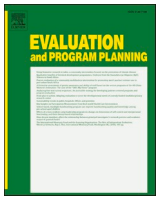
Evaluation and Program Planning 114 (2026) 102711

Contents lists available at ScienceDirect

Evaluation and Program Planning

journal homepage: www.elsevier.com/locate/evalprogplan



# Scenario-based planning for urban sustainability: Envisioning an ecological city in Shandiz, Iran by 2032

Forouzan Taheri [a], Mahdi Kolahi [b,*,1]

[a] Living Green Empowerment Organization (Atazis), Iran
[b] Department of Range and Watershed Management, Faculty of Natural Resources and Environment, Water and Environment Research Institute, Ferdowsi University of Mashhad, PO BOX 9177948974, Mashhad, Iran

ARTICLE INFO

*Keywords:*
Environmental governance
Future studies
Scenario planning
Social justice
Urban ecology
Urban planning

ABSTRACT

Urban sustainability in developing countries is often hindered by infrastructural limitations and the complexity of environmental uncertainties. This study applies scenario-based planning to explore future pathways for the development of an ecological city in Shandiz, Razavi Khorasan Province, Iran, by 2032. Following a six-step scenario planning framework, the research employed a mixed-methods approach, including expert questionnaires to identify and prioritize key drivers, and semi-structured interviews using saturation theory to construct scenario logics. The analysis yielded three distinct future scenarios: the Ideal City (sustainable and inclusive development), the Command City (state-driven but fragile planning), and the Ruined City (unsustainable and fragmented growth). Strategies were formulated to guide urban stakeholders toward realizing the most desirable future. The study contributes to the field of urban futures by demonstrating how participatory scenario planning can support informed decision-making under uncertainty and promote sustainable urban transitions.

## 1. Introduction

The accelerating rise in greenhouse gas emissions has positioned climate change as one of the most urgent challenges of the twenty-first century. Since the Industrial Revolution, rapid economic expansion and urbanization have strained ecosystems worldwide, leading to biodiversity loss, environmental degradation, and severe pollution of air, soil, and water (Mianabadi et al., 2022; Piralizefrehei et al., 2022a, 2022b; Rouhi et al., 2024). Urban areas, now home to more than 75 % of the global population (Malekmarzban & Mofidi-Shemirani, 2022), sit at the nexus of these pressures. Cities are simultaneously engines of economic growth and major drivers of environmental stress, intensifying ecological risks that threaten both natural systems and human well-being (Mianabadi et al., 2023; Kolahi et al., 2023). Yet, despite the growing body of urban sustainability research, there is limited evidence on how foresight-driven evaluation frameworks can inform urban planning in rapidly changing secondary cities of the Global South. This study addresses that gap by linking scenario-based evaluation with ecological urban planning in a context marked by both opportunity and uncertainty.

In response, the ecological city has emerged as a pivotal framework for sustainable urban development (Wang et al., 2024). The model emphasizes harmonizing human settlements with nature while sustaining economic vitality and social equity. Ecological cities reorient development trajectories by embedding ecological principles into planning and governance (Meng et al., 2021). As critical sites of transformation, cities must play a central role in mitigating climate change, enhancing ecological resilience, and safeguarding resources for future generations (Pandey & Ghosh, 2023). Importantly, positioning scenario planning within the evaluation literature allows us to move beyond descriptive accounts and systematically assess alternative development trajectories, trade-offs, and policy implications.

Over three decades of scholarship on urban ecology has provided spatial and functional principles to guide eco-city development (Shackleton et al., 2021). Roseland (1997) identified ten key dimensions, including compact land use, preservation of urban green spaces, non-motorized transport, repairing ecological degradation, equitable housing, social justice, local agriculture, recycling, sustainable technologies, and pollution minimization. More recent frameworks stress the role of biodiversity enhancement, functional diversity, and citizen participation in ecological transitions (Jamal et al., 2025; Kolahi et al., 2024a, 2024b). Together, these principles highlight the ecological

* Corresponding author.
*E-mail addresses:* foruzantaheri1993@gmail.com (F. Taheri), MahdiKolahi@um.ac.ir (M. Kolahi).
[1] ORCID: 0000-0002-1115-9880.

https://doi.org/10.1016/j.evalprogplan.2025.102711
Received 14 July 2023; Received in revised form 5 September 2025; Accepted 8 September 2025
Available online 11 September 2025
0149-7189/© 2025 Elsevier Ltd. All rights are reserved, including those for text and data mining, AI training, and similar technologies.

city as a comprehensive strategy for reconciling environmental, social, and economic imperatives.

Comparative research reinforces the model's relevance. Wong and Yuen (2011) examine eco-city experiments across national contexts, while Jelks et al. (2021) evaluate outcomes from sustainability initiatives in multiple metropolitan regions. Bibri et al. (2024) identify seven critical success factors for eco-city development, ranging from governance capacity to technological innovation. Coskun (2023), Nguyen and Vu (2023) and Riffat et al. (2024) conceptualize ecological cities as self-sustaining systems that minimize resource consumption and waste, while supporting human-scale accessibility, compact urban forms, and mixed-use neighborhoods. Collectively, these studies establish ecological cities as an indispensable paradigm for addressing contemporary urban challenges.

However, eco-city development in the Global South faces distinctive obstacles. Many cities in developing countries experience rapid, uncoordinated urbanization coupled with weak infrastructure, environmental vulnerability, and institutional limitations. In such contexts, sustainability initiatives often confront trade-offs between ecological preservation and developmental needs (Kalogiannidis et al., 2023). Lowe et al. (2022) emphasize the importance of long-term commitments to ecological protection, cultural integrity, and financial viability, while Zorba (2023) highlights the tension between tourism-driven growth and ecological balance. Hu and Xi (2023) further demonstrates that cities situated in environmentally sensitive regions must adopt ecological planning as a strategic priority to avoid irreversible degradation. This study contributes by demonstrating how evaluation frameworks—anchored in scenario analysis—can systematically inform urban planning under these complex conditions, offering both theoretical and practical insights

Traditional planning methods, constrained by deterministic assumptions, often prove inadequate in these complex environments (Bahrami et al., 2024). In response, scenario planning has gained recognition as a methodological innovation capable of addressing uncertainty in urban governance. By exploring multiple plausible futures, scenario methods facilitate anticipatory governance, adaptive strategies, and visionary thinking (Mannucci et al., 2023). Ampatzidou et al. (2022) note that urban planners frequently lack the tools to anticipate complex socio-environmental dynamics, a gap that scenario planning can help bridge.

Scenario methods have been widely applied in land use management, regional planning, and urban system design (Pastor et al., 2022; Sedighi et al., 2024). They encompass diverse techniques, from extrapolation and trend analysis to Delphi methods, simulation, causal modeling, and game theory (Slaughter, 1998). For example, Kharazmi and Taheri (2019) developed a "Golden Situation" scenario for Mashhad, envisioning an integrated digital city where all stakeholders actively fulfill their roles. Malekabadi et al. (2025) employed participatory scenario planning in Isfahan, identifying key drivers and stakeholder perspectives that informed multiple urban futures. These studies highlight the versatility of scenario planning and its potential for enhancing urban sustainability, particularly in regions marked by uncertainty and rapid change.

In Iran, as in many developing nations, urban sustainability is challenged by uncoordinated expansion, ecological degradation, and governance fragmentation. Scholars such as Kahrobaei et al. (2022) and Mohammadabadi and Kolahi (2022) stress the need to integrate natural resources, socio-cultural values, and ecological dimensions into strategic planning through scenario-based approaches. This study contributes to this growing body of work by focusing on Shandiz, a rapidly urbanizing tourist city near Mashhad. Shandiz combines significant ecological assets with acute risks stemming from uncontrolled construction, land-use change, and environmental decline. Its trajectory exemplifies the dilemmas faced by many secondary cities in the Global South: balancing economic aspirations, particularly in tourism, with ecological sustainability.

Accordingly, this research applies a structured scenario planning framework (Fahey & Randall, 1997) to envision pathways for transforming Shandiz into an ecological city by 2032. By identifying critical drivers, engaging stakeholders through surveys and interviews, and analyzing alternative futures, the study generates scenarios that highlight both risks and opportunities for sustainable urban development.

The contribution of this paper is threefold. First, it operationalizes scenario planning as an evaluative tool for sustainability transitions, demonstrating its utility for aligning stakeholder perspectives and anticipating socio-environmental trade-offs. Second, it provides empirical evidence from a Global South context, addressing the gap in eco-city research beyond established cases in advanced economies. Third, it offers actionable insights for policymakers in Iran and similar contexts seeking to reconcile ecological preservation with economic and social development. Together, these contributions position the study at the intersection of evaluation, urban governance, and ecological planning, advancing both the theory and practice of scenario-based urban sustainability.

## 2. Methodology

### 2.1. Study area

Shandiz City, covering approximately 450 ha, is located in Binaloud County at 36.23° N latitude and 59.18° E longitude, about 35 kilometers west of Mashhad, Iran (see Fig. 1). Nestled between the fertile slopes of the Binaloud mountain range and the Mashhad plain, the city sits along the Mahvareh Hills at the head of one of the region's five main valleys. Shandiz's elevation ranges from 1300 to 1420 m above sea level, with gentle northeast and eastward slopes conducive to sustainable ecological urban development. The Shandiz River, a prominent natural asset, enhances the area's ecological and aesthetic value.

Historically, Shandiz was one of the four major cities in the ancient Toos region and has long served as a popular mountain retreat, known for its scenic villages, verdant orchards, and cultural heritage (Farnhad Consulting Engineers, 2016). Despite the emergence of Mashhad as Iran's second-largest metropolitan area, Shandiz has retained its identity as a recreational and ecological hub (Farnhad Consulting Engineers, 2016).

However, recent urban growth in Shandiz has largely occurred in a fragmented and reactive manner, often influenced by short-term economic pressures and private investment rather than guided by scientific planning or long-term sustainability strategies. Unregulated development—particularly of villas, restaurants, and commercial recreation facilities—has proceeded without adequate environmental assessments or regulatory oversight. These trends have led to the degradation of local ecosystems, water resources, vegetation, and the city's traditional urban fabric.

The city also faces pronounced seasonal fluctuations in its population due to tourism. While Shandiz experiences a significant influx of visitors during peak periods, its infrastructure—such as wastewater management, public transportation, green spaces, and parking—has not been developed to meet this seasonal demand. Urban development in the area often overlooks key principles such as walkability, integrated public transport, and bicycle-friendly infrastructure.

Furthermore, tourism planning in Shandiz has generally lacked genuine community engagement, resulting in projects that fail to align with local cultural and environmental values. Insufficient attention to the ecological and social carrying capacities of the region has contributed to mounting environmental stress and a decline in quality of life for residents.

Given Shandiz's rich environmental and cultural potential, the absence of effective urban policy risks transforming the city into a site of ecological deterioration and urban chaos. To address this, it is crucial to adopt a comprehensive urban development strategy grounded in sustainable development principles. This includes limiting unregulated

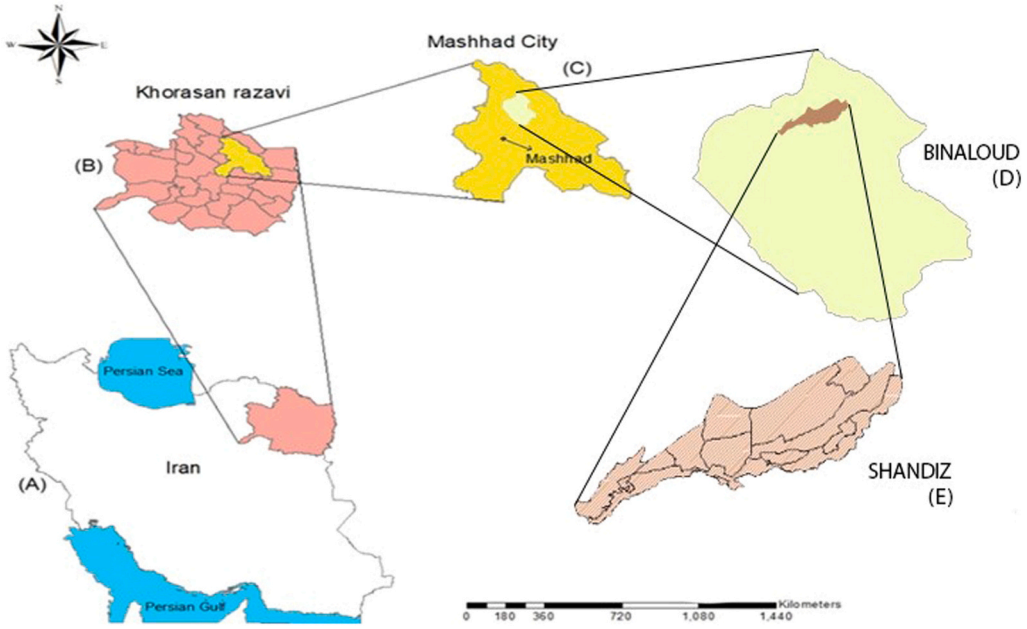



**Fig. 1.** Location of Shandiz City, Binaloud County, Iran.

construction, designing infrastructure that reflects actual tourism capacity, increasing local community participation in decision-making processes, and implementing robust environmental and cultural monitoring for tourism-related projects.

### 2.2. Research method

The study aimed to develop plausible scenarios for transforming Shandiz into an ecological city by 2032 using a structured scenario planning approach. The process followed the six-step scenario development method proposed by Fahey and Randall (1997), as outlined in Figs. 2 and 3.

Shandiz, a prominent tourist city in northeastern Iran, has faced increasing urban instability over the years due to ineffective governance, uncontrolled land-use changes, developments exceeding the city's environmental carrying capacity, loss of agricultural land, degradation of natural ecosystems, excessive construction, and growing air, soil, and water pollution. These issues have contributed to a range of environmental and infrastructural crises, including water scarcity and ecological decline.

To shift the city from its current unsustainable trajectory toward a more resilient and sustainable future, it is critical that urban managers

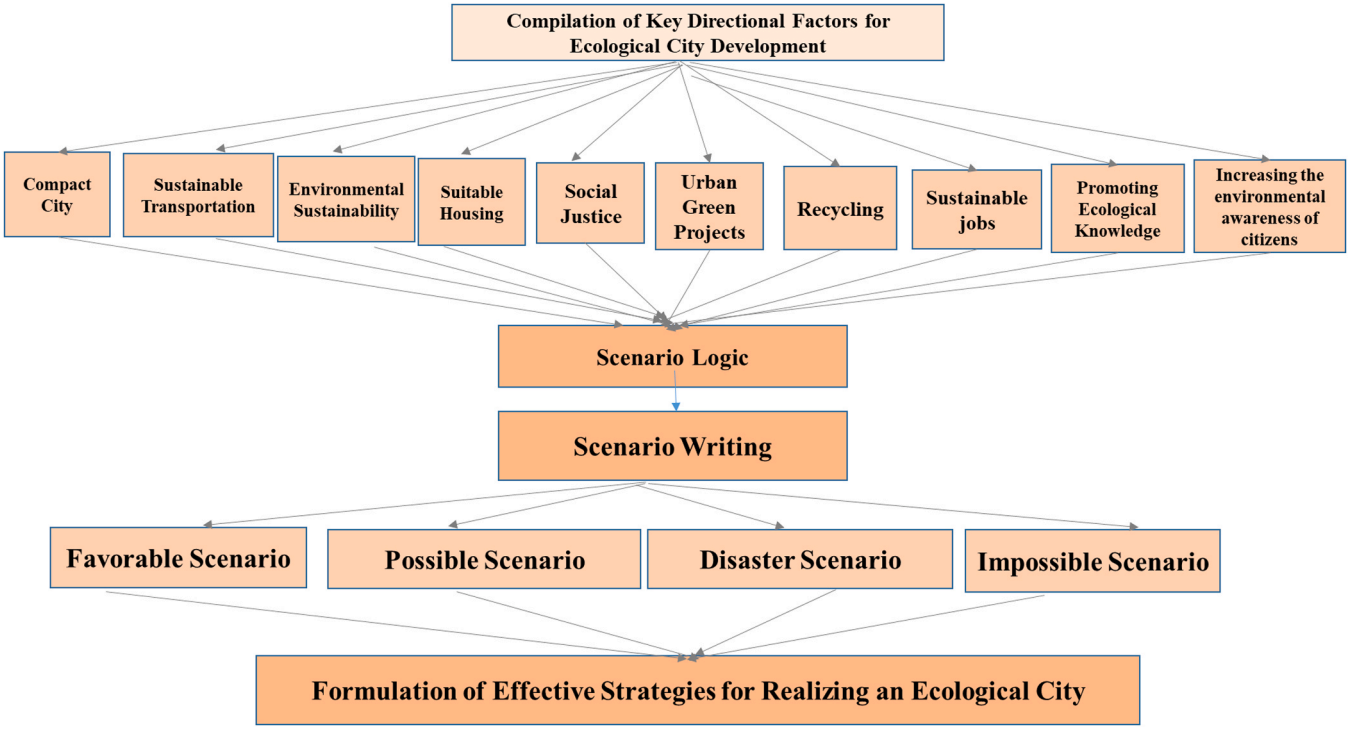



**Fig. 2.** Conceptual Framework of the Research.

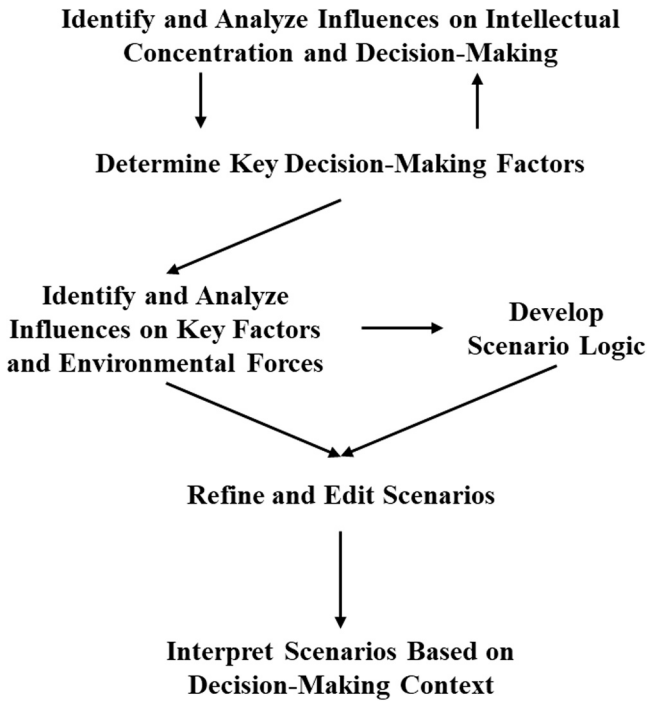



**Fig. 3.** Six-Step Scenario Development Process (Adapted from Fahey & Randall, 1997).

and planners, in collaboration with civil society, begin integrating ecological principles into planning and development processes.

The year 2032 was selected as the planning horizon for this study because it allows a reasonable yet urgent timeframe—approximately a decade—for implementing necessary ecological, infrastructural, and governance reforms. This timeline acknowledges both the immediate need for action and the practical realities of policy reform and institutional coordination. Shandiz holds considerable tourism potential, but its current pattern of unregulated and unplanned expansion has led to the depletion of natural resources, insufficient infrastructure, and urban instability. Achieving a sustainable transformation by 2032 will require comprehensive policy revision, infrastructure upgrades, and a shift toward localized, science-based urban management rooted in ecological design. The 2032 horizon was therefore chosen as a critical window for coordinated action by local authorities, national agencies, and active public participation.

#### 2.2.1. *Step 1: identification of influencing factors*

A comprehensive list of influential factors affecting the future of Shandiz was compiled from literature, expert input, and field observations.

#### 2.2.2. *Step 2: categorization into ecological city dimensions*

These factors were then classified under ten dimensions of an ecological city, as defined by Roseland (1997):

1. Compact Urban Form
2. Sustainable Transportation
3. Environmental Sustainability
4. Affordable and Adequate Housing
5. Social Justice and Equity
6. Urban Green Infrastructure
7. Waste Management and Recycling
8. Sustainable Employment
9. Promotion of Ecological Literacy
10. Public Environmental Awareness

#### 2.2.3. *Step 3: expert assessment of impact and uncertainty*

A questionnaire containing 70 items corresponding to the above ten dimensions was distributed to 24 experts (9 university scholars and 15 city managers or technical professionals; Attached as Supplementary Material). Each item was rated in terms of impact and uncertainty using a 5-point Likert scale.

Quantitative data were analyzed using SPSS software:

Items with mean impact scores above 3 were considered high-impact factors.

Items with high impact and moderate uncertainty were identified as critical scenario drivers, following methodologies by Fahey and Randall (1997) and others.

A one-sample *t*-test was used to statistically validate critical drivers, and a Friedman test was applied to rank them by importance. Results were plotted in a 3 × 3 impact-uncertainty matrix, presented in Fig. 4.

#### 2.2.4. *Step 4: scenario logic development*

Semi-structured interviews were conducted with relevant experts to generate scenario logic. An inductive method was used due to the diversity of factors. Two core planning paradigms were identified as scenario axes:

Top-down macro-level planning at national and regional scales
Bottom-up participatory planning based on local social capital

These two axes enabled the construction of a logical scenario matrix accommodating both institutional and grassroots dynamics.

#### 2.2.5. *Step 5: scenario construction*

Four scenario narratives were developed based on combinations of the two axes. Expert input was used to refine these scenarios, ensuring they were plausible, internally consistent, and relevant to current trends.

#### 2.2.6. *Step 6: scenario interpretation and strategy formulation*

Experts were asked to evaluate the current state of Shandiz, and responses were analyzed thematically using SWOT analysis. Each scenario was then evaluated for its long-term outcomes through additional expert interviews (25 participants), where interviewees predicted changes in critical drivers under each scenario logic. This facilitated the selection of the most desirable scenario and the development of actionable strategies to achieve it.

### 2.3. *Data collection and analysis*

This study employed a mixed-methods approach using both quantitative (questionnaires) and qualitative (interviews) data sources:

- **Questionnaires**: A 70-item survey was distributed to ecological city experts and planners. Each item corresponded to one of the ten

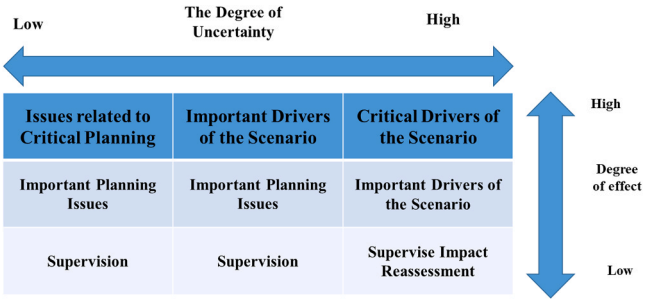



**Fig. 4.** Impact–uncertainty matrix for identifying critical scenario drivers.

sustainability dimensions. Responses were analyzed for central tendency and dispersion.

- **Critical Factor Selection**: Factors scoring:
  - o $\geq$ 3.0 on impact were considered significant
  - o Close to 4.0 in impact and 3.0 in uncertainty were identified as scenario drivers
- **Statistical Tests:**
  - o ***T*-tests**: Validated significance of scenario drivers
  - o **Friedman test**: Ranked priority drivers
- **Scenario Validation**: Conducted via semi-structured interviews with 25 experts, supported by scenario logic documentation and forecast matrices.

In the scenario development process, experts identified two primary dimensions— macro-level planning at national and regional levels and participatory planning based on social capital —as the fundamental axes encompassing all scenario drivers extracted in the previous stage. These dimensions were selected through an inductive approach grounded in expert workshops, where the relationships and interactions between key trends, uncertainties, and drivers were synthesized.

Each of these axes represents a continuum:

- On the vertical axis, the positive end reflects efficient macro-level planning (top-down) at the national and regional levels for the city of Shandiz, while the negative end denotes inefficient or absent macro-level planning at these levels.
- On the horizontal axis, the positive end indicates participatory planning grounded in social capital —emphasizing local engagement and trust—whereas the negative end reflects non-participatory, top-down planning approaches that ignore local capacity and networks.

These two axes intersect to form four quadrants, each representing a distinct scenario context. The drivers extracted from the previous analytical phase were then positioned within these quadrants according to their relevance and influence, helping shape the logic and narrative of the resulting scenarios.

To address the reviewer's request for clarity regarding the factors included in each category, we provide a summary below:

#### 2.3.1. Macro-level planning (national and regional)

This dimension includes drivers that relate to formal, top-down governance, policy frameworks, institutional effectiveness, and strategic planning capacities. Specific drivers in this category include:

- The development and enforcement of national and regional urban planning regulations.
- Alignment of local plans with national sustainable development goals.
- Budgetary and institutional support from national and regional authorities.
- Cross-sector coordination mechanisms.
- Adoption of green infrastructure standards (e.g., rooftop gardens, ecological zoning) facilitated through legal frameworks.

#### 2.3.2. Participatory planning based on social capital

This dimension reflects drivers rooted in community engagement, collective action, and the leveraging of local knowledge and networks. Key drivers here include:

- Active citizen participation in planning and environmental initiatives.
- Trust and cooperation between local government and residents.
- Public awareness and acceptance of ecological city concepts.
- Sense of belonging and civic pride at the neighborhood level.
- Bottom-up initiatives such as environmental stewardship groups and local green projects.

These two dimensions were chosen due to their centrality in determining the success or failure of urban ecological transitions in developing country contexts. In such settings, macro-level planning often remains at the policy stage without full implementation, while participatory planning is either undervalued or entirely neglected. However, successful ecological city planning depends on the integration of both dimensions—strategic governance and community engagement.

In conclusion, positioning the scenario drivers within this two-dimensional framework enables a more structured and logically coherent scenario construction process. It ensures that the diverse forces influencing the future of Shandiz are systematically incorporated, thus enhancing the robustness and policy relevance of the resulting scenarios.

## 3. Results

### 3.1. Participant profile

The survey sample comprised 84 % male and 16 % female respondents. Regarding educational attainment, 35 % held a master's degree, 26 % a doctoral degree, 9 % were Ph.D. candidates, 8 % had postgraduate qualifications, and 22 % held a bachelor's degree. Institutional affiliations included 53 % of respondents from the municipal sector (managers and experts), 11 % from Ferdowsi University of Mashhad, 5 % from the County Environmental Protection Department, 21 % from the Transportation Organization, and 10 % from the district administration of Shandiz.

### 3.2. Identification of key driving forces

Experts and specialists identified a set of critical driving forces based on their level of impact and uncertainty within the dimensions of an ecological city. All identified drivers scored an average above 3, underscoring their significance in shaping the future of Shandiz.

### 3.3. Ranking of critical drivers

Table 2 presents the prioritized ranking of the 25 key driving forces using two dimensions: impact and uncertainty. Each factor is labeled according to its thematic category:

- Compact City (C1–C4)
- Sustainable Transportation (T1–T6)
- Environmental Sustainability (S1–S2)
- Sustainable Housing (H1–H3)
- Social Justice (J1–J2)
- Urban Green Projects (G1)
- Waste Recycling (R1)
- Sustainable Employment (J1)
- Ecological Awareness Promotion (P1)
- Citizen Environmental Awareness (A1–A2)

The Friedman test was conducted to assess the statistical significance of differences among the importance of the 25 drivers. The test yielded a statistic of 0.014 with a significance level of $p < 0.05$, confirming the rejection of the null hypothesis that all factors are equally important. These results indicate statistically significant variation in the perceived influence of the critical drivers on future strategic directions.

### 3.4. Matrix of driving forces

Fig. 5 visualizes the $9 \times 9$ matrix of critical driving forces, highlighting the relationship between impact and uncertainty. The three cells in the top-right quadrant of the matrix represent the most critical scenario-shaping drivers. From a total of 70 initial factors, 25 were finalized as core driving forces.

In addition, the perspectives of interviewees were analyzed through

**Table 1**
Key Driving Forces for Ecological Urban Development in Shandiz (2032 Horizon) *(Table includes categorized drivers across ecological city dimensions.)*.

| Row | Driver | Row | Driver |
|---|---|---|---|
| 1 | Neighborhood mixing or land use diversity | 14 | Architecture and construction adapted to climatic conditions |
| 2 | Optimal use of land and encouragement of building reuse | 15 | Suitable location for housing construction |
| 3 | Expansion of recycling areas | 16 | Adequate primary infrastructure such as water supply, sanitation, environmental quality |
| 4 | Avoidance of urban sprawl and expansion into outskirts | 17 | Availability of suitable services for citizens (green spaces, transportation) |
| 5 | Improvement of transportation infrastructure quality | 18 | Citizen's sense of belonging to the city and neighborhood |
| 6 | Expansion of pedestrian and cycling areas and enhancement of their safety | 19 | Attractiveness of health and treatment centers |
| 7 | Increased utilization of intelligent transportation systems and traffic control | 20 | Recycling and sanitary disposal of waste |
| 8 | Management of transportation network | 21 | Citizens' interest in environmental activities |
| 9 | Promoting a culture of public participation in sustainable transportation policies and programs | 22 | Development of rooftop gardens in collaboration with municipality and citizens |
| 10 | Coordination of transportation policies with physical, economic, environmental, and other related development plans | 23 | Use of clean fuel and control of air pollution |
| 11 | Preservation of natural ecosystems | 24 | Creation of urban green projects in line with environmental principles |
| 12 | Development of necessary regulations for preventing discharge of untreated sewage into water and surrounding land resources | 25 | Investment in clean energy technology development |
| 13 | Control of water, air, and soil pollution | | |

a SWOT framework, assessing the city's current ecological status across four dimensions: strengths, weaknesses, opportunities, and threats.

### 3.5. Scenario development

Expert interviews were synthesized into three prospective scenarios based on a two-dimensional logic framework. This framework combines two key planning dimensions:

#### 3.5.1. Vertical axis (top-down governance)

- o Positive: Effective national and regional planning
- o Negative: Ineffective national and regional planning

#### 3.5.2. Horizontal axis (participation)

- o Positive: Participatory planning based on social capital
- o Negative: Non-participatory planning with disregard for social capital

A fourth hypothetical scenario combining ineffective planning and participatory governance was deemed implausible and excluded from further analysis.

*3.5.2.1. Scenario 1: The Ideal City*. This scenario envisions a future where the compactness and mixed-use zoning of Shandiz promote the reuse of buildings and urban land without further sprawl into

**Table 2**
Ranking of critical drivers by impact and uncertainty for ecological city planning in Shandiz (2032 Horizon).

| Uncertainty | Impact | Code | Examined factor | Driver |
|---|---|---|---|---|
| 3.1 | 3.5 | C1 | | Mixing or integrating land use |
| 2.9 | 3.4 | C2 | Compact city c | Optimizing land use and encouraging reuse of buildings |
| 3.2 | 3.3 | C3 | | Growth of recycling lands |
| 3.0 | 3.8 | C4 | | Avoiding sprawl and dispersion in the outskirts |
| 3.1 | 3.9 | T1 | | Improving transportation infrastructure quality |
| 3.0 | 3.9 | T2 | Sustainable transport T | Expanding special spaces for walking and cycling and upgrading their safety |
| 3.3 | 3.9 | T3 | | Using the transportation system more and controlling traffic intelligently |
| 3.0 | 3.9 | T4 | | Transportation network management |
| 3.1 | 3.6 | T5 | | Cultural promotion among officials for public participation in sustainable transportation policies and programs |
| 2.9 | 3.4 | T6 | | Using clean fuel and controlling air pollution |
| 3.2 | 3.5 | T7 | | Coordinating transportation policies with physical, economic, and environmental development plans |
| 3.0 | 3.8 | S1 | | Preserving natural ecosystems |
| 3 | 3.8 | S2 | Environmental sustainability S | Developing necessary laws regarding the discharge of untreated sewage into water resources and surrounding lands |
| 3.0 | 3.6 | S3 | | Controlling water, air, and soil pollution |
| 3.0 | 3.8 | H1 | | Architecture and construction in accordance with climatic conditions |
| 3.0 | 3.5 | H2 | Suitable housing H | Appropriate location for housing construction |
| 2.8 | 4.0 | H3 | | Appropriate primary infrastructure such as water supply, health, and environmental quality |
| 2.6 | 4.1 | J1 | | Availability of suitable services for citizens |
| 3.2 | 3.8 | J2 | Social justice J | Sense of citizenship to the city and neighborhood |
| 3.0 | 3.9 | J3 | | Desirability of health and treatment centers |
| 2.7 | 3.9 | G1 | Urban green projects G | Creating urban green projects in line with environmental principles |
| 3.1 | 3.9 | R1 | Recycling R | Recycling and sanitary landfill of waste |

(*continued on next page*)

**Table 2** (*continued*)

| Uncertainty | Impact | Code | Examined factor | Driver |
|---|---|---|---|---|
| 2.7 | 3.7 | J1 | Sustainable jobs S | Investing in clean energy technology development |
| 3.0 | 3.8 | P1 | Promoting ecological knowledge P | Citizen participation in environmental activities |
| 3.0 | 3.4 | I1 | Increasing the environmental awareness of citizens c | Developing rooftop gardens in cooperation with the municipality and citizens |
| 3.0 | 3.7 | I2 | | Expert activity in ecological principles and environmental issues |

agricultural or peripheral zones. Despite previous challenges—including large-scale projects such as the *Shandiz Phenomenon*, which increased surface load, landscape fragmentation, and pollution—this scenario mitigates environmental degradation through participatory and strategic urban planning.

Key features include:

- Integration of residential and employment zones
- Reduced reliance on personal vehicles through sustainable public transport
- Promotion of environmental awareness and cultural development among decision-makers
- Intelligent traffic management systems
- Expansion of non-motorized transport infrastructure (e.g., walking and cycling networks)

*3.5.2.2. Scenario 2: The Command City.* In this model, top-down planning is effectively implemented but public participation is lacking. Although land use is optimized and environmental infrastructure is improved through centralized strategies, the lack of social engagement results in suboptimal implementation and public resistance. Key environmental laws exist but are poorly enforced, resulting in continued degradation.

Challenges under this scenario include:

- Insufficient sustainable housing and infrastructure
- Declining access to public services (green spaces, transport, healthcare)
- Weak urban identity and sense of belonging
- Inadequate recycling and tourism infrastructure
- Neglected environmental education and civic engagement

Despite professional planning and adherence to standards, the absence of community involvement hinders the scenario's success.

*3.5.2.3. Scenario 3: city ruins.* This pessimistic scenario reflects the collapse of both planning and public participation. Urban sprawl accelerates, land use becomes chaotic, and environmental quality declines drastically. Transportation remains inefficient, and no progress is made in clean energy adoption. Social cohesion deteriorates as unemployment rises, public services falter, and ecological damage becomes irreversible.

Key indicators of this breakdown include:

- Degradation of water, air, and soil quality
- Spread of unregulated construction and inappropriate architecture
- Failure of legal enforcement and institutional coherence
- Declining tourism and increased out-migration due to poor urban livability

**Table 3**
SWOT analysis of the current ecological status of shandiz.

| Strengths (S) | Weaknesses (W) |
|---|---|
| √ The presence of flat and low slope soils with deep depths. | √ Lack of topographic diversity |
| √ The Shandir river flowing on the southern side of the city enhances the air quality, attractiveness, and desirability of the environment. | √ High erosion susceptibility of soil |
| √ The soil salinity level in the region is very low, and irrigation of the land does not cause soil salinization. | √ High percentage of gravel in the soil |
| √ The wells and qanats in Shandiz provide relatively suitable sources of water. | √ Lack of rainfall and dry climate |
| √ The existence of orchards shows that there is still the possibility of reviving the forest cover and creating a plain forest. | √ Lack of plant cover diversity |
| √ The extensive tourism potential throughout the city. | √ Lack of sufficient data and information on the chemical and biological quality of water resources |
| √ The existence of terrestrial and aerial reservoirs for water storage. | √ Lack of focused 1st tier tourism potential in the city |
| √ Approved and executive plans for upgrading and developing the water supply network. | √ Disposal of garbage in rivers and water and soil pollution |
| √ Connection of the Shandiz power distribution network to the provincial and national power grid. | √ Accumulation of harmful animals and insects in areas with accumulated garbage |
| √ Relatively desirable physical and structural quality of the electricity and gas infrastructure facilities, especially against earthquakes. | √ Creation of undesirable views and unpleasant odors due to the discharge of wastewater and waste |
| √ Low level of power outages, gas pressure drop, and water pressure drop in residential areas. | √ Discharge of household and municipal wastewater into wells and contamination of soil and groundwater resources |
| √ Continuous management and supervision of the operation of infrastructure networks. | √ Lack of compliance of road networks with the current role of Shandiz city |
| √ Public transportation (metro and bus) to Mashhad. | √ Incompatibility of the volume and functional capacity of current constructions |
| √ Proximity to the second largest metropolis and the first religious city in Iran. | √ Creation of severe traffic nodes |
| √ Construction of the large Padideh project. | √ Unidirectional and linear structure of communication networks |
| √ Opportunities, uses, and complementary activities for tourism. | √ Existence of interfering industries and workshops, such as livestock and industrial units |
| √ The largest capital market and government credit in the province after Mashhad. | √ Lack of comprehensive development |
| √ The existence of active workshops. | √ Weakness and absence of urban management infrastructure networks such as the sewage collection and disposal system |
| √ The increase in urban-scale uses in the area. | √ Increased risk of flooding |
| √ The presence of cross-regional uses, restaurants, and population attraction. | √ Failure to predict crisis management mechanisms |
| √ The existence of a valley as a natural corridor linking the landscapes. | √ Unidirectional gas distribution network in the city |
| √ The dominant morphology of the hills and then the mountains. | √ High dependence on natural gas |
| √ The existence of surface and groundwater resources. | √ Limitations of electricity transmission in dead-end streets and alleys |
| √ The collection of non-fruit-bearing gardens and trees as green spaces along the river. | √ Location of Shandiz city's water supply sources outside the city |
| √ The presence of beautiful Aras and Arghavan Woodlands around the area. | √ Lack of use of traditional absorption well methods in the current situation |
| √ The mixture of residential and orchard uses as a model of garden house or villa with dense vegetation cover. | √ Insignificant share of electricity generated from renewable energy sources |
| | √ Environmental pollution due to the production of electricity from fossil fuels |
| | √ Excessive energy waste in buildings and urban facilities |
| | √ Irrigation of agriculture and orchards with drinking water quality |
| | √ Lack of a complete and comprehensive database |
| | √ Disposal of surface water through open channels and canals. |
| **Opportunities (O)** | **Threats (T)** |

(*continued on next page*)

**Table 3** (*continued*)

| Strengths (S) | Weaknesses (W) |
|---|---|
| √ Flat lands and deep soil for developing orchards and reviving tree covers. | √ Inappropriate cultivation patterns and land use change put excessive pressure on natural resources. |
| √ Possibility of natural growth of tree cover. | √ Loss of vegetation cover in the catchment areas increases the risk of flooding. |
| √ Extensive tourism potential in almost all parts of the city. | √ Discharging domestic wastewater into absorbent wells despite the existence of underground water resources in the region poses a risk of water pollution. |
| √ Creating a branch from the Mashhad-Golbahar urban railway line to Shandiz city. | √ Discharging domestic wastewater into canals and street drains and transferring them to surface water sources pose a threat to resources and the risk of spreading disease-causing agents. |
| √ Diversity of activities and functions in the region and the possibility of planning based on this diversity. | √ The risk of earthquakes due to the presence of faults such as the South Mashhad Fault, the South Chenaran Fault, the Tus Fault, etc., which have a direct impact on infrastructure networks. |
| √ Proximity of Shandiz city to the metropolis of Mashhad and the possibility of enjoying existing advantages. | √ The invasion of saline water into underground aquifers due to overexploitation. |
| √ Large attention of the macro-management of the metropolitan area to the situation and needs of Shandiz city. | √ The influx of a large number of pilgrims and tourists to Shandiz. |
| √ Strong emphasis on the use of renewable energies. | √ Disturbance in the nutrition of underground aquifers due to the reduction of precipitation in recent years. |
| √ Emphasis on supporting energy producers and optimizing energy consumption policies. | √ Construction on the surface of the land reduces the absorption and conduction of precipitation and surface water. |
| √ Implementation of sewage collection plans and using wastewater. | √ Wastewater entering surface water and groundwater. |
| √ Possibility of extending the freeway to Shandiz and direct communication with all parts of the country. | √ Decline of handicraft industries, increasing unemployment and migration. |
| | √ Creating income and social gaps. |
| | √ Low participation of women in employment |

This scenario reflects the urgent need for integrated urban management and community-oriented governance.

## 4. Discussion

This study underscores that the "Ideal City" or "Golden Situation" scenario is not merely an aspirational vision but a necessary trajectory for achieving ecological urban development in Shandiz. Drawing on scenario analysis and expert engagement, this pathway emerged as the most desirable future, balancing ecological integrity with urban functionality. Core to this vision are institutional coordination, meaningful community participation, and the prioritization of environmental sustainability through long-term planning and design.

The "Golden Situation" scenario highlights integrated land-use planning that advances compact urban forms and proximity between residential, economic, and ecological zones. Such integration reduces urban sprawl, revitalizes the existing urban fabric, and enhances efficient land utilization (Jiang et al., 2022). This stands in sharp contrast to current patterns in Shandiz, where fragmented development and uncontrolled expansion have degraded agricultural land and stressed local ecosystems. The proposed pathway directly addresses these vulnerabilities through participatory planning and ecologically grounded decision-making.

Equally important are transformations in transport and mobility. The scenario promotes sustainable systems, including investment in intelligent transportation, low-emission fuels, pedestrian-friendly networks, and expanded public transit (Elassy et al., 2024). These measures align with biophilic design principles and climate-adaptive planning, reducing automobile dependency, mitigating environmental pressures, and enhancing urban livability.

In architecture and construction, the scenario emphasizes climate-responsive, energy-efficient building systems based on local materials. Such practices preserve architectural identity while raising ecological performance standards (Tachir et al., 2025). At the same time, inclusive and resilient public services—spanning education, healthcare, recreation, and cultural facilities—reinforce social cohesion and urban resilience.

Environmental management forms a central pillar of this pathway. Expanded urban agriculture, advanced waste and wastewater systems, and investments in green infrastructure (Chen et al., 2020) create a low-carbon, adaptive urban ecosystem aligned with environmental justice and community well-being (Malekmarzban & Mofidi-Shemirani,

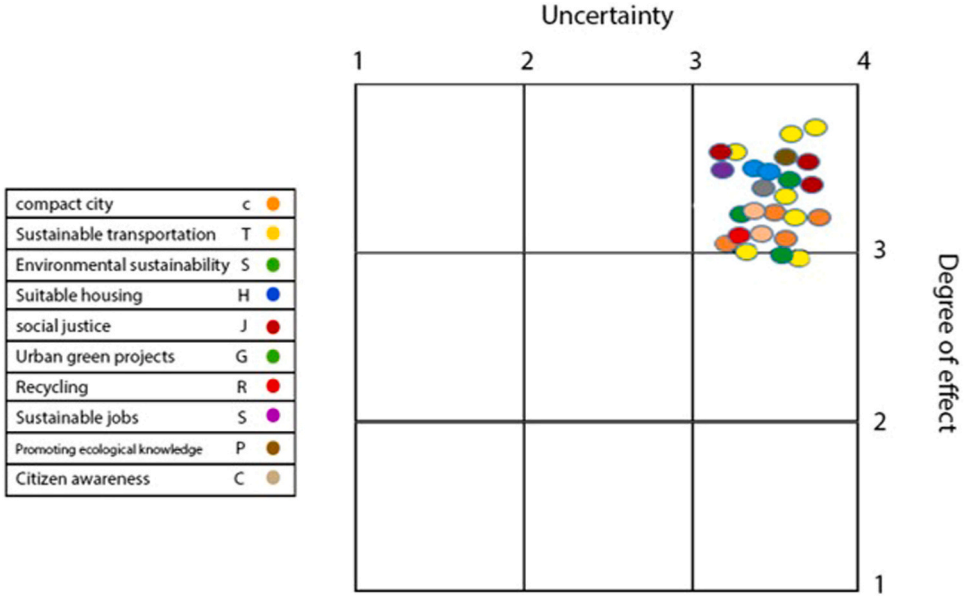



**Fig. 5.** Impact-uncertainty matrix of critical driving forces for Shandiz.

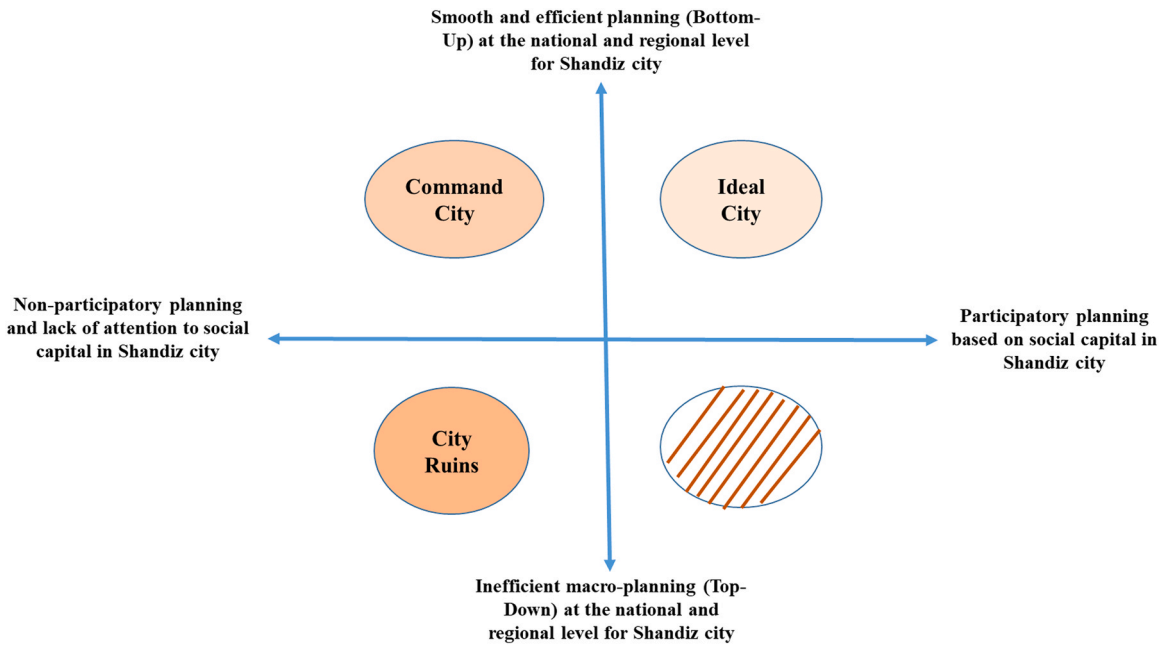



**Fig. 6.** Scenario logic framework based on planning efficacy and public participation.

2022). Collectively, these interventions position Shandiz as a potential model of integrated, ecologically sensitive development.

### 4.1. Study limitations

Despite its contributions, the study faced limitations. A primary challenge was data scarcity: the absence of reliable and disaggregated indicators restricted the comprehensiveness of the ecological city assessment. Data collection spanned nearly a year and was hindered by fragmented and inconsistent sources.

Another limitation concerned stakeholder engagement. Many municipal officials and experts were unfamiliar with scenario planning, requiring substantial training and orientation. While this improved awareness, it may have limited the depth or precision of some responses. These challenges underscore the importance of strengthening institutional capacity for foresight-based planning.

### 4.2. Future research directions

To expand on these findings, several avenues are recommended:

- **Ecological resilience under climate change and urban growth:** Assessing Shandiz's adaptive capacity through scenario-based vulnerability analyses.
- **Managing ecological–tourism conflicts:** Developing governance mechanisms that balance conservation imperatives with tourism-driven development.
- **System dynamics modeling:** Employing simulation or agent-based models to capture feedback loops and long-term socio-ecological interactions.
- **Policy simulation of environmental interventions:** Evaluating strategies to halt or reverse ecological degradation through scenario-based policy testing.

These directions would refine theoretical insights and strengthen policy relevance for Shandiz and comparable secondary cities in the Global South.

### 4.3. Theoretical and methodological contributions

The concept of the ecological city has become a global paradigm in urban planning, representing a transition toward sustainable lifestyles and livable human settlements. In contemporary urban development, resource consumption has often exceeded ecological carrying capacities, prompting the eco-city approach to emerge as both a scientific discourse and a policy paradigm (Datta, 2012; Roseland, 1997). At its core, this perspective emphasizes harmony between humans and nature, pursuing goals of environmental stewardship, economic sustainability, and social cohesion. As Register argued, ecological cities must be environmentally sustainable, compact, socially just, and conducive to healthy urban living (Chang et al., 2016). Similarly, Sarkar (2016) underscores that eco-city development requires ecological protection, clean air, reliable water supplies, healthy housing, and disaster resilience. Danneels (2023) and Kanaani (2022) highlight that ecological planning is not merely aesthetic, but fundamentally linked to questions of justice, equity, and the production of urban space.

By situating Shandiz within this global paradigm, this study makes three original contributions:

1. **Advancing evaluation theory**: This research demonstrates how scenario analysis can function as a foresight-based evaluation tool that operationalizes the eco-city paradigm in a localized context. Rather than treating scenarios as predictive devices, the study employs them as evaluative frameworks that allow stakeholders to test uncertainties, anticipate trade-offs, and assess long-term impacts. This bridges futures research with evaluation theory, extending complexity-aware and utilization-focused approaches (Berner et al., 2025; de Vries et al., 2024; Lounder, 2025).
2. **Methodological innovation**: Unlike much of the eco-city literature that remains conceptual, this study localizes the eco-city model for a peri-urban tourist city in Iran. Through scenario-based foresight combined with qualitative stakeholder analysis, it demonstrates how international frameworks can be contextualized in regions characterized by institutional fragmentation and territorial inequality. The methodological fusion of foresight tools with participatory evaluation creates a multidimensional approach applicable to other data-scarce environments.

3. **Enriching planning debates:** By weaving foresight, evaluation, and eco-city paradigms, this study contributes to planning theory by presenting a hybrid evaluation–planning framework. It repositions ecological urbanism not simply as a design concept, but as an adaptive governance strategy that can guide secondary cities in the Global South toward sustainability.

### *4.4. Lessons learned and practical implications*

- **Participatory scenario planning is indispensable**: Engagement fosters ownership, uncovers divergent assumptions, and strengthens foresight capacity.
- **Scenario analysis enhances governance**: Structured foresight tools support integrated decision-making and reduce reliance on reactive policy.
- **Evaluation must remain adaptive and contextual**: Ecological planning requires flexible models that evolve with changing socio-environmental conditions.
- **Cross-sectoral integration improves outcomes**: Linking land use, transport, environment, and social policy creates more resilient urban systems.
- **Theory-informed evaluation strengthens practice**: Drawing on systems and complexity theories equips cities like Shandiz to design resilient futures under deep uncertainty.

Overall, the findings reaffirm that ecological city development in Shandiz—and in similar rapidly urbanizing contexts—requires not only technical solutions but also participatory governance and adaptive evaluation frameworks. By situating scenario analysis within evaluation research, this study bridges foresight and assessment, offering both methodological contributions and actionable insights for sustainable urban transformation.

## 5. Conclusion

The "Golden Situation" scenario highlights the urgent need to align urban development in Shandiz with the principles of ecological city planning. As both a tourist hub and a peri-urban settlement, Shandiz sits at the intersection of opportunity and risk: unregulated growth, speculative construction, and infrastructure deficits have already contributed to ecological stress and socio-economic imbalance.

To address these challenges, urban governance must adopt a participatory, ecologically grounded planning paradigm. Integrated infrastructure, sustainable tourism strategies, and climate-responsive architecture rooted in local traditions are essential to repositioning Shandiz as a national exemplar of ecological tourism and resilient urban design.

This study contributes to the evaluation and planning literature by operationalizing scenario analysis as a foresight-based evaluative tool. It demonstrates how combining scenario planning with participatory and systems-oriented approaches can generate actionable insights, anticipate trade-offs, and inform strategic decision-making in rapidly transforming urban contexts. Beyond Shandiz, the findings illustrate the broader applicability of foresight-driven evaluation for cities facing ecological vulnerability, governance fragmentation, and socio-environmental complexity, offering both theoretical and practical guidance for advancing sustainable urban transitions.

## Author contributions

FT was responsible for data collection, analysis, and the initial drafting of the manuscript. MK contributed to the conceptualization of the study, provided guidance throughout the research process, and critically reviewed and edited the manuscript. Both authors approved the final version of the manuscript.

## CRediT authorship contribution statement

**Foruozan Taheri:** Writing – review & editing, Writing – original draft, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Mahdi Kolahi:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Project administration, Methodology, Data curation, Conceptualization.

## Consent for publication

Not applicable.

## Consent to participate

Not applicable.

## Ethical considerations

None declared.

## Funding statement

No funding was received for this research.

## Declaration of Conflicting Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Acknowledgments

The authors would like to thank all the experts who participated in the survey and provided valuable insights for this research. Special thanks to the interviewees whose contributions significantly informed the scenario planning process. No third-party assistance was used in writing or editing this manuscript.

## Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.evalprogplan.2025.102711.

## Data availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

## References

Ampatzidou, C., Vervoort, J., von Flittner, Z. F., & Vaajakallio, K. (2022). New insights, new rules: What shapes the iterative design of an urban planning game? *Urban Planning, 7*(2), 295–305.

Fahey, L., & Randall, R. M. (Eds.). (1997). *Learning from the future: Competitive foresight scenarios*. John Wiley & Sons.

Bahrami, A., Soltanifar, F., Fallahi, P., Meschi, S. S., & Sohani, A. (2024). Energy and economic advantages of using solar stills for renewable energy-based multi-generation of power and hydrogen for residential buildings. *Buildings, 14*(4), 1041. https://doi.org/10.3390/buildings14041041

Berner, H., Hurtado, S. D. G., & Gualini, E. (2025). Strategies for urban climate adaptation: Pathways towards equitable resilience in barcelona and Berlin. *Cities, 161*, Article 105836.

Bibri, S. E., Krogstie, J., Kaboli, A., & Alahi, A. (2024). Smarter eco-cities and their leading-edge artificial intelligence of things solutions for environmental sustainability: A comprehensive systematic review. *Environmental Science and Ecotechnology, 19*, Article 100330.

Chang, I. C. C., Leitner, H., & Sheppard, E. (2016). A Green leap forward? Eco-state restructuring and the Tianjin–Binhai eco-city model. *Regional Studies, 50*(6), 929–943.

Chen, Y., Zhu, M., Lu, J., Zhou, Q., & Ma, W. (2020). Evaluation of ecological city and analysis of obstacle factors under the background of high-quality development:

Taking cities in the Yellow River basin as examples. *Ecological Indicators, 118*, Article 106771.
Coskun, H. (2023). Eco-city planning; concepts and contemporary models. *Global Journal of Ecology, 8*(2), 110–119.
Danneels, K. (2023). The politics of urban ecology: Paul duvigneaud and the rise of ecological urbanism in Brussels during the 1970s. *International Journal of Urban and Regional Research, 47*(5), 792–808.
Datta, A. (2012). India's ecocity? Environment, urbanisation, and mobility in the making of lavasa. *Environment and Planning C: Government and Policy, 30*(6), 982–996.
Elassy, M., Al-Hattab, M., Takruri, M., & Badawi, S. (2024). Intelligent transportation systems for sustainable smart cities. *Transportation Engineering*, Article 100252.
Hu, L., & Xi, Y. (2023). Evaluation of effective factors in achieving ecological city in the direction of sustainable development. *Sustainability, 15*(8), 7006.
Jamal, S., Atahar, M., & Ahmad, W. S. (2025). Resilience in urban ecosystems: Interdisciplinary perspective, strategic blueprint, and innovative pathways for the cities of tomorrow. *GeoJournal, 90*(1), 18.
Jelks, N. T. O., Jennings, V., & Rigolon, A. (2021). Green gentrification and health: A scoping review. *International Journal of Environmental Research and Public Health, 18*(3), 907.
Jiang, X., Zhai, S., Liu, H., Chen, J., Zhu, Y., & Wang, Z. (2022). Multi-scenario simulation of production-living-ecological space and ecological effects based on shared socioeconomic pathways in zhengzhou, China. *Ecological Indicators, 137*, Article 108750.
Kahrobaei, A., Kolahi, M., & Anabestani, A. (2022). Impact of Socio-economic factors on the success of rangeland management plans at baharkish watershed of quchan county. *Journal of Geographical Studies of Mountainous Areas, 3*(11), 189–206.
Kalogiannidis, S., Kalfas, D., Giannarakis, G., & Paschalidou, M. (2023). Integration of water resources management strategies in land use planning towards environmental conservation. *Sustainability, 15*(21), 15242.
Kharazmi, O. A., & Taheri, F. (2019). Presenting probable scenarios in the formation of electronic city of mashhad in 2025. *Journal of Geography and Regional Development, 17*(1), 193–222.
Kolahi, M., Abdollahzadeh, A., & Noori, R. (2024a). Holistic management approach for Social-Ecological systems in Iran. *Environmental Reviews*. https://doi.org/10.1139/er-2024-0028
Kolahi, M., Jannatichenar, M., Davies, K., & Hoffmann, C. (2023). Legal conflicts among natural resources stakeholders in Iran. *British Journal of Middle Eastern Studies, 50*(1), 160–179.
Kolahi, M., Sharifi, Z., Heydari, S., & Ansari, M. (2024b). Urban water footprint in mashhad, Iran's second largest city. *Environmental Conservation*, 1–7. https://doi.org/10.1017/S0376892924000195
Lounder, K. M. M. (2025). *Defining a prepared citizen to align high school visions with community expectations: A qualitative study* (Doctoral dissertation). University of Dayton.
Lowe, M., Adlakha, D., Sallis, J. F., Salvo, D., Cerin, E., Moudon, A. V., & Giles-Corti, B. (2022). City planning policies to support health and sustainability: An international comparison of policy indicators for 25 cities. *the lancet global health. 10*(6), e882–e894.
Malekabadi, R. M., Goodarzi, M., & Jazi, F. F. (2025). Identification of factors influencing the realization of good urban governance in the city of isfahan using a futures studies approach. *Urban Governance, 5*(1), 121–131.
Malekmarzban, A., & Mofidi-Shemirani, S. (2022). Ecological urbanism by providing ecological urban design criteria in district 4 of Tehran. *Journal of Environmental Science and Technology, 22*(11), 227–245.
Mannucci, S., Kwakkel, J. H., Morganti, M., & Ferrero, M. (2023). Exploring potential futures: Evaluating the influence of deep uncertainties in urban planning through scenario planning: A case study in Rome, Italy. *Futures, 154*, Article 103265.
Meng, F., Guo, J., Guo, Z., Lee, J. C., Liu, G., & Wang, N. (2021). Urban ecological transition: The practice of ecological civilization construction in China. *Science of the Total Environment, 755*, Article 142633.
Mianabadi, A., Davary, K., Kolahi, M., & Fisher, J. (2022). Water/climate nexus environmental rural-urban migration and coping strategies. *Journal of Environmental Planning and Management, 65*(5), 852–876.
Mianabadi, A., Davary, K., Mianabadi, H., Kolahi, M., & Mostert, E. (2023). Toward the development of a conceptual framework for the complex interaction between environmental changes and rural-urban migration. *Frontiers in Water, 5*, 1142307.
Mohammadabadi, F., & Kolahi, M. (2022). Factors affecting people's engagement in the implemented natural resources plans at khorasan razavi province. *Journal of Range and Watershed Management, 74*(4), 821–835.
Nguyen, T. H., & Vu, G. H. T. (2023). Eco-city paradigm: Urban planning towards sustainable development goals. In *, 403. E3S web of conferences* (p. 01002). EDP Sciences.
Pandey, B., & Ghosh, A. (2023). Urban ecosystem services and climate change: A dynamic interplay. *Frontiers in Sustainable Cities, 5*, 1281430.
Pastor, A. V., Nunes, J. P., Ciampalini, R., Bahri, H., Annabi, M., Chikhaoui, M., & Raclot, D. (2022). ScenaLand: A simple methodology for developing land use and management scenarios. *Mitigation and Adaptation Strategies for Global Change, 27*(8), 52.
Piralizefrehei, A. R., Kolahi, M., & Fisher, J. (2022b). Ecological-environmental challenges and restoration of aquatic ecosystems of the Middle-Eastern. *Scientific Reports, 12*, 17229.
Piralizefrehei, A. R., Kolahi, M., & Fisher, J. (2022a). Evaluation of zayandehroud basin health in the Iranian plateau. *Aquatic Sciences, 84*(4), 64.
Kanaani, M. (Ed.). (2022). *The routledge companion to ecological design thinking: HealthfuL Ecotopian Visions for Architecture and Urbanism*. Taylor & Francis.
Farnhad Consulting Engineers. (2016). *Comprehensive plan of shandiz city*. Khorasan Razavi Province, Iran: Ministry of Housing and Urban Development.
Riffat, S., Ahmad, M. I., & Shakir, A. (2024). Eco-Cities: Sustainable urban living. In *Sustainable energy technologies and low carbon buildings* (pp. 259–309). Cham: Springer Nature Switzerland.
Roseland, M. (1997). Dimensions of the eco-city. *Cities, 14*(4), 197–202.
Rouhi, K., Motlagh, M. S., Dalir, F., Perez, J., & Golzary, A. (2024). Towards sustainable electricity generation: Evaluating carbon footprint in waste-to-energy plants for environmental mitigation in Iran. *Energy Reports, 11*, 2623–2632.
Sarkar, A. N. (2016). Eco-Innovations in designing ecocity, ecotown and aerotropolis. *Journal of Architectural Engineering Technology, 30*, 1–15 (March).
Sedighi, E., Salmanmahiny, A., Fath, B. D., & Daliri, H. (2024). A spatial scenario planning framework for land use decision-making: Case study of gorgan township, Iran. *Environment, Development and Sustainability*, 1–26.
Shackleton, C. M., Cilliers, S. S., du Toit, M. J., & Davoren, E. (2021). *The need for an urban ecology of the global south* (pp. 1–26). Springer International Publishing.
Slaughter, R. A. (1998). Futures studies as an intellectual and applied discipline. *American Behavioral Scientist, 42*(3), 372–385.
Tachir, G., Zencirkiran, A., & Osmanoğlu, İ. (2025). Eco-Development through ecological architecture: A case study of trakya university. *European Journal of Sustainable Development, 14*(2), 397-397.
de Vries, M., Vinke-de, Kruijf, J., & Augustijn, D. D. (2024). Design of a value-based and forward-looking framework to assess flood resilience. In *International Conference on Resilient Systems, ICRS* (p. 55). ETH Zurich.
Wang, D., Xu, P. Y., An, B. W., & Guo, Q. P. (2024). Urban Green infrastructure: Bridging biodiversity conservation and sustainable urban development through adaptive management approach. *Frontiers in Ecology and Evolution, 12*, 1440477.
Wong, T. C., & Yuen, B. (2011). *Eco-city planning. Policies, practice and design*. Springer Science+ Business Media BV..
Zorba, B. K. (2023). Eco-city tourism in smart cities for sustainability. In *Smart Cities for Sustainability* (pp. 139–150). Emerald Publishing Limited.

**Foruozan Taheri** holds a Ph.D. in Geography and Urban Planning and serves as an expert at the Living Green Empowerment Organization (Atazis). Her research focuses on sustainable urban development, particularly the integration of ecological principles into urban planning and community-based sustainability initiatives.

**Mahdi Kolahi** is an Assistant Professor at Ferdowsi University of Mashhad and a specialist in Environmental Social Informatics, with academic training from Kyoto University. His work centers on the human dimensions of conservation, addressing complex socio-environmental and natural resource challenges. He has published extensively in international peer-reviewed journals and has authored 18 books and over 80 scientific articles. Dr. Kolahi has over seven years of academic experience, including mentoring graduate students and serving as Vice-Chair of the Water and Environment Research Institute at FUM. He has played leading roles in several national and international projects, including as Lead Author for the UN's GEO-7 and IPBES assessments. Additionally, he served as the IUCN CEM Regional Co-Chair for Central Asia. Dr. Kolahi is also the CEO of the environmental NGO Atazis and has held visiting research positions at institutions such as Kyoto University and the City University of Hong Kong.