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Riparian reclamation and its importance in the designing of a city with a biophysical approach

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Abstract---Throughout history, it has been seen that all the civilizations have settled down at the side of the rivers and fertile regions of this earthly planet. Villages have always featured very auspicious climates so that mankind could think about expanding his territory and transforming villages into present-day city forms. However, following the increase in the number of the cities and the increasing daily expansion of the population, changes were being more frequently made in nature, and mankind started deploying himself in a battle with nature every day more than the day before. River valleys are among these natural regions that were always raided more than other spaces by human beings due to their possession of abundant potential and suitability as habitats for a diverse variety of plants and animals. As the primary veins of the environment's survival, the river valleys accommodate many plant and animal species. With the population growth and decrease in the area of land suitable for living, river valleys were turned into human dwelling places for their high potential. These places have been cheerful and lively spaces in the past times, but they have currently become the dumping sites for the urban wastes and garbage. Most Iranian cities cannot be excluded from this rule. The increase in the population, the formation of cosmopolitans, and the subsequent decrease in the appropriate livable places set the ground for the abuse of the river valleys.

Keywords---*riparian, urban design, biophysical approach.*

Introduction

The intact natural spaces in the vicinity of and inside the cities are natural potentials, and the ecological continuation and persistence of the cities depend on their rich resources (Camacho, R., et. al., 2020; Karagodin, V. P., et. al., 2020). Most of these natural precincts are on the verge of destruction due to the absence of proper design and correct management, and the natural resources are gradually diminishing. The ecological design of these natural spaces can supply the cities with natural potential and provide the people residing in the cities and even the suburbs with tourism attractions. Amongst these natural spaces, urban waterways and rivers can be pointed out. Still, it must also be mentioned that they have been subjected to intensive destruction and abuse in recent decades. In any case, the natural structure of the rivers has been severely subjected to cities' expansions; hence there is a need for special environmental reconsiderations. Therefore, besides the tourist attraction methods, the urban structure enhancement should be considered when designing proper entrance ways to the river valleys.

One of the important and distinct properties of the river valleys is their providing faunal and floral lives with habitats. In an article, Mr. Professor Yavari presents a different theory of river valleys: "river valleys are natural corridors of the cities with one of the primary functions of the urban river valleys being the establishment of a connection between the natural and urban spaces." "Natural networks and corridors are important factors giving rise to the formation of the structural and functional evolutions within a region's realm; in this case, the urban land within the city of Tehran. In addition to the water flow, air circulation in the natural networks and corridors can refresh the air and contribute to the displacement of the particles, small animals, pollens and plants' seeds, vapors and gases. The structure of urban land is the product of the dependent distribution of a collection of spots and corridors in a ground of a given land, with their properties being indicative of the structural situation (stability or susceptibility) thereof. In between, the corridors or the river valleys' natural passageways might be the most important factor because they can create a stable and sustainable connection between the green space and open space in a city. Thus, besides being the skeleton and the structural foundation, the river valleys also play a role as the environmental shaper in Tehran" (Sashipur and Elyasi, 2015).

Rivers and valleys can be pointed out among the most important natural spaces that have always been reviving the urban spaces in various spots around the globe. In Tehran, these river valleys do not play a constructive role in increasing the spatial qualities and enhancing the quality of the citizens' lives and, additionally, "have caused certain problems and disorders for various reasons while the optimal use of these natural gifts and the connecting of the intra-city green spaces to the existing natural spaces can supply the human needs and guarantee the persistence and survival of the natural environment to be eventually followed by the environmental stability and sustainability" (Minavi et al., 2014).

Designing the structures on the side of the rivers or water has always played a significant role in the cities. Regarding the river valleys, Zandiyeh and Jaffermand propose such a design as being very critical and important and state that “due to the direct connection between the city and the river, designing gains more significance. The construction of the artificial structures in such precincts is of great importance, and the sporadic and disorganized constructs, the existence of intact non-designed and, in the meanwhile, destroying riverbanks, presence of spaces that cannot be used and are not suitable for the city residents in the face of the rivers, unsound and unhealthy urban visage and landscape are amongst the factors rendering the beautiful and architectural designing necessary and well-needed but, of course, to the extent that it does not end in abusing the river limits” (Bozorgi et al., 2004).

Due to their possession of such potentials as water and nature, river valleys have played significant roles in human beings' lives. The presence of water in the context of the cities has always been studied and investigated. Mr. Dr. Jahanshah Pakzad expresses that “wherever water finds it possible for itself to be somehow manifested inside the city, it has always played a distinct role in attracting the people of the same city or the travelers. This manifestation is usually in the form of a river passing through the city and a sea or a gulf in the vicinity of the city. Each of these two states has had considerable effects on the countenance of many of the world's important cities in such a manner that the water edge, as an outstanding element, has been found to play a key role in shaping the mental images of the citizens or the travelers moving through the city. Water edges, as well, can be the grounds of many happenings within the city or local scales” (Aalinasab and Suzanchi, 2013).

Organizing and revitalizing the river valleys or the water edges are among the top-priority urban issues yearly in many countries. All the cities with such potential have been found to bring about huge evolutions and changes in the sides of their water streams to preserve their urban values to be handed over to the later generations. “The revitalization of the riparian limits is amongst the fascinating phenomenological interventions within the process of the urban life's revival; with their possession of a large number of cases and different qualities of the results, such cities have been transformed like laboratories to a locality enabling various experiences within the process of urban life's revival. Although each of these cases has different geographical properties, cultural dimensions and bioenvironmental contaminations, they are envisioned as valuable sources of ideas for the future. After about 30 years of efforts in line with the revitalization of the urban riparian regions, comparing the various cases can illuminate key factors of their success” (Purja'afar, 2012). Considering the abovementioned materials, the present study aims at riparian regions' reclamation and its significance to urban design with a biophysical approach.

Study's Theoretical Foundations:

The river valleys' protection and conservation have always been a significant and controversial issue. “Urban river valleys are completely distinct from the other natural resources in the cities. One of such characteristics is the river valleys' expansion and intrusion into the urban textures, hence their ready availability.

Such a situation is unlike elements like mountains, gardens and farms for clear reasons inaccessible to many citizens” (Paseban Hazrat, 2009).

River:

A river or water stream also termed a river in the Pahlavi language (Rûd), is a flowing stream formed by the joining of the water from several springs inside the mountain valleys and passes through the moors and plain lands to reach lakes, seas or oceans. Rivers usually form cones in the first stage at the foot of the mountains. After taking a path, they contribute to the development of the plains via the accumulation of the alluvia. Rivers are important sources in terms of the protection of the natural resources and revitalization of the habitats in the heart of the highly-dense cities because they are continuations of the natural suburban phenomena in the cities. The immethodical expansion of the cities’ structures into the farmlands and the development of the peripheral estates in the suburbs of the cities have caused the smashing and destruction of the forests’ remnants as well as reduction of the green areas and diminishment of the faunal species’ diversities (Purja’afar, Shamshirband and Husseinpur, 2012).

Valley:

It refers to the relatively long indentation between two mountains with a river usually flowing through it. Most valleys are usually formed along with rocks during a plateau’s long erosion process. Since the harder rocky layers are more resistant to erosion and weathering, they remain to form the walls of the valleys. In arid regions, valleys are more likely to form than in humid regions because the physical weathering exerts a larger deal of local impact in the dry areas. The result of the cooperation between the wind and the water of the rivers is the eroding and cutting of less-resistant materials like shale. The water’s continuous freezing and thawing, expansion and constriction contribute to the formation of valleys; water infiltrates into the gaps inside the stones and freezes therein to shatter rocks and finally cause large pieces of stone to separate from the valleys’ walls. Sandstone and granite are the resistant materials usually constituting the valleys’ walls.

The largest and the most well-known valleys have been cut in the lands with arid or semiarid climates by roaring whitewater streams fed by rainfall or thawed snow originating from upstream humid regions. The valley walls remain steep and angular because they are neither washed by repeated rainfalls nor influenced by surface drainage.

River Valleys:

Mountain- and hill-foot valleys are vital to water corridors. Due to their secondary climates, valleys have been a lot more auspicious than their peripheries for settlement and exploitation from long ago. The specific vegetative cover has made valleys proper places to form the centers and develop the communities between the mountains on Iran’s highland. Besides being the routes for the water streams, valleys are also air circulation corridors. These corridors are the vital veins for the supply of resources due to their connecting of the upstream and downstream

sides hence carriage of the materials, energy and capital and enabling access and usability. Natural factors like elevation, dip and population cause the emergence of variable moisture, wind and rainfall by causing the emergence of various morphologies of mountains that accordingly happen to have unique ecological characteristics and different vegetative cover as well as secondary climates on the elevations (Aalinasab and Suzanchi, 2013).

Urban river valleys are among the important factors giving rise to the cities' structural and functional evolutions. In addition to the permanent or seasonal flow of water, there are also visual and natural values and different activity/functional patterns (within the format of recreational/touristic and economic and, even in some cases, human life performances) in these natural corridors. In the theories pertinent to sustainable urban development, the proper use of these regions within the framework of the sensitive and vital urban regions' plans has been placed on the agenda of the corresponding urban institutes.

Water Routes:

Water areas and riparian routes are types of paths designed by environmental designers. Such routes can be divided into riparian routes, rivers and water canals within the urban environment and the linear water areas. Riparian passageways enable pedestrians to walk and have public access to the river banks. Riparian routes are lively places. The boringness of the water edges can be counteracted through diversity in the sequence of the walls' positive and negative spaces. These routes can be designed in such a way that they can protect the important spaces and expose certain spaces to sight.

Rivers and canals are deemed as the ecological pivots inside the cities. The preservation of their access and permeability in adherence to the ecological standards is of great importance for heightening the cities' spatial quality. They are known to have such capabilities. Linear water routes and canals are not viewed as routes, but they can create many attractions by drawing the attention of the pedestrians and passersby to the stretch of their movement. The presence of water elevates the pleasure of walking on a path by bringing about sequence, diversity and different experiences. The movement paths should be juxtaposed to provide diverse views with the combination of their impacts, leading to a visual discovery of the water routes or lake, if any. It is favorable to design the water margins' paths and roads with waviness along their vertical and horizontal curves; they should be made of masonry that is united with the natural landscape. However, on the lands where there is a need for more architectural confrontations, the shape and the masonry of the routes and spaces would take a more structural form (Purja'afar, 2013).

Riparian Areas' Reclamation:

"Riparian" or "near-water" refers to the urban limits in direct contact with water. These areas are usually connected with sections occupied by harbor constructs and their relevant infrastructures. The revitalization of the riparian limits has become one of the fascinating phenomena of the urban life revitalization process since 1980. In terms of their large number of cases and different qualities of the

results, such cities have been transformed from laboratories to a locality enabling various experiences within the process of urban life's revival. Although these areas have different geographical properties, dimensions and cultures, and bioenvironmental pollution, they are considered valuable sources of ideation for the future. After nearly 30 years of endeavors parallel to the urban riparian areas' revival, comparing various cases can clarify the key success factors enabling the better designing and reclamation of the riparian areas (Purja'afar, 2013).

Connection, Biophysical Approach:

From the perspective of the ecologists, the natural landscape is made by blending various sorts of habits with the transition areas between them. The riparian ecosystem is "the transition between the aquatic ecosystem and the adjacent terrestrial ecosystem," so the designing works should be directed at connecting and corroborating the interaction between the riparian ecosystems. Riparian ecosystem is an ecological term describing the continuation of the natural habitats into the natural landscape. Rivers and their banks are components connecting the various types of ecosystems. On a small scale, a river with a complex flow regime incorporates various riparian ecosystems and their middle aquatic habitats with slow and fast water currents and hot and cold water bodies, and parts with nutrient richness and poorness. Here, connection means "the existence of various organisms and the interferences of the energies in various riparian ecosystems with those of the middle ecological units" (Purja'afar, 2013).

Based on this definition, a high degree of relationship is obtained between the natural habitats and landscapes in a repetitive system through the flood streams between the dry periods. The connection expresses itself in horizontal, vertical and longitudinal forms; it is horizontal considering the connection between the organisms inside and outside the water; it is longitudinal in terms of the connection between the water source and the river's downstream side, and it is vertical in regard of the connection between the river and the groundwater. As a principle, the creation of connection serves the augmentation of biodiversity and reduction of the artificial environment's detrimental effects. Therefore, the rivers' ecological revival seeks the destruction of hard spaces (roads, dams and walls) and revitalization of the natural paths, plantation of trees and plants and creation of barriers between the artificial environment and the river.

Theorists' Framework:

1. Forman and Gordon:

From the perspective of modernist ecology, national parks or river-valley ecosystems are parts of the space having the qualifications for being particularly decorated in terms of topography, vegetative cover, hydrography and, possibly, the artificial environment. This part of the space is called landscape. In this perspective, the landscape consists of groups of ecosystem or spatial units influencing one another with a similar form repeated in the entire surface area.

Based on Forman and Gordon's theories, the primary element in such ecosystems or biogeoscape is the spot which, according to them, "a spot or an ecological

mosaic is designed in such a way as to together present the most expanded view of a landscape, so the ecological mosaic is the smallest unit of a landscape; the bedding is the dominant encompassing element with the spots being connected through corridors for reaching a more well-protected whole, i.e., a river valley. In designing a river valley, spots and corridors are used as structures to enhance stability (cited in Shamshirband et al., 2012).

2. Jahanshah Pakzad:

Jahanshah Pakzad realizes the urban river valley spaces are suitable for enhancing tourism; he states that “the intact natural spaces in the margin and inside the cities are natural potentials with the continuation and survival of the cities’ ecologies being dependent on the rich sources existing in them. Most often, these natural precincts are exposed to destruction due to improper design and incorrect management, after which the natural resources are decreased in number. Ecological designing of these natural spaces can supply the cities with these natural potentials and provide the people residing in these cities and even the peripheral cities with suitable touristic spaces. Among these natural spaces are the urban rivers and waterways that have been intensively subjected to destruction and abuse in recent decades. In any way, the natural structure of the rivers is extremely influenced in the urban areas by urbanization and urban expansion, so there is a need for special environmental reconsideration. With the expansion in the immethodical constructions in today’s cities, directing attention to the natural elements of the cities like rivers, mountains, forests and so forth can be accompanied by significant reductions in its unfavorable impacts.

On the other hand, in between the commotion and complexity of today’s life, there is a huge need for the existence of spaces accommodating leisure time activities on a natural ground away from the life concerns. Permanent riparian areas are stretched urban spaces passing through the cities and granting cheerfulness and liveliness to the mental image of the majority of the citizens. The liveliness is usually brought about through the diversification of the riparian areas’ spaces and their subsequent providing of rooms for performing a diverse array of activities which consequently invite citizens to prove presence in such spaces” (cited in Motavalli, 2010).

Considering Jahanshah Pakzad’s notions, the cities’ water edges are borders of confrontation between water and the city. These are margins on which the human, water, city, ecology, culture and nature encounter. The lands in these margins express the complicated relationships with the functional paradoxes and similarities, including the natural process, on the one hand, and the human beings’ needs, on the other. We often remember Venice for its water canals, Isfahan and Paris for their rivers and Bushehr and Marseille for their ports and harbors. Most of the individuals inside such cities have the opportunity to enjoy such God’s gifts, but they usually cannot due to their being busy with life concerns. It is noteworthy that Iran is replete with such gifts of God and natural resources. The cities are also assessed based on their water availability. Contrastingly, natural resources are the most interfering factors in the construction. The cities are almost always kept hidden behind the rigid walls so that the dangers that the flood and storms may cause can be controlled.

Additionally, the rivers and seas' shores are maximally applied to construct the urban structures. The result of such paradoxes is that such a thing as urban space loses its sense when it comes to contact with water and water edge, whether on the river banks or the seashores.

3. Zandiyeh and Jafferman:

Zandiyeh and Jafferman realize river valleys, urban rivers and water edges as the best design choices by architects and urban designers and express that "due to the direct relationship between the cities and the rivers in such places, the designing work gains higher importance. The construction of artificial structures in such precincts is highly significant. The sporadic and disorganized constructs, the existence of intact non-designed and, in the meanwhile, destroying riverbanks, the presence of spaces that cannot be used and are not suitable for the city residents in the face of the rivers, and unsound and unhealthy urban visage and landscape are amongst the factors rendering the beautiful and architectural designing necessary and well-needed but, of course, to the extent that it does not end in abusing the river limits" (cited in Motavalli, 2010).

4. Abrkar:

Based on Abrkar's ideas, most cities possess spaces that can be used as natural areas in the urban planning and designing works so that the city-dwelling human beings' naturalistic needs can be better met. "The subject that has forced the officials in charge of regional and urban contextual planning to think of solutions is the method of confronting with and applying such spaces with regards to the development of the talented urban contexts and spots with designing talents inside the urban and regional realm. To have a comfortable life, mankind needs a favorable environment. The environment is composed of natural and artificial spaces. The natural environment is the gift of God to us like the natural resources, including mountains, green environment and green soil suitable for expanding the vegetative cover" (cited in Motavalli, 2010).

5. Valizadeh and Mohammadi:

As one of the main veins of the environment's survival in the cities, rivers have been intensively raided by human beings during the past two decades. This can set the ground for the destruction of human life in the future, and it is a sign signaling a human life full of bioenvironmental pollution.

Based on Valizadeh and Mohammadi's notions, rivers can be divided in terms of their water volume variations during a year into two sets of permanent and seasonal rivers. In humid climates where the rainfall is high, and evaporation is low, the rivers are of the permanent type. In the arid regions where the rainfall is low, and evaporation is high, the rivers are more temporary and seasonal. The river and its bedding, i.e., the river as a whole, play a significant role in human beings' lives. Since this essential element plays a constructive role in the process and quality of the large cities' transformation into what they are now, the full-scale historical, cultural and political investigation and a consequent definition based thereon can be a lot helpful in specifying and introducing this essential

element. The investigation and classification of various Iranian and foreign cities and the role played by rivers in the siting of the main structures of these cities and their formation and development are the bases of the discussions proposed in the first step of encountering any river. To discern the method of the cities' settlement in the vicinity of the rivers and, put differently, to comprehend the special role many of the rivers have played in the emergence and expansion of the cities, the investigation of the rivers' chronological statuses seems to be necessary" (Cited in Motavalli, 2010).

6. Asghari Moqaddam:

Hydrological or water resources are considered the first locus of mankind's settlement, the first place of the human-nature connection, and the first space of the human beings' socialization with the natural system in their periphery. Primitive mankind used to think of the rivers as the biggest and most important element of sustenance and survival based on their preliminary and essential intrinsic needs and wants. They often satisfied his life requirements and needs through this source of life.

Considering Asghari Moqaddam's notions, "the rivers' pass through the cities play an effective role in the process of urban life. These rivers, called urban rivers, are the most important natural phenomenon in many cities around the globe. Rivers create life in their margins and provide many animals with good habitats. These green networks can set the ground for different performances. The existence of rivers in the urban regions can be a factor moderating the weather and creating a very pleasant vista for the city-dwellers. Thus, during the recent century in the world and the recent years in Iran and, especially, Tehran, a lot of attention has been paid to such spaces, and efforts are being made to meanwhile preserving the common bedding of the rivers, organize the margins and use them for various purposes, including green spaces and parks. Meanwhile, it gives the riverbed a proper and acceptable shape, preventing it from becoming a dumping site. This process allows the adjacent lands to offer favorable services and provide the city with pleasant landscapes" (Asghari Moqaddam, 1999).

7. Bahram Soltani:

Considering the ideas of Bahram Soltani, rivers and valleys are amongst the most important natural spaces that have always been reviving the urban spaces in various global spots. "In Tehran, these river valleys do not play a constructive role in enhancing the spatial qualities and elevating the quality of citizens' life and, additionally, cause the emergence of problems and disorders for numerous reasons. This is while the optimal use of these natural gifts and connecting them to the intra-city green spaces through the existing natural spaces can, meanwhile satisfying the human needs, guarantee the natural living environment's persistence and survival and be followed by environmental sustainability" (Bahram Soltani, 1992).

8. Paseban Hazrat:

The subject “protection and conservation of river valleys” has always been very significant and controversial. In all of the conferences and journals about city-building and urban designing, the subject “ecological urban designing” has been one of the primary pivots of the lecturing, and, in this regard, many professors have articulated various notions, including Mr. Dr. Paseban Hazrat who realizes the urban river valleys as being completely higher and more distinct than the other natural resources and expresses that “urban river valleys possess a completely distinct attribute in contrast to the other natural resources of the cities and that is their expansion and intrusion into the urban texture hence their high accessibility. This feature is quite unlike the properties of elements like mountains, gardens and farms that are kept away from the access of many of the citizens for clear reasons” (Paseban Hazrat, 2009).

9. Hussein Ali Leqa'ei:

Based on Hussein Ali Leqa'ei's writings, “the northern valleys overlooking Tehran have been at first qualified for rural texture with a pleasant weather that has gradually attracted urban development and, since the natural potency is not taken into consideration in urban development, all of the factors that can cause economic booming such as good weather and access to natural facilities have gradually been diminished and replaced by urban constructions and air pollution” (cited in Motavalli, 2010).

10. Hussein Yavari:

According to Hussein Yavari, natural networks and corridors are significant factors leading to the formation of structural and functional evolutions on the lands of a region such as the urban land of Tehran. “Besides water flow in the natural networks and corridors, air circulation causes air refreshing and displaces particles, microorganisms, pollens and plants seeds, vapors and gases. The structure of urban land is the product of the associated distribution of a collection of spots and corridors along with the bedding in a land with their characteristics reflective of the structural situation (stability or vulnerability). In between, the river valleys' natural corridors or passageways might be the most important structural factors because they create sustainable development between the green space and the existing open space inside the cities. Thus, the river valleys play a role as the skeleton and structural basis in addition to their being the environmental operator of a city like Tehran” (cited in Motavalli, 2010).

Conclusion:

The present study aims at riparian revitalization and its significance in urban design with a biophysical approach. The investigations indicated that all the theorists had emphasized the protection and conservation of the urban river valleys for their possession of abundant potentials useful to their periphery and their accommodation of various faunal and floral species. The environment of the river valleys is envisioned as the urban air filter and air blower; accordingly, a lot of stress is placed on preventing immethodical changes and occupations; urban

river valleys are also the main veins of survival. During this time that mankind is increasing his biological footprints daily wherever he goes, the conservation of even a small part of this nature of the earth can come to help the human beings in the future and prevent mankind from downfall. These days, the capitalists are doing anything to earn money, even by misusing the environment; speaking about the river valleys is of great importance even for a short while. Once, mankind was a slave of nature, but he is now the king of the earth with the human realm being every day widened more and. All the theorists, both domestic and foreign, are repeatedly speaking about this so that even a small part of this nature can be kept for future generations, thereby saving them from oxygen capsules.

Generally, the results indicated that the recognition of the river valleys' entrance and creation of a filter between the urban space and the natural space, finding the potentials of the river valleys' entrances and transformation of these potentials into the pivots of the development center and joints of the urban spaces and tourism resorts, protection and maintenance of the system's primary identity, creation of access for all of the social classes and the construction of conforming public spaces with high qualities are important for the absorption of the stimulating land uses.

The plans should be made and implemented for the people and in cooperation with the people. The novel developments should be done in conjunction with the people. Prevention of excessive occupation of the natural area, use of the vernacular masonry found in the vicinity and embedding of these principles in the plans and programs, as well as observance of the hierarchy of the city's access to the nature, separation of the land usages in the entrances to the river valleys and prevention of constructions not matching with the river valleys' well-evident entrances should also be taken into account.

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