Explaining a Conceptual Model for Sustainable Regeneration of the River Valleys of the City of Tehran (Case study: *Darakeh* River Valley in Tehran)

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Abstract

The issues of loss of quality of life and functional disruption of the river valleys are very important. In the present settlement system, the river valleys should not be places for reproducing poverty. To link the environmental values with urban development, the research is to answer the following question: How can the results of the integrated development of urban valleys be achieved via urban planning? In this study, river valleys, as the case study, were divided into four zones. Then, using the VIKOR method, these zones were ranked. After that, according to the relevant index, it was confirmed that the approaches adopted in the context of the reconstruction and organization of river valleys have failed to create a stable place. Sustainable urban regeneration, comprehensive and preventive approach and action for resolving urban problems of the target area of operations, and components of an integrated conservative development approach is replaced by some purely developmental and stereotypical measures. The conceptual model of sustainable urban regeneration resulting from the theoretical and responding questions to the research question as a step forward with the goal of optimal management and policy making in the valleys are explained and suggested to enhance the quality of these sensitive areas as the natural and exclusive wealth of cities such as Tehran Metropolis.

Keywords: Regeneration; River valley; Tehran; Integrated approach; Preservation and development; VIKOR.

1. Introduction

Currently, the growing expansion of the city of Tehran has led to the destruction of gardens, agricultural lands and river valleys and has damaged the environment by contamination of soil, air, surface and underground waters. In this context, urbanization has a duty to minimize the destructive effects of urban development by deliberately monitoring the city. A sustainable city of today is characterized by development capacity in accordance with nature and the health and sustainability of urban environments can only be ensured through environmental-friendly development strategies that bring natural and urban environments to life. The main field of urban activity is the promotion of the quality of the environment and the city with the aim of improving the quality of life.

Regenerative sustainability helps us to re-conceptualize relationships among humans' technological, ecological, economic, social and political systems. Through exploration of ‘net positive’ or ‘regenerative’ development lenses and the traditional sustainability literature, the conceptualization and approaches to achieve sustainable development and ecological modernization are expanded to articulate and to explore the evolving sustainability discourse, ‘regenerative sustainability’. (Xiaoling Zhang & et al. 2015, P:1).

There are highly complex projects, which contain provisions to entire city scale, their essence is to create a superior comfort and an aesthetics positive change. (Alpopia & Manolea, 2013, P:179). the river valleys, as a type of public spaces with functional, recreational, environmental, economic and social functions, are a type of public spaces in the public domain. In addition to the role of respiratory lungs of the city and the relation of the city to nature, they are places of occurrence of social events, and act as the city's major capacities in the field of urban economics and eco-tourism.

in recent years, ecological corridors have gradually become sites that are seriously threatened by development and construction or actually broken apart. the eco-environment is deteriorated in eco-logical corridors, making it difficult to ensure effective connections between green spaces in various regions. therefore, there is an urgent need to investigate the sensitivity of ecological corridors, clarify the content of protection, and control land use changing for construction purposes, to ultimately guarantee the ecological services and bearing functions of ecological corridors. (W. Hong et al. 2017, P:317). Over the course of time, different approaches have been taken in the world and in Iran in the context of the river valleys, which, based on the type of thinking and approach, various designs and measures have been implemented in various areas of this sensitive area. considering the fact that the subject of this article is the

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revival of these special zones with the aim of raising the concepts hidden in these areas in the life of the city, the way of approaching these river valleys is a unique capacity to improve the quality of life of the citizens of Tehran, as the capital of Iran. It is because there are different aspects for the functions of these zones as they are the respiratory lungs of the city and part of the city's skeleton. The way of facing the problems and challenges of the river valleys is to make urban planning's to improve the quality of the city environment as a living area and improving the quality of life of citizens with the approach of non-governmental and governmental participation. These goals are involved in the integrated and sustainable revival of protective development.

In this paper, after presenting theoretical literature, the explanation of sustainable reproduction, conceptual model of sustainable development of the urban valleys will be presented. In the same way, the following hypothesis is also tested: "It seems that identifying the components of the revival of sustainable development of Tehran's river valleys is essential for preserving and improving the quality of the rivers as special zones, and contemporary urban planning is not compatible with this important necessity".

2. Theoretical Background and General Concepts

In this paper, studies have tried to reach a theoretical lens and achieve a new understanding of the subject. In the general view of theoretical approaches to the revival of the city valley rivers can be summarized in the following table:

Table 1
The evolution of theoretical attitudes toward the revival of the river valleys

Row	Approach	Type of interaction	Theorist
1	Protective	Rebuilding the river valley, returning to the primitive ecosystem	Gore (1985) cited by Brookes and Shields (1996) Lewis (1990), cited by Henry and Amoros (1995)
2	Functional	Full structural and functional return to pre-disruption time	Cairns (1991) cited by Brookes and Shields (1996)
3	Environmental repairing	The restoration process restores the overall structure, functions, and dynamics but independent of the behavior of the ecosystem	NRC (1992) cited by FISRWG (1998)
4	Making sustainable river valley	Dynamic balance to keep river valley and the ecosystem around it	Osborne et al. (1993) cited by Brookes and Shields (1996)
5	Distinction between repairing and recreating	Once destruction has gone beyond the ecosystem, it is impossible to repair to a default condition.	Aronson et al. (1993); Gore and Shields (1995)
6	Rehabilitation	Improved ecosystem functionality and processes in a habitat have been destroyed.	Dunster and Dunster (1996) cited by FISRWG (1998)
7	Tolerance	Restoration of parts or processes of an ecosystem to the previous state	Bradshaw (1997)
8	Environment totality and improving well-being	Restoration as a planned process	WWF/IUCN (2000)
9	Environmental integrity	Restoring the natural, environmental and biological elements of the hydrological link	Wohl et al. (2005)
10	Environmental engineering	Ecosystem design for the benefit of humans as well as the natural environment	van Bohemen (2004)
11	Political and economical	River rehabilitation and ecological coherence assessment	Jungwirth et al. (2002)
12	Spirituality	Psychological needs (opportunities for cognitive and spiritual development, recreation, a safe future for both present and future generations)	De Groot (1992) cited by van Bohemen (2004)
13	Integrated protection	Flexibility and Resistance. Current diversion in environmental integrity	cited in Jungwirth et al. (2002)
14	Sustainable development	The healthy timeframe is to supply the goods and services needed by human and non-human inhabitants	Vugteveen et al. (2006)
15	Sustainable regeneration	At the same time as protecting environmental and human values (Integrated Discovery)	Application of persistent open-cast perspectives in the debate on the recovery of the river valley

Source: authors retrieve : Simon Dufour & Herve Pe Gay, 2009

Previous studies on sustainability were often confined to environmental concerns. However, in recent studies, social, economic, and sociopolitical stability, and the role of people and their demands have become increasingly important. Therefore, the expansion of the concepts and approach to the confrontation with river valleys in this paper will be discussed as follows:

2.1. Sustainability

Sources and solutions for the main urban sustainability challenges are increasingly linked to cities (Grimm et al., 2008; Rees & Wackernagel, 1996; Tan, Wang, & Sia, 2013). In the late 1990s and early 2000s, urban

development policies and practices underwent radical reconstruction: resources have been reintroduced into urban development and at the same time manifested itself in urban sustainability discourses (Bramley & Power, 2009; Dickinson, 2005; Krueger & Buckingham, 2012; Vigar, Graham, & Healey, 2005; Warnby, Bennison,). Cities are centralized consumption centers that are dependent on the production capacities of ecosystems even beyond their urban boundaries and are responsible for many local and global environmental issues. These issues are not only taking place in cities, but also in rural and industrial areas, where energy and materials are acquired through urban life and absorb their waste (Bithas & Christofakis, 2006; Grimm et al., 2008; Paloheimo & Salmi, 2012). This is not a new concept: nearly 20 years ago, Rees and Wackernagel (1996) concluded that urban policies should try to reduce energy consumption and urban-related materials extensively. Similarly (Grimm et al., 2008), it has been argued that as environmental impacts develop as a result of our understanding of environmental issues on a larger scale and the effects of more personal and collective lifestyles, elections and actions increase.

2.2. Protection and development

The urban development process promotes higher urban densities and increases business services, but it is hard to contribute to environmental sustainability. More development in cities, as it focuses on consumer centers, makes them more efficient and appropriate, but it has been incapable of protecting natural and environmental wealth. Protecting, rehabilitating and reusing urban cultural heritage and critical and vital areas are among strategic measures designed to achieve sustainability for cities (Conference of Small Cities and Sustainable Cities in Europe, 1994). The tourism industry is a key economic sector in the world and is considered as an activator of urban physical and social modernization (Lew, 2007; Owen, 1990). In general, rural areas are not common tourist destinations unless they are located in special tourist networks. Nevertheless, rural areas can offer specific destinations as cultural environments that have attractive power to attract tourists with whom they have a sincere connection.

2.3. Sensitive areas

Sensitive areas generally point to ecological factors and mechanisms that play a key role in the overall environment of a region (Lu et al., 2013; Jennings and Reganold, 1991). These elements have poor ability for internal or external interference and self-healing (Yan et al., 2009). Sensitive areas, along with the most severe environmental changes, also have environmental problems.

2.4. Environmental corridors

environmental corridors should be considered as a priority for conservation and construction in the environment. From a practical point of view, the core of environmental corridors examines the relationship between organisms and the landscape, regardless of urban areas (Ramiadantsoa et al., 2015; Ottoman Palmisano et al., 2016). In addition, environmental corridors cover environmental services such as water conservation, pollution control and the reduction of the effects of global warming (Bryant, 2006; Haaren and Reich, 2006).Therefore, the urgent need to examine the sensitivity of environmental corridors, clarifying the contents of the protection and control of land use change for construction purposes is ultimately necessary to ensure environmental services and rehabilitate the functioning of environmental corridors in urban environments.

2.5. Sustainable urban regeneration

Regeneration means growing or leading to the re-growing of the things, being re-energized or re-energized and rejuvenated, and sustainable urban regeneration is an interdisciplinary category in knowledge, research, public policy, and practice. It includes elements of urban planning, urban infrastructure, political economy, urban design, urban tourism, local community development, cultural development, etc. Sustainable urban regeneration is an important part of macroeconomic policies and responds to the challenges posed by urban degradation. It has been formed to promote the quality of urban life permanently. A series of activities are aimed at reversing the economic, social, physical, environmental, and management decline that seeks to achieve sustainable restoration in conditions of residents, local communities and places that suffer from various deprivations (Andrew Tallon, 2009).

Sustainable urban regeneration means a comprehensive and integrated approach to solving urban problems in the target area that has long-term, strategic objectives beyond the goals, aspirations and achievements of urban renewal, urban development and urban restoration. It involves economic, social and environmental reengineering and re-creation, and integrates the city-region into the goals of sustainable development and restores economic activity, restores social performance and restores environmental qualities (Andrea Colantonio and Tim Dixon, 2011).

Sustainable urban regeneration is a look to the past and without clearing the historical identities of different periods to create a new identity in line with the living conditions of today's people and a comprehensive concept means improving the status of deprived areas in the economic, physical, social and cultural aspects.

Bearing in mind that in recent years the debate on "sustainable restoration " has been confirmed in policy and institutional terms and traditional themes such as basic needs (i.e. housing and health, education and training, justice, poverty reduction and vitality) have become increasingly more complete or they are replaced with certain concepts, such as identity, sense of place and culture, the empowerment of partnership and access, health and security, social capital, prosperity, happiness, quality of life, physical re-development and the interests of social networks, and, in other words, soft goals against hard goals (Colantonio & Dixon, 2011).

2.6. Sustainable urban regeneration with integrated approach

The crisis facing today's society requires solutions and new

strategies that will lead to the transformation of urban areas. Sustainable urban regeneration means improving the quality of life and investing in the future; this is a very broad and necessary exercise, although it is still hard and impossible.

Table 2
A quick view of the table of sustainable regeneration

Title	Descriptions
Definition	Comprehensive and integrated policy for the prevention and solving of urban problems in all economic, social, environmental and physical dimensions in a way that promotes the livability of cities and the quality of life of citizens. Urban regeneration involves a network of measures and plans that are flexible on a variety of spatial scales and on the path to sustainable development goals, and at all levels of maximum participation, all actors and stakeholders, especially people, are brought to the public.
Goals	Social harms reduction, integration of urban networks, forecasting and preventing the reproduction of poverty, reduction of urban poverty, promotion of urban identity and dignity of the place, increase the tolerance of the cities, improving urban governance, sustainable conservation of tangible and intangible heritage and protection of ecosystems
Process principles	Adoption of spatial and strategic perspective for recognizing and confronting urban challenges, creating a city attitude, defining a vision, defining operational objectives, building collaborative, learning and inclusive networks, connecting top to bottom programs and bottom to top programs, fair distribution of resources and continuous monitoring and evaluation
Emphases of sustainable urban renewal	Reduction of urban poverty, promotion of urban tolerance, realization of urban governance, promotion of location identity and dignity
The main forces leading the sustainable urban regeneration process	Government (policymaker, facilitator, advocates, observer and controller on a national scale), private sector, public organizations (charities, community-based organizations, non-governmental organizations, sports practitioners, artists, associations, faith-based organizations, government-run

Source: The authors, adapted from Tehran's Urban Restoration and Renovation Organization, winter 2017

For many years, the social crisis has profoundly affected the construction industry and the housing market and has stopped investing in public infrastructure and unemployment. To overcome it, research, legislative proposals, and policy formulation have led to the transformation and rehabilitation of urban areas, environmental protection and prospects, and prevented the loss of other areas of sustainable development objectives as a basis for all policies and strategies. Therefore, common agricultural policies, uniting policy, community policy in research and development, transport policy and energy and telecommunications policies, environmental policy and housing policy all are based on the principle of sustainable development (Albu, 2006).

The process focuses on addressing the city's major issues that, in order to meet the quality standards of deprived communities, will benefit the current and the future population with the goal of solving urban problems and find a long-term improvement to the economic, physical, social and environmental aspects of a region. The most important principles of urban regeneration are the need to establish clear and measurable goals of the process of urban regeneration and, with regard to the goals of sustainable development, proper analysis of local conditions to be conducted. In addition, the need for effective use of the natural economy, economic resources and human resources, participation and collaboration among stakeholders must be put ahead, which will improve the physical condition of buildings, social structure, economic base, and environmental conditions. (Roberts & Sykes, 2000, P: 17-18)

Urban regeneration is an opportunity to solve problems such as the lack of identity of the residential area, massive loss of green spaces, the lack of public spaces and high population density, which leads to the environmental quality issues. The term urban regeneration is synonymous with urban redevelopment or urban renewal. In this way, the term operates on a set of principles and contributes to the sustainable development of cities.

Urban regeneration with an integrated approach to protectionist development involves the restoration of unsustainable urban areas through certain actions, such as reconstruction of historic areas, improving living conditions in residential areas, rehabilitating public spaces, urban furniture, modernizing urban infrastructure of water, gas, electricity, transport infrastructure, etc. A sustainable urban regeneration project can only be achieved through collaboration between institutions, universities, municipalities, environmental associations and creators. Urban rehabilitation measures are based on social, economic and technical reasons. (Alpopia & Manolea, 2013, p. 179)

Today, urban development and protection covers a wide range of social, economic, cultural, environmental and management considerations, and, on the other hand, it continues to emphasize the integrity of the body and content. Due to the continuous interaction of the concepts of sustainable urban development, the protection of natural heritage, rehabilitation, social support in the field of education, participation, promotion of tourism and the organization of cultural events, it can be referred to as an integrated approach to development and protection. (Lotfi, 2012, P:267), Indeed, the need to take into account development capacities and potentials is essential in order to achieve sustainable development.

3. Recognition and Analytical Data

Natural elements, as potentials, create sets of newest landscapes to the worst natural sceneries by combining human-made spaces. River valleys as green spaces and natural lungs act as corridors for the transfer of air and self-cleaning of air around them.

The regeneration of natural elements, especially the river

valleys, is crucial for the sustainable role of the green infrastructure and respiratory system in the city and its equipping with collective life. Looking at the history of these river valleys in Tehran, one can mention the role of these natural elements of space, such as leisure time, social interaction of the inhabitants, and suitable places for business and economic activities. Now that these places are at stake due to demographic and physical changes, there needs to be an appropriate solution to prevent further degradation. To achieve the minimum sustainable development, there needs to be a creation of the role of the river valleys for regeneration of economic, social, physical, environmental and administrative purposes.

Over the past few decades, Tehran has faced significant increases in population. This increase in urbanization was followed by the use of land for urban housing, regardless of environmental capacities. This has had adverse consequences and degradation of the environment in Tehran and has disturbed the balance between the city and the environment. Urban valleys as elements of the ecological structure of cities can play an effective role in creating an equilibrium between the human space of the city and the nature, but the widespread use has caused pressure to the nature. This has led to the destruction of trees and vegetation and caused water pollution. Therefore, the creation and increase of recreational places, planning of natural environments in order to preserve and restore natural ecosystems and optimal utilization of them is absolutely necessary.

3.1. Introduction to the river valleys of tehran

The northern boundary of Tehran is in a distance of about 40 kilometers along the slopes of the Alborz Mountains. In this area, there are several valleys that extend from the southern slopes of Alborz to the city of Tehran. On the other hand, the existence of water in most of the year, which is due to precipitation, creates rivers in the valleys, and thus we see the presence of rivers that flow from the northern quays and after the passage from Tehran to the southern desert of the city. These valley rivers flow in the city while there is no river passes through this city. The most important river of the valleys of Tehran from east to west are Lark, Darabad, Jamshidieh, Goladdareh, Darband, Velenjak, *Darakeh*, Farahzad and Kan.

These nine river valleys with beautiful mountain cliffs, green slopes and orchards, indigo skies, clean air, springs and flowing water have made unique places in Tehran (Pourjafar, 2004). They are among the most important promenades of the citizens of Tehran, so that the mountains of northern Tehran, Darband, *Darakeh* and Velenkak are used by most people of Tehran for leisure activities.

Among the most important advantages of the river valleys are the following (Bemanian, 2008, p. 6-7):

Providing fresh water resources, the natural corridor of the flow of water and air, creating tourist spaces and gathering places for different ceremonies, creating green spaces and air filters, creating new landscapes by integrating the natural environment and elements and making and upgrading the quality of the urban environment.

However, the river valleys, in addition to the benefits that they have, can be a source of fundamental problems if they are not properly used, including:

Development of high density construction in the adjacent valleys, lack of anticipation of river limits, conductivity of surface waters and urban sewage to them and cause pollution of the valleys, discharge of waste within the valley, destruction of natural elements, and flood occurrence and urban inertia.

3.2. Introducing the research scope

Darakeh River Valley begins from the northern and southern stretches of the northern mountains of Tehran and goes to the village of Derekah and ends up in the south in Goftegoo Park. Along the shaft, it crosses the neighborhoods of Shahrak-e-Gharb, Saadat Abad, Mulla Sadra, and Kooye Nasr. Expansion and extension of the development course along the entire Evin Corridor, in parts of this axis, there are areas such as green spots and gardens that are for environmental protection. In other parts of the axis, such as the developmental urban matrix, there is development tendency and it is proposed to be in the range of combining the two approaches.

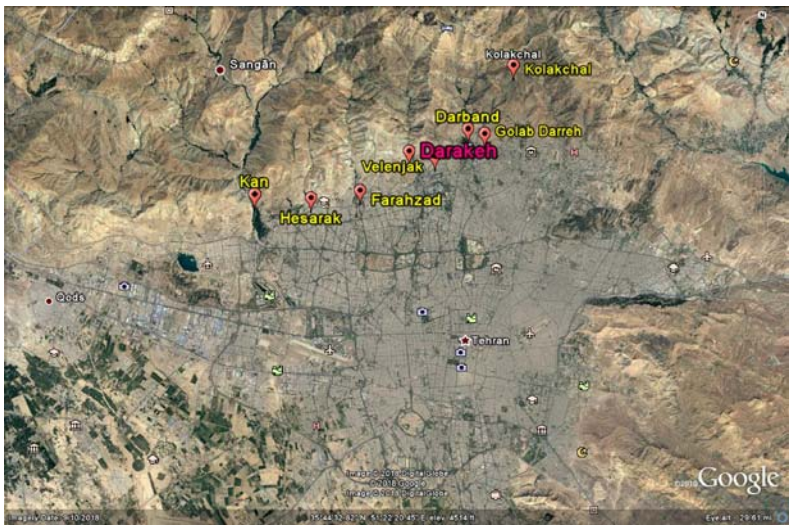


Fig. 1. Locations of Tehran's river valleys

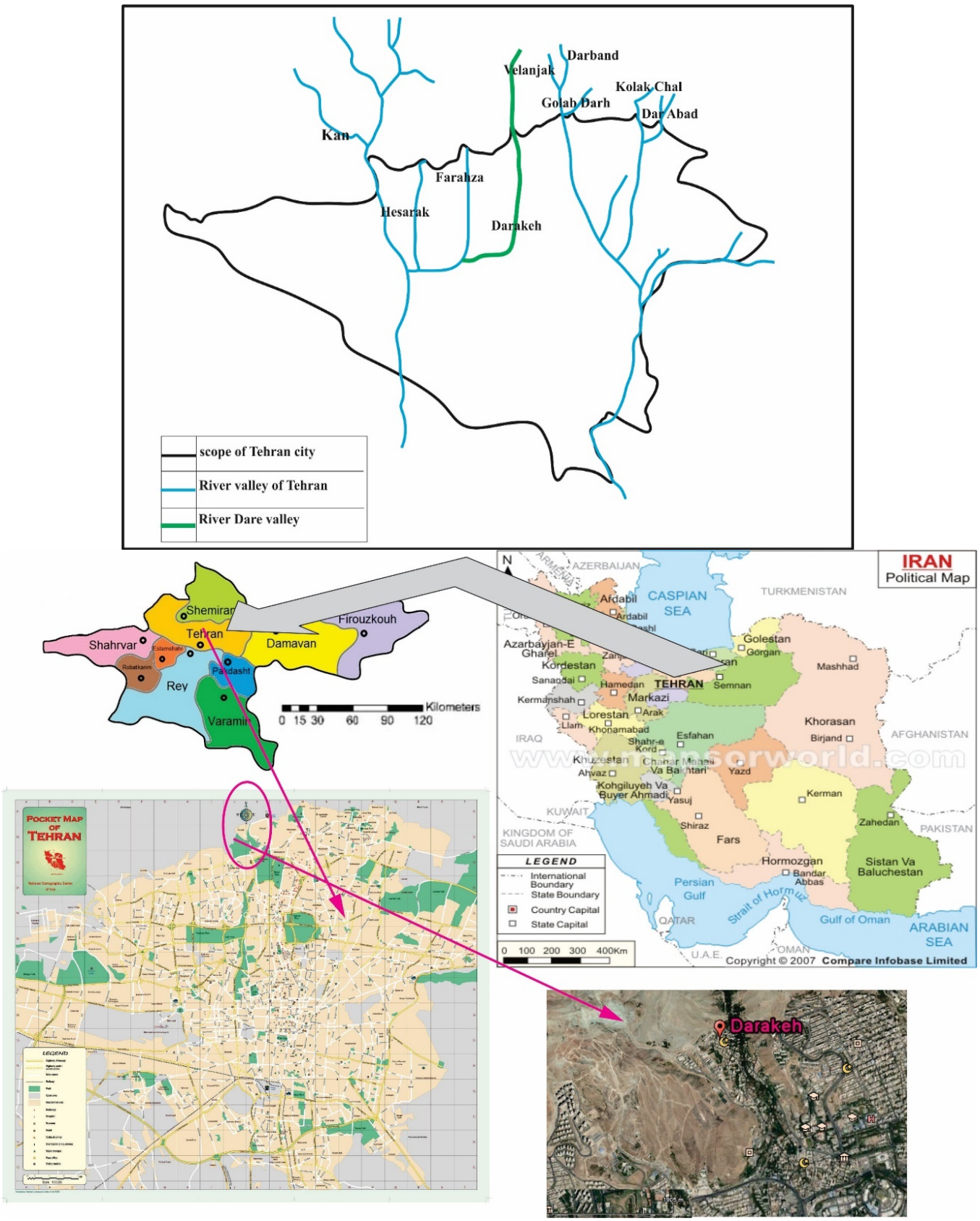


Fig. 2. The location of *Darakeh* River Valley

Table 3
Identification of components, approaches, principles, criteria and indicators of urban sustainable regeneration of river valleys

Component	Principle	Emphases	approach	Criterion	Sub-criterion	Index	Measurement	Target
Environmental	Creating a Strategic Space Attitude in Understanding and Facing Urban Challenges	Protecting the ecosystems and protecting the river valley in the face of accidents	Protection	Protecting Environmental Values	Natural corridors of flow of weather	Water	Free stream of water	Improving the city's tolerance
						Air	Free flow of air	
				Reducing pollutants	Preventing the sewage from entering the river valley	Sewage entrance to the river valley	Number of sewage systems	
			Development	Vegetation	---	Green space	Area of green space to the total available area	
Economic	Fair distribution of resources	Reducing urban poverty by empowering residents in target areas	Protection	Improve activities in combination with natural potentials	Identification and support existing investments	Eliminating investment barriers	Capacity for investment	Preventing regeneration of poverty
			Development	Creation and development of tourism economy	Profitability, Innovation and Entrepreneurship	Economization of places as an optimal use of natural wealth	Spaces with economic development capabilities	
Social	Creating and integrating collaborative networks	Protecting values in target areas and revitalizing and promoting social cohesion of residents	Protection	Promoting quality of life	Collective memorial places	Increasing the sense of belonging to the place	Durability in the atmosphere	reducing social harms
			Development	Lifestyle enhancement	Placemaking	Giving the place identity	Location of the occurrence of events	
Physical	Promoting Urban Identity and Dignity	Protection of intangible and tangible heritage in specific areas and zones	Protection	Promoting location identity and dignity	Increasing safety and security	Protecting wildlife	Creating public areas of activity in combination with the natural environment	Establishing urban-based attitude
			Development	Development of open spaces and urban infrastructure	Livability	Development of leisure-time spots and eco-tourism	Developable arenas	
Managerial	Realization of urban governance	Protection of tangible and intangible heritage	Protection	Good governance to protect sensitive areas	Education and training	Space Justice	Available facilities	Connect programs from bottom to top and from top to bottom and monitor and evaluate continuously
			Development	Active Location Management	People's participation in all stages of the process of sustainable regeneration from idea to implementation	Use of collective and social assets	Legislation, Implementation and Supervision	

4. Findings of Descriptive and Analytical Discussion

Explaining the conceptual model of sustainable regeneration of urban valleys with an integrated protection-based development approach.

Sustainable urban regeneration (SUR) is a useful tool for displaying urban rehabilitation projects. It involves both procedural and balanced multidimensional considerations (outcomes and effects). Urban development beyond the development and engineering efficiency in terms of time, cost and delivery of the project. Sustainable regeneration projects are based on local roots and aesthetic identity and include multiple and complex objectives that provide a conceptual model and identification table for sustainable regeneration of urban river basins and provide criteria for the integrated protection-based approach, as explained in the following.

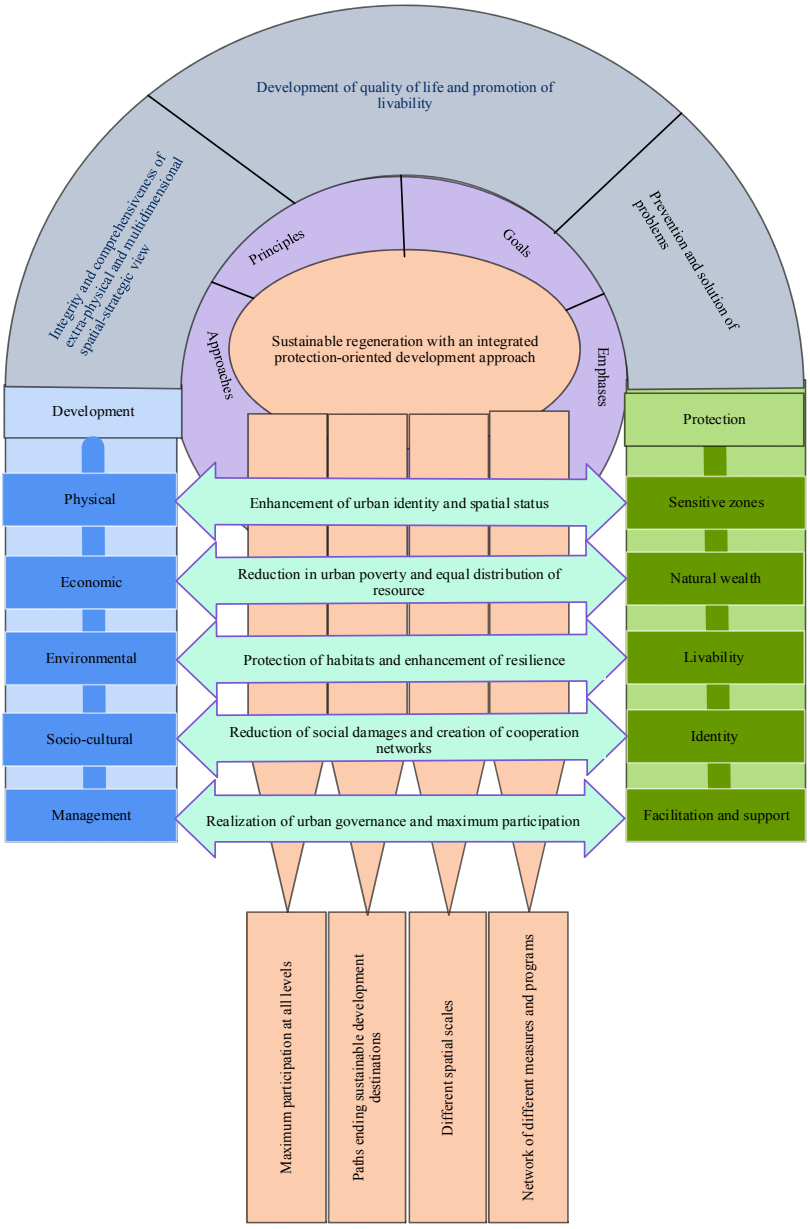


Fig. 3. Conceptual model of sustainable development of urban valleys with an integrated protection-based development approach
Reference: authors

Table 4
Research Methodology

Row	Research methodology	Data collection tools	Desirable results
1	Content analysis: A survey of research on the river valleys of Tehran	Library - Documents	Extracting the components of urban regeneration and improvement of urban valleys and the incompatibility of contemporary urban planning with the above-mentioned components.
2	VIKOR	Document studies	Achieving one or more competing strategies for an issue with conflicting metrics

5. Methodology of Research

In order to provide the necessary explanations in the research methodology, according to the research question, attempts have been made to examine the stages of work and how to test the hypothesis. In order to study the hypothesis that "it seems that identifying the sustainable regeneration components of Tehran's river valleys is necessary for maintaining and improving the quality of these particular zones, and contemporary urbanism is not compatible with this important necessity", there are put emphasis on identification, indexing, functional definitions, and analytical data.

The method used in this research includes the steps as follows:

5.1. ***Darakeh*** *river valley*

In this research, *Darakeh* River Valley is divided into four zones as follows.

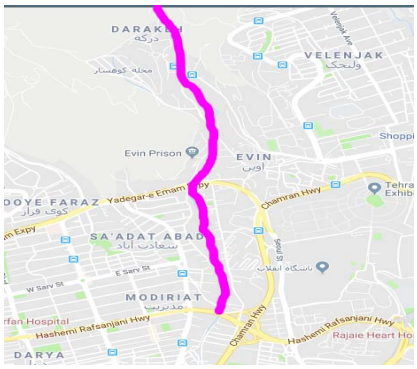
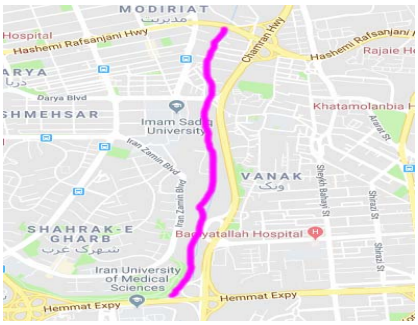
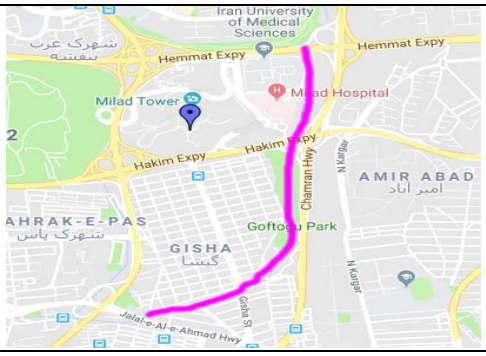
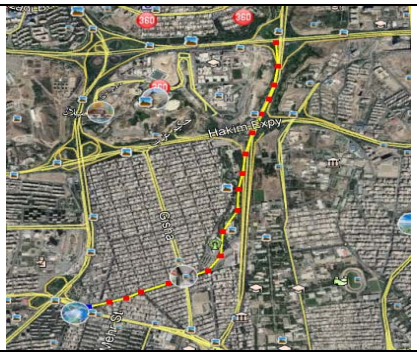
Area 1 The length: 5022 meters Range : From mountain to the beginning of *Darakeh* Village		
Area 2 Length: 3980 meters Range : The beginning of *Darakeh* Village to Hashemi Rafsanjani Hwy		
Area 3 Length: 3080 meters Range : Hashemi Rafsanjani Hwy to Shahid Hemmat Highway		
Area 4 Length: 3107 meters Range: Shahid Hemmat Highway to Jalal Al-e-Ahmad Highway		

Fig. 4. Mapping the *Darakeh* River Valley Source:Google Earth Pro

5.2. Conducting the VIKOR technique step-by-step

The VlseKriterijuska Optimizacija I Komoromisno Resenje (VIKOR) method was developed by Serafim Opricovic. VIKOR is an agreed Multiple Attributive Decision Making (MADM) method. This method is one of the optimization methods in multi-dimensional decision-making. For doing the steps in the Wizard, the Expert Choice 11 and Microsoft Excel 2016 have been used.

The VIKOR Technique is a useful tool for multi-criteria decision-making, especially in conflict situations, where decision makers cannot easily make decisions due to contradictory behaviors.

This method is used to achieve one or more adaptive strategies for an issue with conflicting metrics. Therefore, it can help the decision makers to reach a final decision. Decision makers will agree upon the agreed reconciliation strategy. Under this strategy, the group's utility with maximum (Si) and individual effects with the minimum (Ri) is made.

This method can provide a maximum benefit group for a majority and an individual minimum for opposition.

In this method, only the ideal solution is considered, and the option that has the least distance to this solution is considered as the preferred option.

Like the TOPSIS method, this method is used to rank the options based on different criteria (especially the opposite and with different measurement units). This is similar to the TOPSIS technique, with the difference that the Technique for Order-Preference by Similarity to Ideal Solution (TOPSIS) method was chosen to have the greatest distance from the negative ideal, which made it possible to get away from the positive ideal and this is considered as a defect.

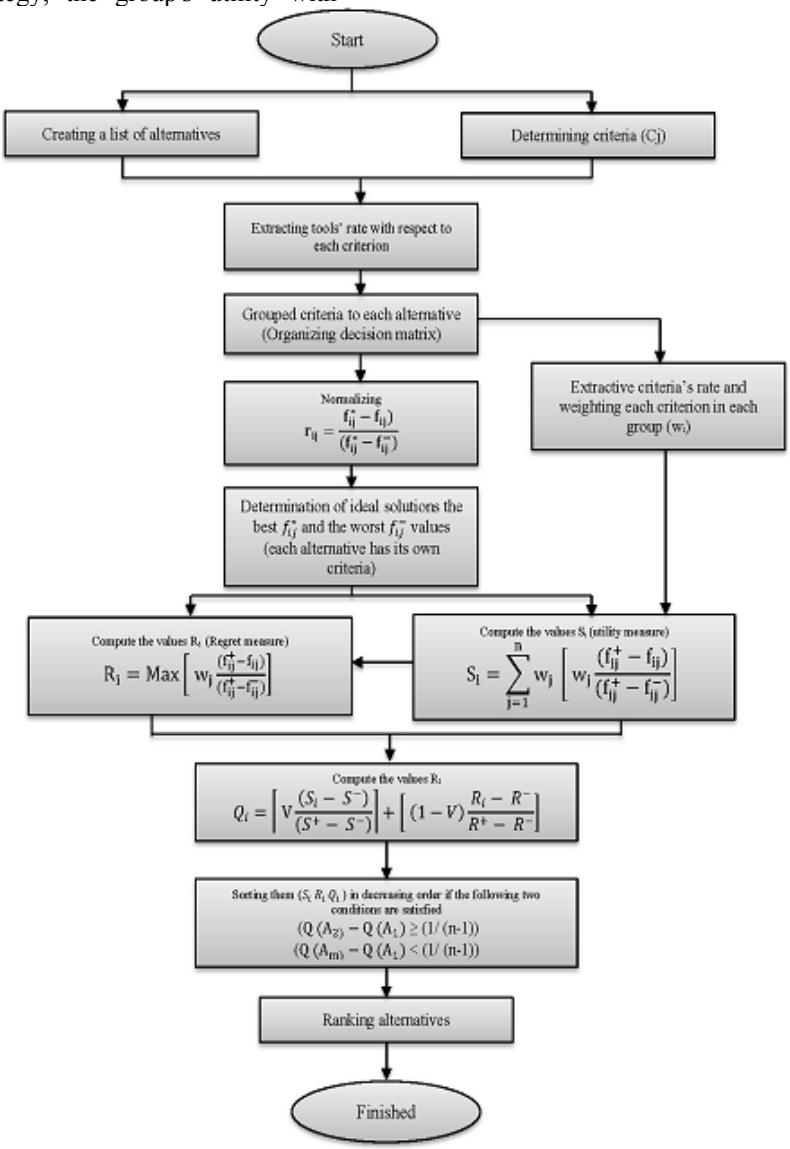


Fig. 5. Diagram of modified VlseKriterijuska Optimizacija I Komoromisno Resenje (VIKOR) technique (Anvari et al., 2014)

5.2.1. Formation decision matrix

Considering the explanation of the sustainable development of the river valleys in the previous sections of the present paper, and the division of *Darakeh* River Valley into four zones, and the ranking of the measures resulting from the sustainable regeneration components of the decision matrix is formed. It is worth noting that the points entered in the table are based on the use of information in the maps (the amount of green space to the total available area), field visits (the environment for investment) and using information available in databases (days of air pollution in the studied areas); the result is presented in the following table.

Table 5
Matrix of the measured measurements

Component	**Environmental**				**Economic**		**Social**		**Physical**		**Managerial**	
Measurement / Zone	Free flow of water	Free flow of air	No. of sewage systems	Area of green space to the total area available	Capacity of the area for investment	Spaces with economic development capabilities	Increasing the sense of belonging to the area	Giving identity to the area	Protecting wildlife and river valleys	Development of leisure-time spots and eco-tourism	Available facilities	Legislation, Implementation and Supervision
1st zone	8	0.565	4	6	3	4	5	3	6	7	6	5
2nd zone	6	0.438	6	5	6	6	4	4	6	6	7	7
3rd zone	6	0.406	6	4	6	9	3	4	4	4	5	4
4th zone	5	0.371	7	4	5	8	5	3	5	5	5	6

5.2.2. Weighting the measurements

- **Shannon's entropy significance coefficient**

The concept of entropy has been widely employed in numerous fields of research e.g., social sciences, economics, physical sciences, etc. based on a mathematical theory of communication proposed by Claude Shannon (1948). The proposed concept can be effectively employed in the process of decision making because in information theory it can be considered as a criterion for the degree of uncertainty represented by a discrete probability distribution, and it measures existent contrasts between sets of data and clarifies the average intrinsic information transferred to the decision maker (Hafezalkotob and Hafezalkotob 2016a). Normalization of x ij to determine p ij which is the total project outcome. (Dos Santos et al.,2018)

Table 6
The overall table of options (alternatives) and indicators for the evaluation of indicators

Indicators / **Options**		indicator n C_n		indicator 2 C_2	indicator 1 C_1
Option 1 :	A_1	$\boldsymbol{r_{1n}}$	. . .	$\boldsymbol{r_{12}}$	$\boldsymbol{r_{11}}$
Option 1 :	A_2	$\boldsymbol{r_{2n}}$	. . .	$\boldsymbol{r_{22}}$	$\boldsymbol{r_{21}}$
	.	.	.	.	.
	.	.	.	.	.
	.	.	.	.	.
Option m :	A_m	$\boldsymbol{r_{nm}}$	. . .	$\boldsymbol{r_{n2}}$	$\boldsymbol{r_{n1}}$

Step 1: Normalize the decision matrix by defining

$$P_{ij} = \frac{r_{ij}}{\sum_{i=1}^{m} r_{ij}}; \forall i.j$$

Step 2: Calculate the entropy of each preference

$$E_j = -[\ln(m)]^{-1} \sum_{i=1}^{m} \left[p_{ij} ln p_{ij}\right]; \forall j$$

Step 3: Determine the degree of discriminability for each preference as

$$d_j = 1 - E_j; \forall j$$

Step 4: Compute the weights associated with each preference as

$$w_j = \frac{d_j}{\sum_{j=1}^{n} d_j}; \forall j$$

Table 7
Indicator Weighting by Shannon Entropy

Options \ Indicators	Legislation, Implementation and Supervision	Available facilities	Development of leisure-time spots and eco-tourism	Protecting wildlife and river valleys	Giving identity to the area	Increasing the sense of belonging to the area	Spaces with economic development capabilities	Capacity of the area for investment	Area of green space to the total area available	No. Of sewage systems	Free flow of air	Free flow of water
1st zone	5	6	7	6	3	5	4	3	6	4	0.565	8
	0.227	0.261	0.318	0.286	0.214	0.294	0.148	0.15	0.316	0.174	0.317	0.32
	-1.48	-1.34	-1.146	-1.25	-1.54	-1.22	-1.91	-1.9	-1.15	-1.75	-1.15	-1.14
2nd zone	7	7	6	6	4	4	6	6	5	6	0.438	6
	0.318	0.304	0.273	0.286	0.286	0.235	0.222	0.3	0.263	0.261	0.246	0.24
	-1.15	-1.19	-1.298	-1.25	-1.25	-1.45	-1.51	-1.2	-1.34	-1.34	-1.4	-1.43
3rd zone	4	5	4	4	4	3	9	6	4	6	0.406	6
	0.182	0.217	0.182	0.19	0.286	0.176	0.333	0.3	0.211	0.261	0.228	0.24
	-1.7	-1.53	-1.704	-1.66	-1.25	-1.74	-1.1	-1.2	-1.56	-1.34	-1.48	-1.43
4th zone	6	5	5	5	3	5	8	5	4	7	0.371	5
	0.273	0.217	0.227	0.238	0.214	0.294	0.296	0.25	0.211	0.304	0.208	0.2
	-1.3	-1.53	-1.483	-1.44	-1.54	-1.22	-1.22	-1.39	-1.56	-1.19	-1.57	-1.61
SUM	22	23	22	21	14	17	27	20	19	23	1.78	25
K	0.721	0.721	0.721	0.721	0.721	0.721	0.721	0.721	0.721	0.721	0.721	0.721
E	0.985	0.992	0.985	0.99	0.992	0.985	0.969	0.976	0.989	0.986	0.99	0.989
D	0.015	0.008	0.015	0.01	0.008	0.015	0.031	0.024	0.011	0.014	0.01	0.011
w	0.087	0.047	0.087	0.058	0.047	0.087	0.18	0.14	0.064	0.081	0.058	0.064

Reference: authors

- **Weighting of measures by entropy and incremental power**

$$\lim_{K\to\infty} \frac{A^k * e}{e^T * A^k * e}$$

Table 8
The weights of measurements by entropy and incremental power

Row	Measurements titles	Weight by entropy	Weight by incremental power
1	Free flow of water	0.064	0.064
2	Free flow of air	0.059	0.059
3	No. Of sewage systems	0.081	0.08
4	Area of green space to the total area available	0.061	0.063
5	Capacity of the area for investment	0.141	0.14
6	Spaces with economic development capabilities	0.183	0.178
7	Increasing the sense of belonging to the area	0.088	0.095
8	Giving identity to the area	0.044	0.047
9	Protecting wildlife and river valleys	0.056	0.055
10	Development of leisure-time spots and eco-tourism	0.089	0.086
11	Available facilities	0.046	0.049
12	Legislation, Implementation and Supervision	0.089	0.085

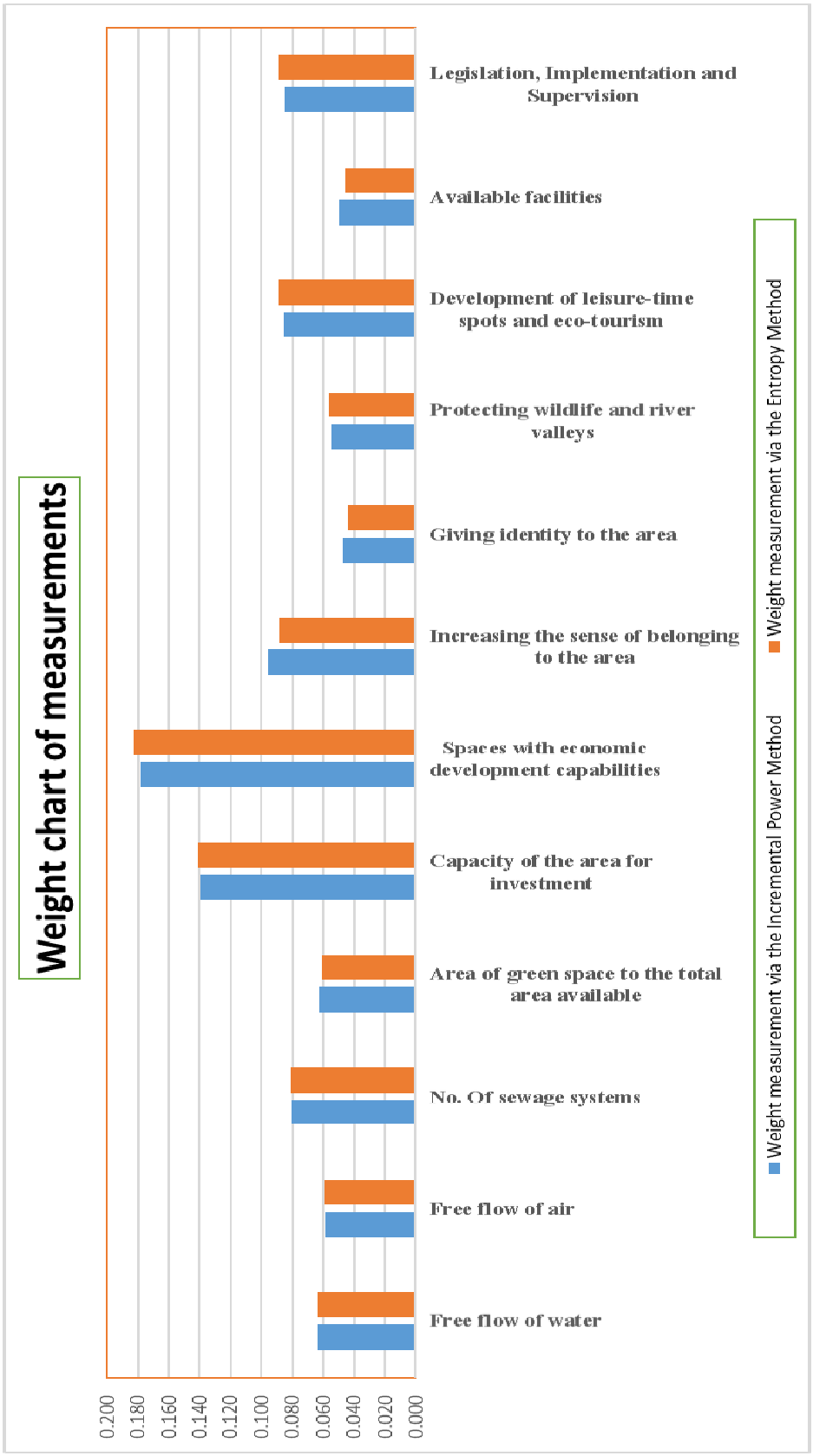


Fig. 6. Weighting of measures by entropy and incremental power

In the entropy method, the initial weighing is defined for the measures, and then the gain is improved by applying the incremental weighting method and becomes closer to reality.

5.2.3. Formation of normalization matrices

Table 9
Table of normalization of measures

Component	Environmental				Economic		Social		Physical		Managerial	
Measurement / Zone	Free flow of water	Free flow of air	No, of sewage systems	Area of green space to the total area available	Capacity of the area for investment	Spaces with economic development capabilities	Increasing the sense of belonging to the area	Giving identity to the area	Protecting wildlife and river valleys	Development of leisure-time spots and eco-tourism	Available facilities	Legislation, Implementation and Supervision
1st zone	0.000	0.000	0.080	0.000	0.000	0.178	0.000	0.047	0.000	0.000	0.025	0.056
2nd zone	0.042	0.038	0.027	0.031	0.140	0.107	0.048	0.000	0.000	0.029	0.000	0.000
3rd zone	0.042	0.048	0.027	0.063	0.140	0.000	0.095	0.000	0.055	0.086	0.049	0.085
4th zone	0.064	0.059	0.000	0.063	0.000	0.036	0.000	0.047	0.027	0.057	0.049	0.028

5.2.4. Calculation of R, T and Vicar (Q)

Table 10
VIKOR indexes

Based on the amount of **S**		Based on the amount of **R**		Based on the amount of VIKR	
S		**R**		**Q**	
A4	0.690	**A2**	0.178	**A4**	0.928
A3	0.462	**A4**	0.140	**A2**	0.542
A2	0.430	**A3**	0.140	**A1**	0.5
A1	0.386	**A1**	0.064	**A3**	0.167

The optimal answer is the answer that has the lowest Q if two of the following conditions are met.

1. Acceptable advantage in the sense that a reconciliation strategy should have a significant difference with its next solution. In other words, $Q(a^m) - Q(a') \geq \frac{1}{m-1}$

2. Acceptable stability in the decision-making process of the chosen reconciliation strategy has maximum group utility and the least individual efficacy. Alternatively, the selected alternative should have the highest rank in the rank list of R or S or both.

Such a settlement of the agreement remains constant in the decision-making process.

If one of the two conditions is not present, a set of agreed solutions is suggested. In other words, in the above question, the condition is a defect. We will continue to answer for the next ranges, so that the good thing happens first.

With the implementation of the above algorithm, the ranking zone in the field of sustainable recovery is as follows:

$$A_1 > A_3 > A_2 > A_4$$

Area A_1 is placed above all with the following two conditions.

Considering the significant difference in the results regarding the weight of the components and the final rankings obtained using the VIKOR index, it has been proved that contemporary urbanization is not compatible with the sustainable regeneration of urban valleys.

6. Discussion and Conclusion

In the present settlement system, the urban valleys should not become places to reproduce poverty and in practice should not become an anti-development process. They rather should be stimulus. The decline of quality of life in the city valley, functional deprivation of urban resilience focuses our attention. The river flows into the valleys as spaces of the city, with areas that have talents, capacities, potentials, capabilities and special sensitivities.

The perspectives of sustainable regeneration to the river valleys for identification and analysis in cities that have suffered from many problems and disorientations due to their high interpersonal and high physical, biological and human heterogeneity were more appropriate than other approaches and could provide better solutions for improvement. Provide the natural conditions of the cities according to the structure of that city. However, until now, this look has often been done with a landscape

ecology approach. An ecological and quantitative dimension is much more important than other dimensions, while in the urban structure, the ecological dimension is only one component, and a slightly weighted look to the city is not an efficient way to create and improve the ecological network.

The objective of sustainable urban regeneration with integrated approach and protection of the linkage of environmental values is to protect altitudes above 1800 meters, the consolidation of human-nature transplantation, the improvement of the quality of urban life and the regulation of human relations, technology and nature, and conservation and revitalization of the river. The valleys are for the creation of a sustainable site, the diversity of recreational and sporting environments, and the management of floods and the prevention of natural disasters, including the occurrence of floods.

In this paper, after studying the subject literature, the integrated approach of protectionist development in the river valley was suggested with the aim of promoting the city river valleys of Tehran as sensitive areas. As a result, improving the quality of life in the city of Tehran was proposed and the conceptual model of the sustainable rehabilitation of the urban valleys resulted from the field Theoretical and responding questions were explained to the research question.

Darakeh River Valley, as a case study, was divided into four zones. Then, it was decided to identify the sustainable restoration components of the valley. Then, using the VIKOR technique, the ranking of the zones was carried out and, given the considerable difference in the results, the weight of the components and the final rankings obtained using it was proved from the VIKOR Index that contemporary urbanism is not compatible with the sustainable restoration of urban valleys. Therefore, the approaches adopted in the context of the reconstruction and organization of the rivers have failed to create the stable location of these sensitive areas, and in conjunction with the city of Tehran, and as a result of the upgrading, the quality of life of the citizens faces a huge impact.

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