

A study of developing a spatial entity greenway in the case of Irbid City - Jordan

Ansam Bzour, István Valánszki

*Hungarian University of Agriculture and Life Sciences,
Institute of Landscape Architecture, Urban Planning and Garden Art, Budapest*

Abstract. Greenways are urban elements that are designed to show the linear consistency and connectivity between open green spaces and cause a development in the urban texture. As a city starts to grow, the absolute metropolitan development should be followed by an ongoing protection of the rural and urban territories. The nexus between the city development and the fortification of the open agricultural and rural lands is deemed a good strategy in order to result in a homogenous urban fabric of the city. The study aims to present a greenway model of development to work as a prototype applied on an existing route in Irbid City-Jordan by using the methods of testing and analyzing the route during the site visit and by using GIS base maps in order to come up with an absolute combination between monitoring the city growth, maintaining the quality of the agricultural lands and serving the public and local needs in order to result in a more balanced and controlled growth of the city. Irbid city is located in the northern part of Jordan with a radial urban expansion model of growth extending from the historical center and spreading toward the outskirts of the city. Regarding the significant increase in the number of population in Irbid City-Jordan since the 1970s until nowadays and the continuous need for habitats, there was a huge number of housing projects in the inner part of the city that expanded toward the outer part including the rural areas, resulting in a huge lack of agricultural lands and open recreational spaces where people can benefit from. Those spaces form an outlet of the city connected with the inner part by a route. Establishing a greenway along the route raises the integration between people and their lands and encourages farmers to develop and harvest. According to this study, the greenway development, which forms a breath out to the highly built-up area in the city, has become a great tool to result in tremendous beneficial outcomes to the city development.

Keywords: greenway development, urban planning, land revitalization, Irbid city development

Introduction

City development and urban expansion processes are complex, and not quite predictable in all aspects. Thus, in a way, some actions are aimed at rectifying faults and enhancing future growth. Greenways form as systems or networks in which they are designed to manage some parts of the city planning such as; nature protection, biodiversity management, water resources and ecological aspects [1]. Also to support the importance of the cultural recreational and historical protection of the city.

Greenways are urban solutions to form the connection between any kind of open spaces that are open to the public either for recreational use or for other functions such as the protection of the natural resources with the respect of urban safety. As a part of urban green spaces, greenways can also be described as an open space corridor of linear parks that provides natural ecological functions while at the same time offers aesthetical quality and recreational activities for people or can be designed for commuting purposes [12].

John F. Ahern in his article "Greenways as Strategic Landscape Planning" discussed the importance of emerging the greenway as a huge part of the city planning by defining the greenway as a combination between a network of linear corridors,

open spaces and the protected lands connected with these corridors either functionally or physically [1].

*Green spaces and linear parks,
the greenway continuity*

Linear lands are considered as very critical parts of the urban infrastructure to deal with. After the industrial era, lots of cities were left with this kind of elongated lands among the urban fabric which led to some difficulties regarding what to do with these lands. After the decline of the industrial era, cities were changing parallel with the use and design of these lands to create the so-called; Linear parks. Linear parks are defined as an urban or suburban setting that is substantially long and elongated with greenways creating a green continuity in the urban fabric [4]. Those kind of parks are formed as a result from historical features of a city such as roads that were replaced with green spaces. They are ideal for activities or an extension of the urban fabric. They allow number of people to live within close proximity to green space as they stretch through cities.

Urban open spaces and greenways

The term of urban open space as a part of a greenway refers to a space that is connected with high quality maintenance, which is any space that

has no building structure on it and is empty. Can form as an urban space that is located in the urban regions surrounding the city or can be an open space that is an undeveloped piece of land. It has a correlation with the human, standing as a reflection of the human needs and modifications toward natural areas, not to mention the development of the understanding of these spaces and how it influenced the design and style of these spaces which matches with the concept of the greenways as not only for providing urban open spaces but by designing these spaces in a way to serve the community needs. The urban open space is considered as an urban area with a semi-natural ecosystem converted urban spaces by human influence and provided the connection between urban and nature [8]. Urban green spaces in greenways contain the open lands that can be distributed in the urban fabric in many shapes and forms. They also have a function or a purpose for why they are designed as a part of the urban texture. They are open to the public whether they were privately or publicly owned [8].

Ecological sustainability and land revitalization in greenways

In order for greenways to be ecologically sustainable, the structure of the greenways should support the ecological processes that are required for the greenway to deliver biodiversity services for present and future generations. Ecological networks can bridge between reserve conservation (fixed nature in space and time) and development which implies change [7]. The term 'Ecological sustainability' is a new term that is not quite developed in the landscape planning. This was illustrated and mentioned in both Ahern studies [1] and Steiner's book (The living landscape) which demonstrate the ecological approach of landscape planning of greenways [2]. Steiner defined the ecological planning in his book as "the use of biophysical and socio-cultural information to suggest opportunities and constraints for decision-making about the use of landscapes" by taking the sustainability as a landscape goal for landscape development [9]. In order to achieve the combination and stability between the socio-cultural factor and the physical environment, the needs of the future generations should be taking care of and should be compared with the needs of the present. "A condition of stability in physical and social systems achieved by accommodating the needs of the present without compromising the ability of future generations to meet their needs" [1]. Also by achieving a balanced stage between the ecological, cultural and economic functions in order to save the resources for the future generations [5].

Ecological sustainability and ecosystem biodiversity

Ecological sustainability includes all the terms and the parts that are connected to form the whole ecosystem. It is defined as the continuity and the development of the natural resources and the adaptability of species and habitats of the ecosystem including the human effect on the land and the human health. The ecological networks are defined as a set of ecosystems linked together by the flow of organisms, those ecosystems are existed in the landscape as several types and can be for single or multiple purposes [7]. Greenways can form part of the ecological networks mainly forming as linear elements that has a multipurpose use, including aesthetic, recreational and cultural purposes [1].

Public safety and greenways planning

There is always a contrast and a tension between the design of natural corridors and the infrastructure and road system of the city. The planning of safe urban trails within natural greenways can be critical and contentious [6]. Natural corridors may be perceived as unsafe and avoided by people regarding the unclear sightlines that can effect on the ecological integrity. In order to get rid of the idea of unsafety in greenways, the term '**Human ecology**' should be understood regarding the fact that this term refers to the relationship between the human and the environment. people will be expected to interact with the open space in such a way as to maximize their well-being, including their physical safety and their social, psychological and physical comfort [6]. The spatial design of the open spaces creates a mental image and a cognitive map in its users' minds and that what enhances the perception and feeling of safety and security in spaces which leads to increase comfort and enjoyment [3].

Research Gap

The absence of the nexus between the heavily city growth and serving the needs of people is deemed an approach for urban and social failure, not to mention the need to protect the agricultural lands. The study focuses on the importance and outcomes of proposing solutions to achieve a balance between the uncontrolled urban expansion and land protection in order to serve the community needs by examining a development of a greenway along a commuting route; the so-called, "Petra street" which is located in Irbid City-Jordan and connects the historical downtown of Irbid city toward Jordan university of Science and Technology; "JUST". Petra street is not only considered an important traffic connection, but also is forming a significant linear element in Irbid city that connects the agricultural lands surrounding it. According to the refuge waves since 2011, the increase of the population and the expansion of Irbid city, the urban

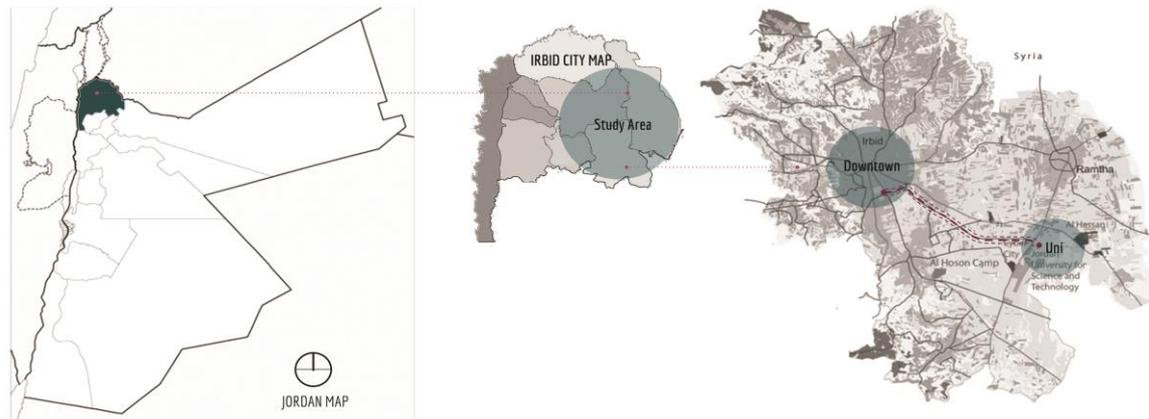


Fig. 1. Share'e Al Petra – Petra Street Study Area Location [Ansam Bzour]

development started to expand in a chaotic distribution toward the route which makes it difficult to provide people with open recreational spaces and protect the existed lands [10]. The chaotic expansion caused a huge loss of the agricultural lands and products among the route.

Research Objectives

In order to rectify and fulfill this research gap, the goal of our analyses is developing a sustainable way to maintain the connection and the balance between the city growth and the protection of the land agricultural quality not to mention serving the community needs and reflecting the identity that demands a clear study of the existing state of the city and the future proposed plans that should be directed to focus on the cultural needs by studying the social patterns and implementing the public opinion. Not to mention examining the development of a greenway proposal in order to test the various outcomes on the development of the city. Both should work together to result in a city that performs as a more flexible for change. In order to inspect the impact of a greenway development on the city planning and highlighting the identity of the city structure and city development, variables should be analyzed while studying the existed route. The proposed greenway is expected to help in revivng the existed neglected agricultural lands to serve the society needs firstly by defining the existed types of the lands and examine the quality of the soil and then starting to propose the suitable solutions such as developing linear parks that have social services and activities to help in achieving the social community needs and proposing a future plan to manage the urban biodiversity. A way of enhancing the social sustainability is to pedestrianize the area and make it more walking friendly by creating linear developed pedestrianized routes and cycling routes that have attractions and open spaces that serve the community needs and enrich the human experience. Another very important planning method that can help in monitoring the anarchic expansion is to study

the traffic connections and the existed road system and to develop a long term plan to serve the vehicle movement and road connections in order to help in solving the traffic jams.

Materials and Methods

Research analysis of the study is based on key topics regarding the establishment of greenway and land quality in the city of Irbid. The study area is located in the south east of Irbid City, forming the connection between the historical downtown extended through a route to Jordan University of Science and Technology. The study aims to analyze and develop the so-called route (Share'e Al Petra – Petra Street). (Fig. 1). The research part is based on theoretical research papers and books, which influence the planning approach. The analysis was made on two different scales; the study of the macro scale with the help of GIS base maps and municipality archives and on the micro scale done by several site visits and observations with professionals. Considering the locals' participation in the study formed an essential tool for the development of the greenway, a hundred interviews and surveys were distributed to the locals and took place in order to deliver their opinions regarding the development of the route. 60 % of the surveys were distributed manually to the residents who live along the route, a 30 % for the employees who work in the municipality of Irbid City and the last 10 % was given to landscape architects who work in the field of urban planning and landscape architecture.

In order to fulfill the real vision of understanding the site, the analysis was projected to be made on different urban and social aspects to meet the study objectives. Studying and analyzing the road infrastructure regarding the ecological aspect by analyzing the green corridors maps in the whole region forms as essential tool during the study process. Route analysis, history development and accessibility help in enhancing the results quality and the development of the study area.

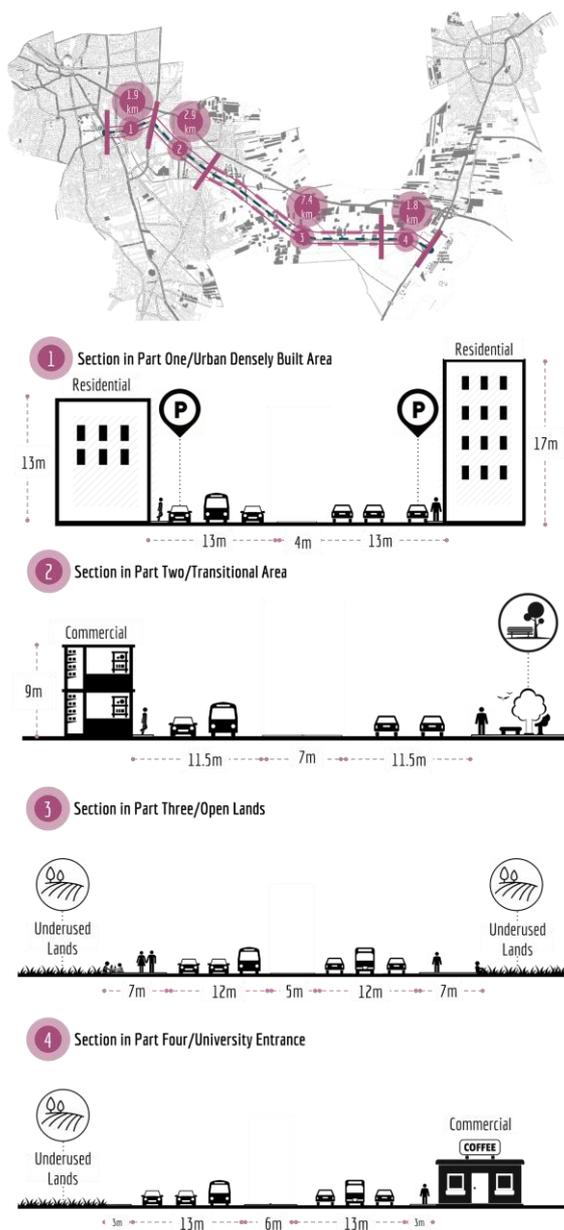


Fig. 2. Study area division method - Iconized sections
[Ansam Bzour]

Focusing on the importance of engaging the community in the decision making process benefits in developing the nexus between the society and their lands and helps in delivering their needs. In order to achieve the social participation in this study, the analysis of the behavioral patterns and social aspects formed a great tool by creating online and personal surveys that meet the understanding level of the community toward the site and studying the cultural aspects and traditions by talking to local people and meeting professionals.

According to the site visit, a method of dividing the study area into four different parts regarding the change in the character and atmosphere was applied in order to come up with detailed analysis and

understanding of the route parts. The first part, which is 1.9 kms, starts from Yarmouk university until the so-called Culture Square. This part is characterized by urban density, heavy traffic thanks to the commercial facilities such as malls, the transportation complex (Amman Complex) and the existence of the university. The common typology of the buildings there is mainly forming as a multi-story residential building.

The second part starts from the so-called Culture Square and ends next to Sareeh traffic sign. This part is shaped as a transitional zone between the densely built up areas and the open lands. It has less urban density than the first part but the heavy traffic continues in this part as well. It is 2.9 kms in length.

The third part forms a selected study area where a deeper analysis was done regarding the goals of this study. It has a length of 7.4 kms and mainly consists of open underused fertilized lands and grasslands. The traffic in this part is less than in the other parts and is mostly limited to users who commute to the university such as students or workers, and to some residents of the surrounding areas. The last section extends toward the entrance of Jordan University of Science and Technology. This part is the most developed in comparison with the other sections of the route. The traffic in this part is heavy, given the proximity of the university entrance. The next figure shows the division of the four parts in plan view (Fig. 2).

Two factors were essential in determining the width and extension of the greenway proposal. After analyzing the topographical formation and ownership of the lands, those two factors formed the key in order to define the edge of the greenway development. The greenway implementation were based upon the lands that share a similar topographical levels with the main traffic route. Another focus was to develop the greenway proposal mainly on the lands that are owned by the government which makes it more applicable for changes. The lands that are owned by the government form a less percentage of the overall area than the lands that are privately owned, yet succeed in maintaining the goal of the greenway proposal.

Results and Discussion

The reason behind the importance of the urban growth control is regarding the continuous increase in the number of population that may effect on the quality of recreational and agricultural facilities. Throughout history, the land of Jordan and especially Irbid City has renowned for its luxurious vegetation and wildlife [11]. Yet, Irbid City has suffered from the rapid change of the number of population and the continuous need for habitats which makes it the third most populous city in Jordan according to the archives of the department

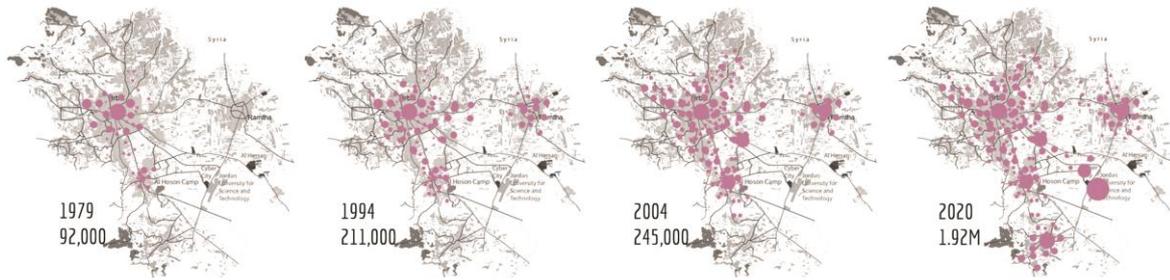


Fig. 3. Population growth in Jordan [Department of Statistics Data-Jordan]

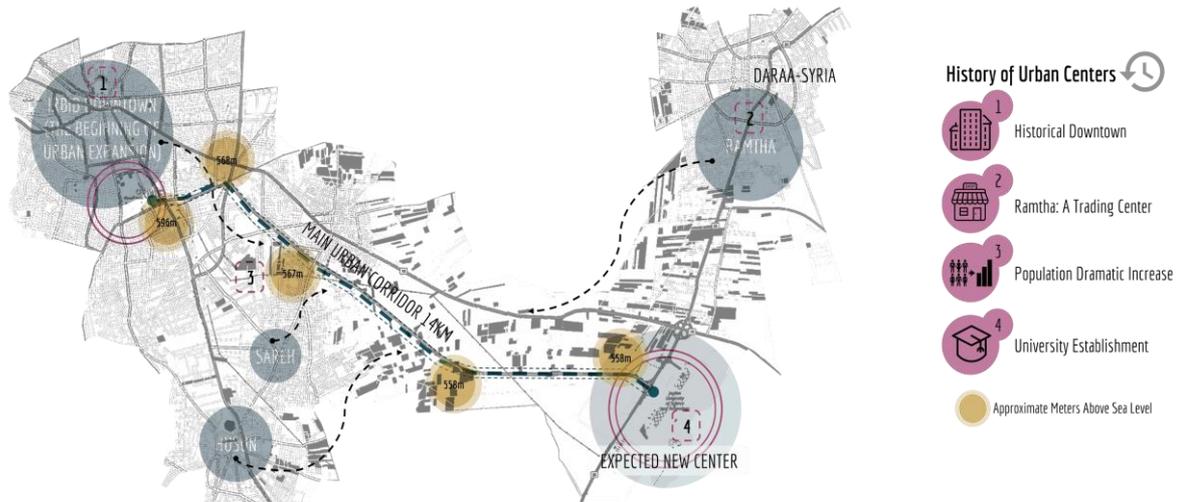


Fig. 4. Urban growth and expansion in the study area [Ansam Bzour]

of statistics, having grown in density dramatically since the 1970s [10] (Fig. 3).

Understanding the city is achieved by understanding the urban development and distribution of built elements. This can be progressed by analyzing the urban expansion and the changes in the city structure and character. The study is focusing on these changes by creating an assessment plan regarding urban aspects. Looking back through history and following the municipality archives and historical maps, the study area has passed through multiple changes regarding the urban expansion and the number of population there [10]. The downtown of Irbid was the first center in the city after the Ottoman Empire, leaving the area with many historical ruins that belong to the Ottoman and Roman colonizations. People started to settle there, as the downtown of Irbid was considered to be the highest point at that time. On the other hand, the Northern part of Irbid started to be formed as another center regarding the strategic commercial location next to Dara'a – Syria. The formation of this center was mainly due to trading purposes: many shops and trading markets started to appear, and the first urban settlement began to exist. After that, the number of population has increased as a result of the refugee wave. That was the case after the establishment of Yarmouk University South

to the downtown, which led to a huge internal refugee wave of students who moved from their villages to live next to the university. This directed the urban expansion toward the university area from the city center and formed new small centers; Husun and Sareh centers [10]. The figure shows the urban growth and expansion in the study area (Fig. 4).

The lands on both sides of the route are believed to have been quite important agricultural resources [11]. The degradation in the quality of the lands and the lack of public open spaces resulted in the huge need to revive the neglected lands and enrich the land biodiversity and sustainability. Deep urban analysis was made in the third section of the route using personal observation through multiple site visits to come up with results that benefit the ecology and biodiversity of those lands. The study of the solid and void helped in showing that the area is divided into different typologies and forms according to the distribution of urban expansion. A division was made to focus on the different characteristics of each part illustrating that the study site starts with a very densely built up area with privately owned lands, and keeps changing to gradually becoming more open with scattered built up areas which strengthen the importance of the route forming a great potential as an open linear element for the city that needs to be planned to serve

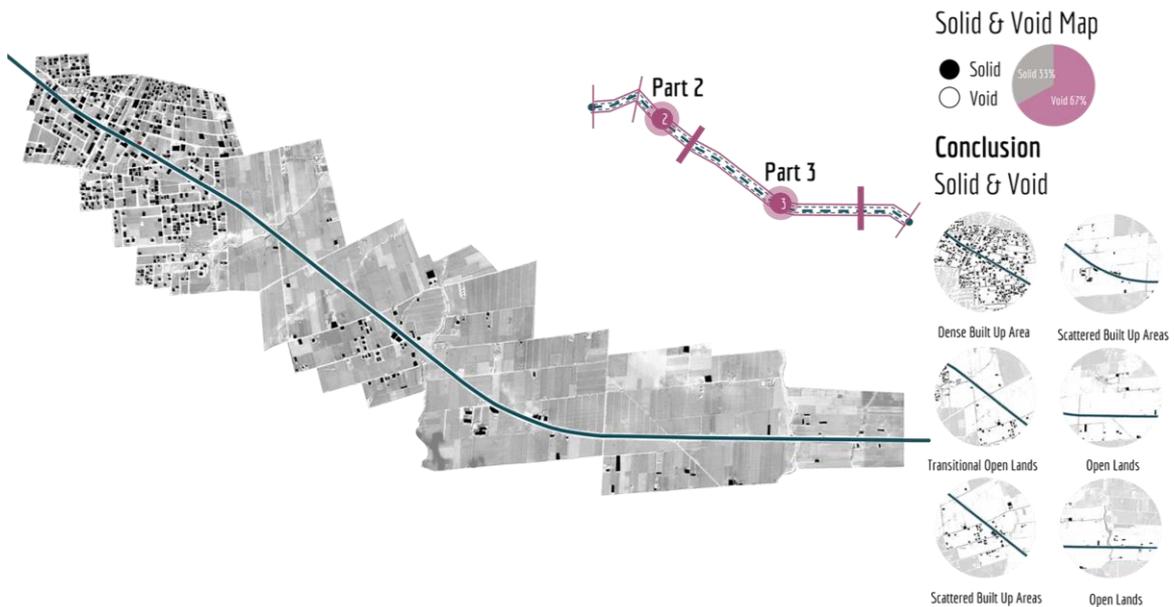


Fig. 5. Solid & Void in the study area [Ansam Bzour]

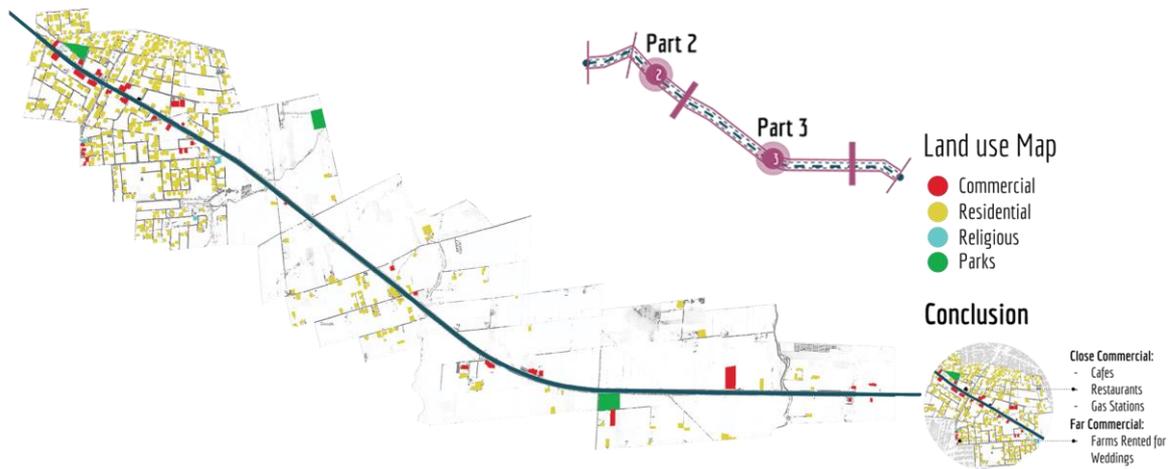


Fig. 6. Land use analysis of the study area [Ansam Bzour]

as a breath out and a facilitated route to serve the community and the city structure (Fig. 5).

The analysis of the land use in the study area based on the GIS basic maps helped in detecting the main functions of the buildings along the route. The buildings that are located closer to the route are mainly functioning as commercial buildings which provide facilities for commuters. Going further from both sides, the function of the buildings changes to become residential with privately owned lands, used primarily in agriculture [11]. Only three small parks were found and two of them are privately used. This shows the huge lack in recreational facilities for the public (Fig. 6).

During the site visit the analysis was made to demonstrate the types of lands by testing the type of the soil in order to know which is more developed than the other. This makes the application of the strategy to develop the lands and achieve the goals more efficient. The result of this analysis illustrated

that the lands next to the route have a rich fertilized red soil and are divided into three types: agricultural land, recreational land - whether privately or publically used-and fertilized lands that are mainly underused. Also, it is important to mention that the route itself is forming three different typologies according to the land analysis; starting from the urban then intermediate and finally going toward the partially rural lands (Fig. 7).

In order to respect the guidance when designing, eliminating or applying changes in a city texture, and to understand the types of roads and the structure of the city, analysis of the traffic and the junctions is really important. The post-analysis map illustrates the types of roads in the study area, as it defines the location of the undeveloped roads and the type of the transportation used. Also, zooming in some sections has been used to show the direction of the traffic. The result reflects that most of the junctions are undeveloped, the sidewalks are not in



Fig. 7. Land typologies of the study area [Ansam Bzour]

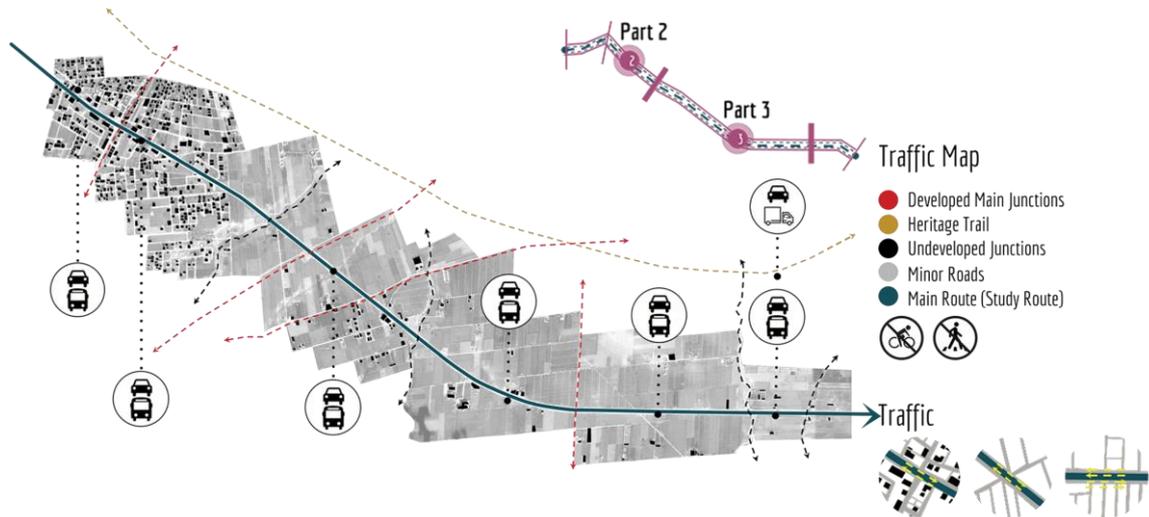


Fig. 8. Traffic analysis of the study area [Ansam Bzour]

a good pedestrianized condition and the route is not provided by bicycle lanes (Fig. 8).

As a result of the analysis, a SWOT map was developed in order to illustrate the strength points in the study area which appear as open lands in a highly built up metropolitan city that people use continuously which show a great potential to serve the community needs as open recreational areas. Some of those lands are distinguished by a good soil condition and quality that form as a suitable base for agriculture. However, the agricultural products quality is degrading which gives a chance to set a data base to improve a long-term plan with the owners and the farmers to manage the agricultural production.

Moreover, enhancing the quality of the road system and managing the weak traffic and connections along the route helps in creating a better environment and contributes in engaging the community with the area, not to mention that it strengthens the value of the lands and makes it more

welcoming to locals by providing the necessary requirements to become more as a pedestrian friendly route.

As mentioned by Ahern J. in Greenways as Strategic Landscape Planning [1], the greenway implementation focuses on enhancing the ability to monitor the city growth by strengthening the protection of the lands and proposing functional or physical changes in order to suit the needs of the community which was formed as potential opportunities that were reflected and illustrated in the SWOT analysis study as it showed similar recommendations and outcomes as described in the study of Ahern J. such as proposing some recreational activities that are required from the locals and recommending the vertical urban expansion in order to manage the city growth and provide a more horizontal openness for the area. However, a huge focus needs to be added on the importance of engaging the community in the changes and modifications of the lands as the public

opinion of any changes that occur in the surroundings should be taken into consideration.

The proposed greenway will benefit Irbid City into making it more flexible for change and adaptable for new proposals and implementations by providing a network base that develops linear elements and connects the lands in between them, not to mention forming as a base for the future ecological development of the city which was focused on in the study of A Tale of Two Trails by Keith [12] on how to consider a greenway as a tool to enhance the structure of the city to which it forms as the base layer for any future development, adding on that the development of biodiversity and the revitalization of the lands surrounding the greenway.

The proposal of a greenway in Irbid City is expected to be a double-edged sword regarding how the community will perceive it and be ready for changes since most of the lands surrounding the route that forms the base for the greenway proposal are considered as privately owned and those changes in the adjacent lands may push some problems to occur regarding the adaptation for the process of modifying the adjacent lands. Although the proposed urban areas are set to meet the community needs which agrees with what is mentioned in the Terminology of Urban Open and Green Spaces [8], according to the survey that was distributed on the residents of the study area it was quite noticeable that many people had a difficulty in understanding the term of greenway proposal and the process of implementing it which raises the importance of focusing on engaging the community in the process of change.

Study Recommendations and Conclusion

Creating unity and consistency between the urban expansion and land protection is important to understand that urban planning must be monitored and controlled equally and parallel between the two directions. The study benefits in the implementation of new proposals of introducing the concept of greenways as a tool to save the scattered lands and regulate the urban development of the city. It helps in presenting the importance of considering the community needs when providing change in the urban textures of the city as well as contributes in regulating the direction of the urban expansion by preventing the chaotic and unplanned urban decisions which develops a base for the future development of the city. This study contributes in highlighting the need and importance of urban and city planning. Urban analysis of Irbid city helps in discovering the demands of the city yet the problems facing the community and people who live there regarding the lack of natural resources and

recreational facilities beside the degradation of the agricultural lands value as shown in the analysis of the existing state of the route.

In order to develop a spatial entity greenway, a strategic vision should be made to demonstrate the main points that should be considered in the design process. The strategic vision should mainly focus on sustaining the lands by redeveloping the agricultural lands and improving the lands that contain fertilized soil in order to be maintained in the future. Moreover, to integrate the society with the value of these lands by developing methods to enhance the social sustainability and providing people with recreational facilities in order to form the greenway as a breath-out for the city. And finally to maintain the mobility connection and the vehicular flow between the old center and the expected new one. The continuous focus on the consideration of the influence and effect of implementing and planning a greenway project in the city helps in expand the process of developing cities in a more dynamic and directed way.

The implementation of a greenway in the study area helps in providing the need of the existed agricultural lands by planting native plants that enhance the biodiversity and strengthen the ecological aspect of the lands. Developing a greenway contributes in proposing a development of functional modifications on the lands that suit the community needs of the area and open up the direction of the urban expansion in a more controlled and monitored way by managing the road system and network along the route and finally providing recreational activities to serve the needs of the local community.

According to the outcomes of the survey that was distributed on the users, the majority of the participants have voted for having more recreational activities along the route that serve their daily needs. Not to mention the importance of maintaining the role of farmers and the connection between them and their agricultural lands by providing sustainable work plan to harvest and improve the land quality and to engage the local community in the importance of being part of the agricultural recovering process.

Proposing a greenway helps the city to grow both naturally and rurally by highlighting and developing the natural resources and protecting the areas of habitats and wildlife. Moreover, it gives an easy access for the community use by providing their needs which can form as a vent for the development of both natural quality and social sustainability by providing attractions that are connected with pedestrianized and cycled routes to enhance walkability.

And finally, the proposed greenway will definitely fix and rearrange the road network and system in order to play a role in directing the city growth by solving the existing traffic problems and preventing future ones.

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AUTHORS:

Bzour Ansam. Architect and Landscape Architect, Institute of Landscape Architecture, Urban Planning and Garden Art, Hungarian University of Agriculture and Life Sciences. E-mail: ansambzour@gmail.com

István Valánszki, Associate Professor at the Department of Landscape Protection and Reclamation, Institute of Landscape Architecture, Urban Planning and Garden Art, Hungarian University of Agriculture and Life Sciences. Field of research: ecosystem services, public participation, landscape evaluation and landscape indicators, landscape management, rural development, tourism.

E-mail: valanszki.istvan@uni-mate.hu

Kopsavilkums. Zaļie koridori ir pilsētas elementi, kuru mērķis ir parādīt lineāro konsekvenci un savienojamību starp atklātām zaļajām zonām un attīstīt pilsētas faktūru. Pētījuma mērķis ir iepazīstināt ar “zaļā koridora” attīstības modeli, lai tas darbotos kā prototips esošā maršrutā Irbidas pilsētā (*Irbid*), Jordānijā (*Jordan*). Objekta apmeklējuma laikā izmantotas maršruta pārbaudes, analīzes metodes un ĢIS bāzes kartes. Irbidas pilsēta atrodas Jordānijas ziemeļu daļā ar radiālu pilsētas paplašināšanās modeli, kas stiepjas no vēsturiskā centra un izplatās pilsētas nomalē. Pētījumā konstatēts ievērojams iedzīvotāju skaita pieaugums Irbidas pilsētā kopš pagājušā gadsimta 70-desmitajiem gadiem līdz mūsdienām. Pilsētas iekšējā daļā tika īstenots milzīgs skaits mājokļu projektu, kas paplašinājās līdz ārējai daļai, ieskaitot lauku teritorijas. Antropogēnās slodzes rezultātā konstatēts, ka šobrīd iztrūkst lauksaimniecības zemes un atvērtu atpūtas telpu, no kurām cilvēki varētu gūt labumu. Zaļā koridora izveidošana analizētajā maršrutā palielinātu integrāciju starp cilvēkiem un viņu zemēm, kas veicinātu lauksaimniecības attīstību, kā arī nodrošinātu labvēlīgākus pilsētas attīstības procesus Irbidas pilsētā.