resilience. The SEM model accurately reflects the causal relationships between governance components and resilience and could serve as a framework for developing strategic policies in other cities. It is recommended that urban managers focus on enhancing participation, transparency, justice, and accountability to develop innovative management strategies to improve resilience.

Figs. 3 & 4 show the coefficient of influence of governance components on the urban resilience of Shiraz and the predicted urban resilience index in different scenarios, respectively.

Conclusion

The present study shows that improving urban governance indicators has a significant impact on urban resilience. Structural equation modeling reveals that the components of participation, transparency, justice, and accountability have a positive and significant effect on urban resilience, with path coefficients of 0.35, 0.28, 0.22, and 0.25, respectively. These indicators can enhance urban capabilities in coping with crises. Furthermore, the results of qualitative interviews emphasize the importance of citizen engagement, transparency, and accountability of authorities. The integration of quantitative and qualitative findings suggests that modern governance policies can help create resilient cities. Therefore, it is recommended that urban managers strengthen participation, transparency, and justice to build the necessary

Table 6. Predicted urban resilience index in the base scenario. Source: Authors.

Governance Index	Change from Current Status	Predicted Resilience Index
Public Participation	±0%	3.78
Transparency	±0%	3.65
Justice & Equality	±0%	3.52
Accountability	±0%	3.6
Overall Average	-	3.64

Table 7. Predicted urban resilience index in the crisis scenario. Source: Authors.

Governance Index	Predicted Decrease (%)	Predicted Resilience Index
Public Participation	-25%	2.83
Transparency	-20%	2.92
Justice & Equality	-22%	2.75
Accountability	-23%	2.77
Overall Average	-	2.82

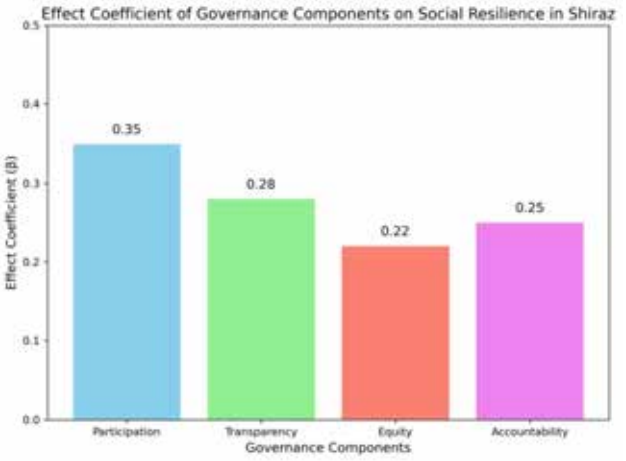

Fig. 3. Impact coefficient of governance components on urban resilience in Shiraz. Source: Authors.

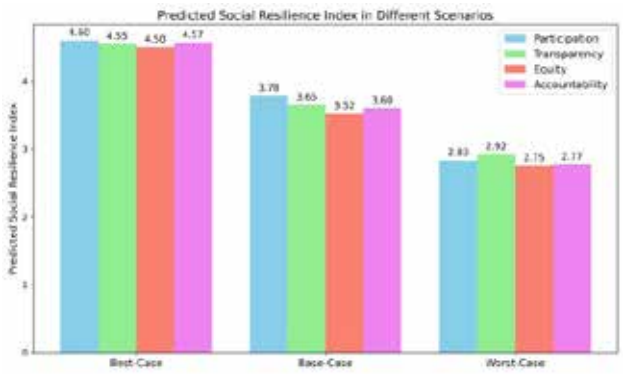

Fig. 4. Predicted urban resilience index in different scenarios. Source: Authors .

infrastructure to tackle crises. Despite limitations, such as the specific characteristics of Shiraz, the study provides a comprehensive framework for developing urban resilience strategies that can be applied to similar cities. In addition to quantitative analysis using SEM, a systematic qualitative process (thematic analysis + fuzzy-Delphi) was conducted to validate the indicators, which strengthens the content validity of the questionnaire. Limitations, such as the sample size in the Delphi process and the need for external validation in other cities, exist. Future research can explore the weighting of indicators by comparing data across different regions.

Declaration of No Conflict of Interest

The authors declare that they have no conflict of interest in conducting this research.

Endnotes

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