Advances
2023; 4(3): 93-110
http://www.sciencepublishinggroup.com/j/advances
doi: 10.11648/j.advances.20230403.13

Making Use of Leftover Spaces Under Railway Paths in Addis Ababa

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To cite this article:
Fuad Muhada Kemal. Making Use of Leftover Spaces Under Railway Paths in Addis Ababa. *Advances*. Vol. 4, No. 3, 2023, pp. 93-110.
doi: 10.11648/j.advances.20230403.13

Received: February 12, 2023; **Accepted**: June 13, 2023; **Published**: August 31, 2023

Abstract: Leftover spaces are spaces in a city can be defined as spaces that exist without clear assigned uses and poorly managed space. The development of the urban railway in Addis Ababa has resulted in a huge number of leftover spaces in the intermediate spaces produced by these concrete structures. Although the space found in the city center, it has received less attention by rising issues with regard to usability, social interaction, integration, etc. This research assessed the characteristics of this leftover spaces under railway paths in Addis Ababa, by selecting three segments in the city where the problem is seen more, and studied their functional and physical characteristics and the existed problems in detail. The research was conducted using a case study approach with different data collection methods such as observation, interviews and document review. The data are presented through images, tables, and maps. The data was collected, primarily from three types of people: those who were seen using the space, those who live near the space and who were passing through the space, and those who work place found in front of the leftover space. Because these people engage with the space on a daily basis and are most likely to notice its effects. The research finding indicated that the existing status of the space is not contributing to urban life, rather it is found that the space works against the urban life by serving as a catalyst for the spread of negative influences like attracting homeless peoples. In response to these findings, the study confirms the importance of enhancing the functionalities of the space in order to create a livable space by making use of the leftover space to contribute to the urban community by adapting the surrounding neighborhood context. In general, the study forwards recommendation for enhancing the current status and forwards new possible design typologies that shows different ways to make the space more useful, functional and attractive without eliminating the neighborhood character.

Keywords: Elevated Railways, Urban Life, Left-Over Spaces, Possible Usage

1. Background

In early 2007 with a rapidly growing population, Ethiopia's capital Addis Ababa was in urgent need of a more efficient urban transport system [10]. At that time, the city has two main forms of public transport: buses run by the state-owned company, Anbessa, and the blue and white minibus taxis, a hybrid of bus and taxi that picks up passengers and drops them wherever they want to go. Each has its shortcomings. Whereas the publicly run bus services are scarce and inefficient, the minibus taxis have a limited capacity of 15 to 20 passengers each. Moreover, the minibus taxis have caused traffic congestion due to chaotic movement, and led to other problems such as environmentally unacceptable emissions and frequent traffic accidents.

In response, in early 2007 the Ministry of Transport and Communications of the Federal Democratic Republic of Ethiopia set up a steering committee to find a solution to congestion [1]. Among all the options, Light Rail Transit was considered the best for multiple reasons, not least because it was viewed as a part of Ethiopia's national rail strategy.

After the execution of the project in some area of the city an elevated railway is used to avoid interruption by traffic on the ground. An elevated railway or elevated train is a rapid transit railway with the tracks above street level on an elevated structure (usually constructed from steel, and concrete). But the spaces beneath these elevated structures are however often neglected and used for unplanned activities such as dumping debris, abandoning of wastes and illegal activities [15].

1.1. Problem Statement

Infrastructures in Addis Ababa are often engineered and

planned with a purely functional purpose [9]. This limits the potential of urban structures to contribute to the positive image of the city and to support several forms of urban life [9]. Elevated railway structures in Addis Ababa are most often designed for a single purpose only for transport. If other activities occur in the leftover free space which found below these structures are usually unplanned and emergent which led to land misuses of the leftover space such as dumping debris, abandoning of cars or illegal activities.

The spaces along and under elevated highways affect the way we experience the city. They disconnect neighborhoods, produce undesirable views, and act as physical and psychological barriers making the pedestrian experience unpleasant [3]. The inappropriate use of the leftover spaces under elevated railways in Addis Ababa lead to social and economic problems in addition to being unsightly and lowering the value of adjacent properties.

The elevated railway structures in Addis Ababa are visible structures, but they are not adequately programmed or physically intended to contribute to the day-to-day life of the population rather than simply providing transportation. Elevated railway structures by being separated from the ground, allow for a free-flow of trains without interruption by traffic on the ground. The spaces beneath these elevated structures are however often neglected, left-over and residual that could be utilized by anyone. These unplanned and emerged activities affect both the municipality and the society by creating different kinds of physical, social and economic challenges in the daily life of the society by allowing the opportunity for street crime and health problems.

Adding to this, the undefined territoriality of these leftover spaces also has a negative impact at municipality level for losing the opportunity of using the leftover space for a specific purpose that can add a financial income for the municipality in a city where land value is high. They also play role on segregating and separating communities and neighborhoods.

1.2. Objective of the Study

1.2.1. General Objective

To study the existing condition and functionality of leftover spaces under railway lanes, identify their challenges and problems to forward possible architectural solution to improve the condition.

1.2.2. Specific Objective

1) To study the existing condition of the lost spaces under the railway lines in relation with their surrounding by studying their functional and physical characteristics
2) To investigate and analyze the challenges and problems created by the lost spaces under the railway lines
3) To forward or provide some design interventions for improving the condition of the spaces under the railway lines

1.3. Research Questions

1) How do the lost spaces under the railway line's function?
2) What are the challenges and problems regarding the spaces under the railway lines?
3) What is the possible architectural solution for improving the existing condition of the spaces under the railway lines?

1.4. Significance of the Study

The spaces along and under elevated highways affect the way we experience the city. They disconnect neighborhoods, produce undesirable views, and act as physical and psychological barriers making the pedestrian experience unpleasant.

Adding to this, the unclear territoriality of these spaces sometimes leads to land misuses such as dumping debris, abandoning of cars or illegal activities. The inappropriate use of the vacant spaces under elevated highways might lead to social and economic problems in addition to being unsightly and lowering the value of adjacent properties.

Therefore, to address these issues at hand, there is a need to understand the current situation of the existing spaces under the railway lines.

1.5. Scope of the Study

1.5.1. Thematic Scope

The research focuses on the spatial design issues, functional, physical and visual qualities of selected lost spaces which exists under railway lines in Addis Ababa.

1.5.2. Spatial Scope

Spatially the study focuses only on the spatial qualities of selected three segments in Addis Ababa railway line.

1.6. Limitation of the Study

Among the limitations encountered during this research are the shortage of previously done local research related to the lost spaces and the lack of properly documented data, especially about the future use of the space. So, the research is focused on ground data to get the required information about the selected lost spaces. The other challenge was, it has been difficult to gather valuable and trusted information using questioner. Therefore, the data was mainly collected using observation and interviews.

2. Literature Review

In this section, an attempt has been made to define what space and lost space is. The section will then try to focus on different definitions and typologies of leftover spaces from different authors, the history of leftover spaces, uses of leftover spaces, the impact of elevated highway and railway lines on the cities and the reasons behind the appearance of them. And finally, the different techniques of using these spaces are discussed.

2.1. Defining Space

Before defining leftover spaces and their characteristics, it is essential to define space first. this section will explain the meaning of space by itself which come into mind when understanding the whole idea of leftover spaces in cities.

According to the Oxford English Dictionary, space directly translates to 'time' or 'duration' and 'area' or 'extension'.

Based on Peterson "Space" is a concept and term that has fascinated humanity for an extended time. He described that Space was related with volume, geometry, and form, but as the time went by with architecture, the meaning of space also started to modify. At this time, space was being recognized as one of the main concepts of architecture.

Peterson discusses various ideas on space. He mentioned in his book Space is understood to be a 'free' entity in nature; it is found everywhere plus it is also conceived as abstract, continuous, vast, and has no form. Peterson also he shared Arnhem's concept of space which something that exists in the absence of objects, as it goes beyond the objects in it. Space is additionally seen to exist best in its natural state, but there has been a necessity to define it and shape it according to one's own needs. Peterson explains this concept by example of walls and furniture.

According to Peterson, there are two basic opposite ideas in the concept of space. Which he calls them space and anti-space.

He described anti-space as" Anti-space is undifferentiated, formless, infinite, universal, singular, and continuous. Space is differentiated, formed, finite multiple, and discontinuous. Space, by definition, will be obliterated by the presence of Anti-space". [16]

Peterson describes that there are 3 types of space that are experienced, namely: -

1) Positive space is closed and formed (exterior piazzas, street corridors) or what he describes as man-Made space 'figural space'.
2) Background space 'natural space' a space which is unformed, or background space (oceans, the earth is seen from the moon, landscapes, sky etc…).
3) And finally, 'Derivative space' a space which is formed as a support to the design of positive space or manmade space. Peterson describes this space as a leftover space, or what he calls a negative space.

Peterson primarily discusses negative and positive space in his work. He refers to the area between walls as negative space. He uses drawings for old buildings to describe how the two places differ from one another. When the wall is solid, it is a poché (positive space), and if the inside is hollow and accessible, it is a "habitable Poche," he argues, using the French term for pocket (negative space). According to Peterson, the city's negative spaces include leftover spaces inside individual blocks, backyards, and irregular plots of property. Urban areas, on the other hand, such streets, squares, and public spaces are thought of as positive spaces.

This classification relates to the thesis because the focus of this study is on Peterson's definition of a space. As a crucial element of architecture, he describes this negative space as "residual," "hidden," and a "by product" of the built environment. The words "residual," "by-product," and "derivative" imply a rely on a predetermined framework. This implies that leftover spaces are not independent entities.

2.2. Defining Lost Space (Leftover Space)

Since 1986, numerous researchers have focused on one particular type of lost space, offering a variety of definitions and interpretations, including loose space, cracks, unoccupied, in-between, transitional, and liminal spaces, as well as neglected and decayed spaces.

The phrase "lost space" was originally used by Trancik to refer to anti-spaces that require redesign and don't add anything helpful to their surroundings or users. Trancik defines lost space as an abandoned, undeveloped, or poorly managed space. It is the undesired urban space that develops unintentionally while the project is being planned. Since 1986, numerous researchers have studied a specific category of lost places, offering a variety of definitions and interpretations.

Trancik defined lost spaces in cities as unstructured patterns, "Lost space can be regarded as the leftover unstructured landscape at the base of high-rise towers to the unused sunken plaza away from the flow of pedestrian activity in the city. Lost spaces are also abandoned waterfronts trainyards, vacated military sites, and industrial complexes." [16].

They are abandoned lands lack of social interaction, and repelling any sort of positive contribution to society, "They are ill-defined, without measurable boundaries, and fail to connect elements in a coherent way" [16].

Table 1. *Definitions of lost space by various scholars Source: Ignited Minds Journals 2021.*

Year	Scholar	Terms	Definition
1974	Sommer	Tight space, Hard space	Offering possibilities for different activities, unrelated to the original designed purpose for a particular space
1986	Roger Trancik	Lost Space	Space that makes no positive contribution to the surrounding people
1996	Loukaitou-sideris	Cracks in the city	Spaces that are abandoned and left deteriorate, which eventually be filled with trash and human waste
2001	Hajer and Reijndorp	In-between	As an ephemeral object, a site-yet not only space, but also a possible future, and disparate activities
2007	Franck and Steven	Loose space	Spaces that only allows certain regulated activities, unrelated to the original purpose

As Trancik stated on his book Parking lots, the edge of poorly maintained or managed motorways, elevated highways, the base of tall buildings, overhead bridges, deserted waterfronts, vacant underground plazas, abandoned military locations, and dilapidated parks can all be examples of lost space [16].

Trancik believes that the car, urban redevelopment, private ownership of public space, the functional differentiation of purposes, and the trend are entirely responsible for the creation of lost spaces.

In order to emphasize this point even more, lost spaces or leftover spaces are typically found on rooftops, in front, on the

sides, or at the back of buildings. "These spaces lose their purpose, values, meaning, and sense of community. Leftover spaces, which are typically controlled by the government but have no designated use, are frequently found adjacent to places having predetermined and limited functions. [16].

2.3. Theoretical Concepts of Lost Spaces and Cities

"The way we experience our city creates piles of stinking garbage unpleasant views, pollution, unlawful activity, unsafe traffic, and unpleasant poorly maintained buildings, and occupied at night by homeless people sleeping in cardboard boxes. Additionally, the ambiguous territoriality of these spaces creates both physical and psychological barriers that detract from the user experience and create a mismatch between new and traditional uses, structures, and activities. [2]

In a Book named "Cracks in the City" by Loukaitou-Sideris describes cracks as "in-between areas, residual, under-utilized, and often degrading." He added that neglect and decay had caused human waste and litter to fill empty spaces in numerous plazas, parking lots, parks, and public housing estates, contributing to their terrible condition.

"The areas under railways, highways, bridges, and other types of urban infrastructure are viewed as unfavorable, dangerous, unattractive, and intrusive. However, architects and urban planners believe that these areas have the potential to be developed into distinctive spaces that are pleasing to the eye. [13]

2.4. Brief History of Lost Spaces (Leftover) Spaces

Roger Trancik argues that Cities all across the world have changed in appearance thanks to automobiles. The majority of urban land is used to store or move vehicles [14]. Cities are divided by highways and rail lines, which leave empty places nearby. As urban design improved, the requirement to alter land use planning also led to the shifting of functions [8].

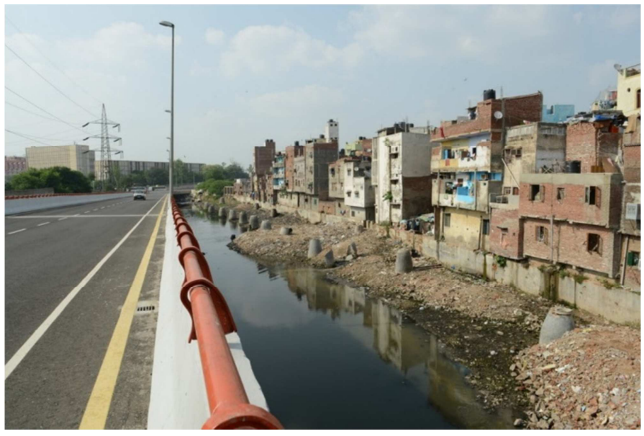

Figure 1. *Example of a geographic void formed due to the presence of a natural feature Source: Nizamuddin Urban Renewal Initiative.*

Different kinds of lost spaces have also been produced as a result of industry relocation and aging transportation infrastructure. At the same time, the building itself was a major focus of urban planning. As a result, public spaces, roadways, and gardens were neglected [5]. He discusses 20th-century development across Europe, where buildings are merely items set on a huge plot of land. There are large grasslands dotted between buildings because green spaces are employed as a buffering. Because of the limited use and excessive size of these areas, new words like "planned wasteland" and "new urban desert" have emerged as a result of inappropriate planning [6].

In addition to the general causes of lost spaces, some are specific to the kind of city. This brings up post-industrial cities since they are a location for unused spaces. Vacant land has become more prevalent as a result of suburbanization, the loss of urban industry, and population decline [12]. "The industrial ruin is a concrete location as well as an empty space that can inspire and hold dreams, wishes, and expectations because it has lost its identity." [12]

These unoccupied or abandoned regions are typically recognized as the post-industrial scape due to their look. Post-industrial areas, underused harbors, abandoned industries, train stations, and yards, areas outside of the city, and areas between the city and suburbs and industrial-era ruins and other places with similar characteristics and appearances are identified as lost spaces [7].

Therefore, it can be shown that the creation and continuous existence of residual areas is unavoidable. The more obvious global mechanisms at work are to blame. Contrarily, the accentuation of leftovers was caused by a variety of factors, including inefficient urban land management, ineffective decision-making procedures, and irregularly shaped property parcels. Therefore, these spaces are not merely a byproduct of policy and planning but also a reflection of the times. [7]

2.5. Uses of Leftover Spaces

In the past, lost spaces were regarded as an issue that needed to be solved or avoided. But through time, they have come to be appreciated as a resource and a setting for ecological and social change [13]. The goal of this thesis is to make leftover areas useful in the pursuit of sustainable development, not to avoid their occurrence. It has been discovered via research and numerous international projects that leftover spaces can be utilized in a variety of ways.

According to Lawson, their uses can include everything from a small-scale urban agriculture program to a communal garden on a single plot. They have also been exposed to adaptive reuse when there exist buildings for similar purposes. Additionally, abandoned areas have been transformed into social hubs for neighborhood events and municipal infrastructure.

2.5.1. Formal Uses

Jaffe, E. [11] presents techniques to improving urban gaps.

First, Artwork. Public art and installations are a basic technique that has been utilized internationally as a tool in urban development. It employs just color and imagination to convert an otherwise uninteresting and uninviting setting into one of expression.

Figure 2. *Toronto, Canada Underpass Park Source: explorewaterfrontoronto.ca Source: explorewaterfrontoronto.ca.*

The second, Tactical urbanism. This technique is promoted by local players, municipal actors, or local organizations to improve a particular location or space, typically for the benefit of a certain local neighborhood. Tactical urbanism's advantages in terms of temporality and affordability make it possible for it to be tested in actual settings. According to [11], there is little to no harm to the neighborhood from tactical urbanism. These projects are typically small-scale and have included temporary seats along streets, turning vacant parking lots into garden lots, turning roadways into transient green areas, and holding street festivals [11].

Figure 3. *San Antonio Ballroom Luminoso Source: culturemap.com.*

Third, permanent projects this type of strategy has a larger budget and frequently excludes significant public engagement.[11] These initiatives take into account the requirement to include these underutilized areas into the urban fabric while fulfilling their function as zones of mobility. Due to their top-down nature, these initiatives may not accurately represent the needs, wishes, or expressions of the people, but they do produce long-lasting, permanent answers. [11].

The fourth approach is a coordination of tactical urbanism and planned approaches.

2.5.2. Informal Uses

Informal activities sometimes take place in leftover places. The areas are typically hidden from formal authorities' eyes. [11] These areas are used for various purposes despite their uninviting look in some cases. These uses may occasionally collide with what the community wants. Homelessness, alcoholism, street art, and drug use are some of them. The users somehow appropriate the area to meet their demands at a certain moment even if they do not own the property. [7]

Reclaiming unused areas has both a formal and informal aspect, as we've seen. The formal strategy for reclaiming vacant lands involves assistance from the state, local government, and private investors. Community groups that either temporarily or permanently occupy the area for their operations are included in this. [8] An informal intervention, as previously stated, is an appropriation made by users who are not a member of any official organization or institution. This intervention exists only to meet this user's requirements. According to Jane, J. [12] several towns all over the world developed both permanent and temporary measures to cope with these vacant land parcels. They also claim that cities have a tendency to accept transitory usage more frequently than permanent ones. Institutional and financial factors are to blame for this.

2.5.3. Temporary Use

As was previously said, unused space offers the possibility of fresh possibilities and new applications. Sometimes when a place is empty, a new owner is only waiting to buy it. However, because this procedure might take some time, this area may continue to be unused. These areas can be made available for temporary usage while we wait. A place that is currently unused might have had a purpose in the past. Additionally, a place that is now being used may end up becoming a remnant with time. “The core of cities is this flux of areas across time. This is where the time aspect of space becomes important” [11].

Due of its complex characteristics, the definition of temporariness in architecture and planning is difficult. Lost spaces or areas that may accommodate numerous uses are suitable for temporary usage. It may be official, casual, impromptu, political, or criminal. Additionally, temporary usage may be planned to emphasize certain features of an empty or underutilized area [11]. It might be for a short period of time—a few hours, a few days, a season, or even years—and is minimal risk with a potential big profit. Its usage in unused locations is one of the numerous advantages of temporary use [11].

In general Jaffe conclude that people in cities have investigated temporary applications, and this has frequently led to initiatives that are valued by the neighborhood and, eventually, the city. The initiatives gradually became official as a consequence, and governments and other authorities took control of them. As a result, when working on projects, developers and planners are starting to set aside area for temporary purposes.

2.6. Empirical Literature Review

The empirical literature review part offers case studies that show how to exploit areas underneath elevated railway lines to their best advantage, as well as success and failure experiences.

2.6.1. Gotera Addis Ababa: Ethiopia

One local case study that show as the best practice and relation of the space under the railway path and the surrounding is the situation which exist in near Gotera square. It consists of different types of characteristics that can give a new perspective on the space under the elevated railway path.

Table 2. *General information about Gotera street.*

General information	Physical characteristics
Owner: Government sector	Material: - Concrete
Type: Parking and properties expansion	Height: 12m

Functional characteristics

Before Addis Ababa Light Rail Transit (LRT) is proposed this area was their properties, then after construction the railway they still use this under elevated railway space for as a support for their commercial activity

In this area we can clearly see how the space under the rail way path is directly related to the surrounding. For example the bar and restaurants uses the space under the rail way as a outdoor serving area in the day time.

In construction material shop area the shops uses the railway support as a storage for their goods like pvc pipe and ppr even when the structure is not near their shop.

Figure 4. *Space under railway used as a storage of goods.*

In Some part of the area the space under the railway path is used by the front commercials as a parking space. This shows how much the space is attached to the activities of the surrounding.

In the other side of Gotera square the space under the railway path is used as well designed parking space. In addition to the parking service the space is also used for car washing area and in the night for car security service.

Figure 5. *Space under railway used as a parking and car washing space.*

Figure 6. *Space under railway used for small sized cars.*

Because of the entrance to the parking spot is so small, they are forced only to provide service for small cars they only give service for only one big vehicles in the entrance space at a time.

Figure 7. *Grill used as a protection.*

Their was a challenge with the street childes to sleep on the open space of the joints in the column and the railway bridge, but they tried to control the activity by using metal bar for closing the space.

2.6.2. East River Waterfront & Ecopark: New York City

Table 3. *General information about the street.*

General information	Physical characteristics
Designers: Workshop: Ken Smith	Size of Space: 2 miles of waterfront
Landscape Architect,	Hours open:
Funding sources: Funding from the	Esplanade closed 6 am to midnight
Lower Manhattan Development	Upper Deck open 8 am to dusk
Corporation	Lower deck open 6 am to dusk

The Franklin Delano Roosevelt elevated expressway runs the length of Manhattan's east side and has blocked the public from access to the waterfront for many years. Since the west side of the island has been converted into a much-used park system, it was only a matter of time before park development came to the other side.

The East River Park's designers took into account the highway's presence and took advantage of it. People are drawn inside the building, through it to a park on the waterfront, and by the way it defines views. To match the color of the ocean at night, the side girder of the highway was painted a light purple. To muffle the noises of the traffic above, a modular system of noise-attenuating material is installed on the underside of the highway.

Figure 8. *East River Waterfront Map Source: Archdaily.*

An elevated park building on the waterfront serves as another attraction to the opposite side. It matches the highway and is one story high, but it is far enough away to be free from its activities. Before the opposing side's park development, the elevated park structure separates the observer from the ground below and connects them to the skyline across the river.

There are places to engage in activity as one walks along the waterfront. Some offer fishing balconies, and ping pong courts, fitness equipment, dog parks, and skateboard facilities. Some are simply passive sitting areas. Except where an activity is emphasized, the area underneath the roadway is open, although on defined paths, bicycles and pedestrians can easily move through it.

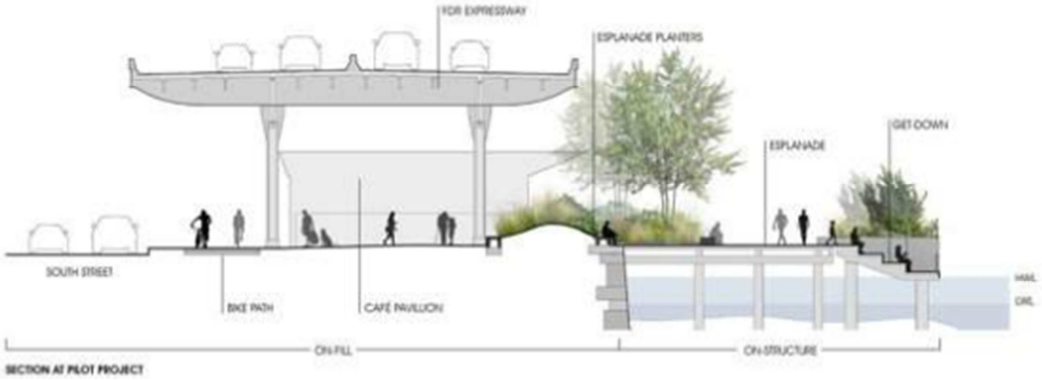

Figure 9. *Horizontal section. of the area showing inside activities like skateboard Source: Archdaily.*

The highway is used as a gateway to the waterfront. The space went from an inaccessible space to becoming a large public space for recreation.

2.7. Lesson Learned

The above case studies shows that it is possible to that lost space under the railway path can be seen as an opportunity and can be enhanced and used to create amaizing and functional spaces that goes with the surrounding situation.

2.7.1. From the Success of the Above Case Studies

One major lesson we can take from the above case studies is that the lost spaces can also contribute to the urban life by integrating and providing a function that imitate the surrounding neighborhood.

2.7.2. From the Failure of the Case Studies

There are different failures which were observed in the above case studies. for the purpose of avoiding the repeat the failures and take a lesson from it the Sometimes when we try to solve one problem, it will introduce another problem. The space have some problems that need to look in to it like lack of fence to protect the green buffer space, the problem of pollution that come from the cars, the noise disturbance for the

individuals who uses the spaces, lack of sanitory (drainage) for the car washing activity and lack of amendments like sitting furniture, lighting fixtures….etc.

Even though the space is putten to use their still some other issues that can be corrected like the space above the parking area is still a lost space that can be used if it's designed.

The space have some problems that need to look in to it

1) lack of fence to protect the green buffer space
2) The problem of pollution that come from the cars
3) The noise disturbance for the individuals who uses the spaces
4) Lack of sanitory (drainage) for the car washing activity
5) Lack of amendments like sitting furniture, lighting fixtures….etc

3. Research Methodology and Approach

3.1. Introduction

This section of the research presents covers research methods/strategies, research approach, research tactics, data sources, sampling techniques, data analysis, and presentation techniques. The predefined data analysis parameters and case selection criteria are also discussed in this part. In general, the study used different techniques and methods to get the required data about the problem related to the space under the rail ways.

First of all, by selecting different segments and assessing their functional and visual characteristics. Then identify the main problems and spatial drawbacks in the existing spaces under the railway lines and finally propose architectural design solutions and recommendations that solve the problems to make them functional and attractive. So, to follow this procedure correctly and find reliable solution for the problem, the researchers used the following techniques, methods, and approaches.

3.2. Selection of Study Area

The study area is focused on leftover space under railway paths on streets of Addis Ababa**.** The study sites were chosen based on where the problem is more visible.

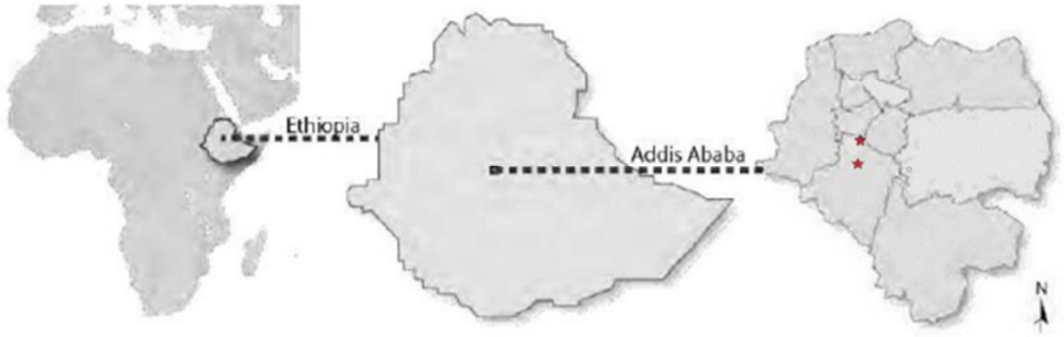

Figure 10. *Location of study area.*

3.3. Sources of Data

In order to assess the objective and come up with the appropriate recommendations, the researcher attempted to make use of both primary and secondary data sources.

The primary data was obtained from

1) Critical observations on the site
2) Notes
3) Interviews
4) Test walk
5) Photographs of the site and related situations

Secondary data collection by the means of

1) Books
2) Journals
3) Publication

3.4. Research Approach

The selection of a research design is based on the nature of the problem or issue being addressed, the researcher's personal experience and the audience for the study [10]. Accordingly, Qualitative method will be used in the study.

In order to get detailed information about the problems related to the space, the research used the Case study method (multiple case studies). The case study method enables the collection of the data from multiple methods (observation, document review, photograph, etc.)

The research uses both descriptive and explanatory research methods to explain the cases in detail. To explore different ideas and study the real-life phenomena related to space under the rail ways. The physical, functional, and aesthetical characteristics of the space were studied using a Qualitative approach. In general, height, material, color and texture, visual continuity security, boundary definition, access control, environmental contribution, privacy, urban functions, or contribution to urban life, and aesthetics are studied qualitatively will particularly be applied were by collection and analysis of qualitative data.

3.5. Data Collection Method

The data were collected using direct observation, interviews, and secondary data such as relevant documents, books, journals, articles, magazines, and other internet sources. Since the research used the case-study method, it mainly relies on the data collected from observations.

3.5.1. Interview

An interview is one of the methods to collect primary data from different people who use the space under the rail ways, The information that collects from the interviews is the most special one to get reliable information. So, a structured interview will be taken from respondents for each selected segments who were passing through the space during the survey.

The interview was also well prepared to get important information from three types of people: those who were seen using the space, those who were passing through it, and those who work place found in front of the lost space. The information that was expected from interviewing peoples who were found passing through the space are

1) Their interaction around the space under the elevated railway,
2) Activities performed around the space under the elevated railway and
3) The attractiveness of the space under the elevated railway.

The information that was expected from interviewing individuals whose work place is around the space and individuals who was using the space are:

1) Their relation of their work with the space
2) Their perception or design preference for the future
3) The function of the space
4) Rules and regulations related to the space

In general, the interview is one of the first sources of data for this research. All interviews were conducted eye to eye with the respondents.

3.5.2. Observation

Observation is one of the methods that is used to collect the required data in the case study. Checklist will be used to observe the existing condition of the study area, and physically visiting the site was necessary to get actual data about the research.

According to Robert K. Yin, direct observation is often useful to collect additional information about the topic being studied. There is nothing reliable other than direct observation. So, direct observation is one of the selective methods to collect reliable data about the existing problems of the space under elevated railways. The researcher walked around the spaces under elevated railways in Addis Ababa to select the cases study spaces that have potential information for this research.

The researcher used different methods to grasp the detailed information during observation including Observation checklist, sketches, texts, photographs, and videos. In general, the information related to the selected cases (segments) and the selected local case study areas was collected using observation.

The researcher visited all three selected segments in three different times of the day (morning evening and night) by spending a minimum of 30 minute. Then repeated same observation three time in different days to get a reliable data and grasp a detailed information on the different activities done on the sites in different times of a day.

3.6. Sample and Sampling Technique

The study was designed to assess the existing condition and functionality of spaces under Railway lanes and identify their challenges and problems. For this purpose, the researcher employed sampling technique based on the purpose of the study, the need to reach the target issue and information gained during personal experience and the case selection criteria are developed according to where the problem is more visible.

The study was conducted in three segments (From Darmar to Abinet, From Gojam-Berenda to Atikilt-Tera and from Agona to Lancha). These three leftover spaces underneath the elevated rails were chosen for the study because they meet the criteria for selection and the problem was found to be more visible there.

For the interviewing individuals who was using the space and working in the active frontage of the space (as their main part of their job directly related to space) the researcher used Stratified random sampling where the researcher divided the population in to sub group on the base of some characteristic and choose randomly.

The number of respondents was determined using purposive/judgmental sampling procedures that took accessibility/availability and respondent willingness to cooperate into consideration. Because this is a qualitative study, the researcher determined the number of interviewers by focusing on certain criteria of obtaining rich and detailed information. So, based on their crucial position, two individuals from either side of the street are interviewed in order to understand the situation on both sides of the street.

For the interviewing the walking users of the space the researcher used simple random sampling where the researcher collected data by giving every member of population equal chance to be selected and choose randomly For each segment six, respondents in which two individuals who was found using the space and four individuals who was passing through the surrounding space are taken randomly for an interview. The number of respondents specified based on the availability of respondents around the space during data collection, their willingness to participate in an interview and the richness of information gathered from them.

3.7. Criteria's for Selecting Study Segments

The spaces were selected for the research based on the following criteria.

1) *Sites where free (void) space under the elevated highway exist* - For example, segments which are elevated But closed that doesn't have a free space or access under the elevated railway will not be considered like segment from St. Lideta to Torhayloch.
2) *Sites where the width of the leftover space under the elevated highway is high*- Among the elevated spaces the one with the highest width are considered because the problem is more visible around these spaces. Because of

this Segments like Stadium to Mexico are not considered.

3) *Sites where the height of the leftover space under the elevated highway is high* –The different problems are mostly affected by human experience So; the cases are selected based on a criteria that have a minimum of standard of human height.
4) *Sites where the leftover space under the elevated highway is not used to specific purpose*- It is unfair to see unused spaces with an architectural problem. So, these spaces were given priority to study and provided the proper solution.

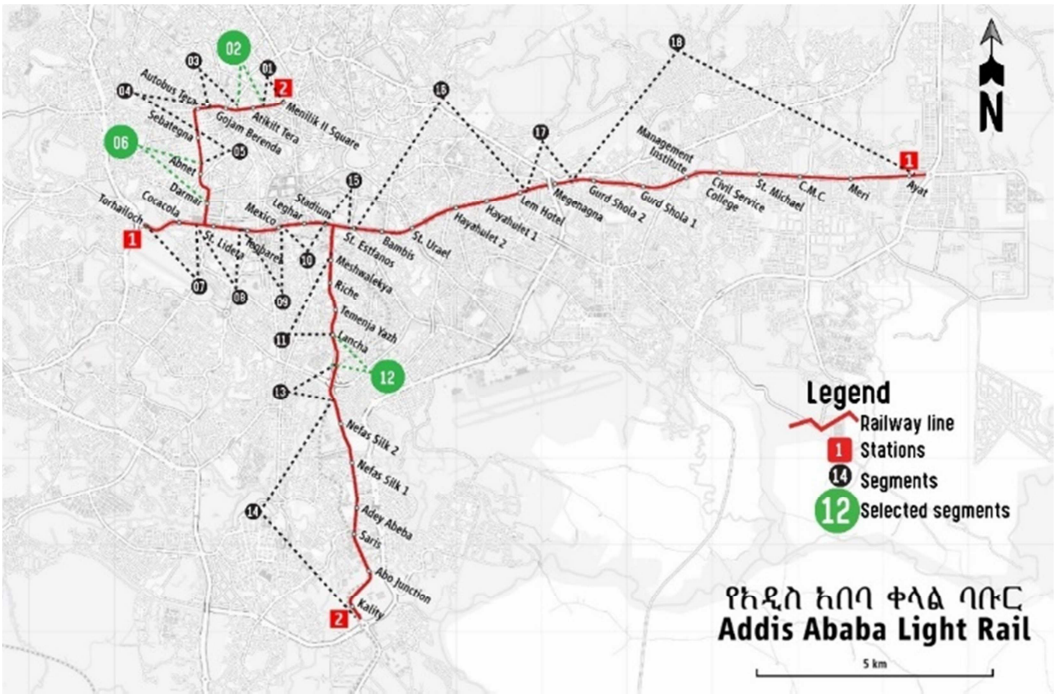

Figure 11. *Addis Ababa railway lane divided by segments.*

The whole railway lane was divided in to 18 sections based on their characteristics and analyzed based on the above four criteria in the table below.

Based on the above criterias the following three segments that fulfill the above four criteria were selected. The selected segments are shown in the map below.

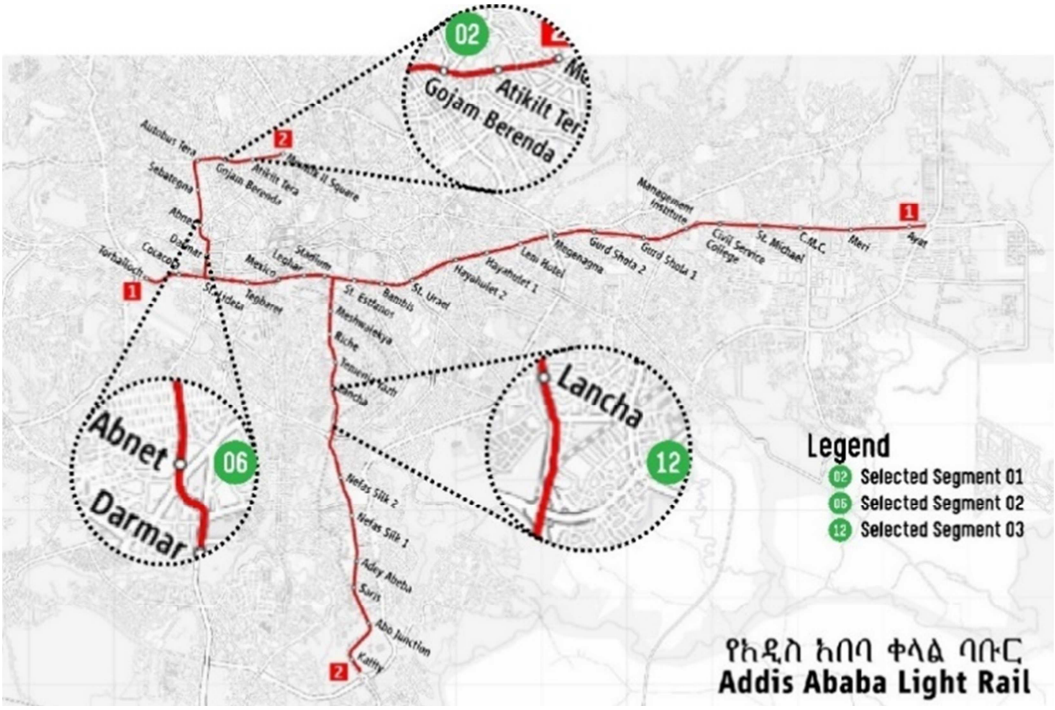

Figure 12. *Selected segments in Addis Ababa Railway Lane.*

3.8. Data Analysis and Data Presentation

First, the cases are selected based on different criteria to identify the spatial problems and identify potentials. Then the data from the interview were collected, analyzed, and interpreted using images, tables, and maps and finally compares the results with the literature to arrive at the conclusion by interpreting the data from observation and interview. The collected data from primary and secondary sources are analyzed in qualitative data forms.

The study used different software such as MS Excel, MS Word, and simple graphics presented in maps, pictures, tables, and 3D images. Table chart is one of the selected analysis tools for qualitative data. Due to the simplicity and design, a table chart is one of the primary choices for this research to analyze the data. Google maps is also used to produce a map and identify location.

Mapping is also used for data presentation to identify the problem area clearly. The locations of the case study buildings, activities taking place around the space, and the problem areas are identified and presented using mapping. Different software is used for the research process, such as Adobe illustrator, Adobe Photoshop and AutoCAD to prepare 2D representation, Revit architecture to create 2D and 3Dvisualization, and Lumion software to render pictures.

3.9. Predefined Parameters to Analyze Cases Study

To address the first and second research question about how the spaces under rail way function and the existing functional problems of the spaces, different parameters are selected to find answer for the research questions. With the following three parameters, the selected cases will be elaborated.

Physical characteristics

1) *Location*: to be familiarized with the general surrounding context of the space
2) *Height & Length*: to review the general characteristics of the space and how does they affect the functionality of the space.
3) *Boundary Definition*: Measuring the degree of boundary definition in terms of weak and strong and to analysis the intended purpose of the space boundary.
4) *Material*: Whether the material used for the space affects the spatial quality of the space

Functional characteristics

To address the first research question about the existing characteristics of the leftover spaces and their surrounding neighborhood different functional parameters are selected to find answer for the research questions.

1) *Urban function*: to study the general site areas, major function or landmark activities. Does the space contribute to urban life or not? The consequence of missing the urban functions in the space.
2) *Pulling factor*: to study the neighbourhood's activity that have a drive to use the space.
3) *Usage activities*: to study how the space by itself is currently functioning. The type of activities done in the space.
4) *Space interaction*: to study the connection b/n the site with the users and the surrounding environment (urban fitting) to help on prioritize the users need for future action.

4. Analysis and Findings

This part covers the overall study of selected case segments in Addis Ababa. The first part discusses the existing situations of the lost spaces under railway paths, including the physical and functional characteristics of the spaces. The second part is an analysis of data from interviews and, the last one is to discuss the overall findings investigated from the case study buildings. In general, this chapter consists of the data analysis and the finding investigated from all data collection methods.

4.1. Location and Description of the Study Area

The study was conducted in different areas of Addis Ababa, Ethiopia. Addis Ababa is the capital city of Ethiopia and is located at 9º2' North of the equator and 38º34' East of the Greenwich line, nearly at the geographic center of the country. The city is the most populated and urbanized city from others in Ethiopia.

The cases segments were selected from three main sites in Addis Abeba: the first one from Agona to Lancha, the second one from Gojam-Berenda to Atikilt-Tera and finally the third one from Darmar to Abinet.

Figure 13. *Location of the study area.*

4.2. Segment 01:- Gojam-Berenda to AtikiltTera, Addis Abeba, Ethiopia

4.2.1. Location and Description of the Segment 01

The site is located at Merkato, Addis ketema sub-city, Addis Ababa, Ethiopia. In the street that goes from paisa to autobistera.

The site is occupied by different types of electronics markets in both sides of the street.

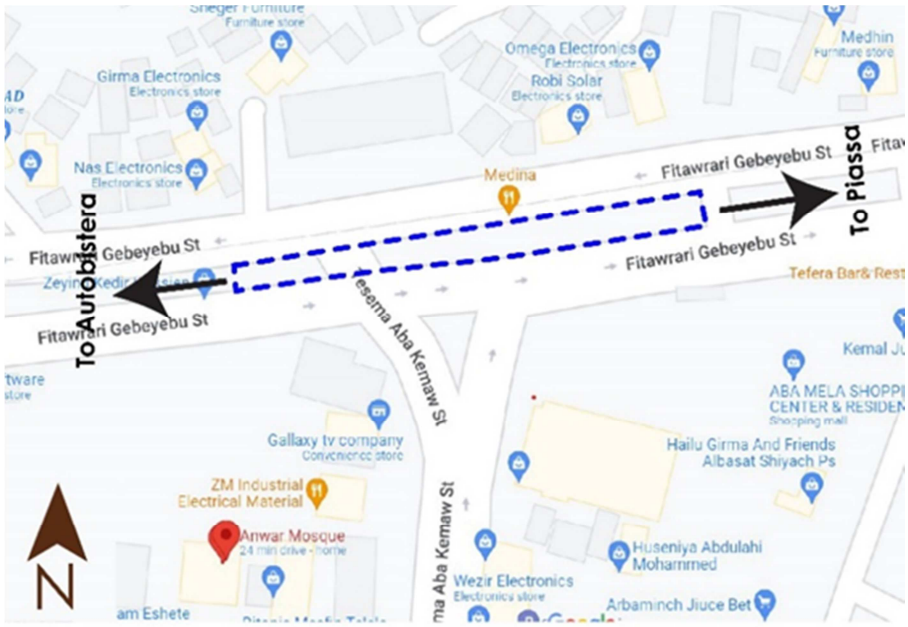

Figure 14. *Location of the segment 01.*

The site is known as an electronic market zone from all over Merkato and a large amount of vendor are found on this site according to lack of space and some of the spaces are taken for new construction purpose.

Figure 15. *Mesjid chaf and Tach Medeb.*

4.2.2. Analysis and Findings Investigated Through Observation in Segment01

Functional Characteristic

As mentioned on the general information the site is more dominated by electronics market, and the place activity land mark is also electronic market, however the electronic market itself has its own distinct by the type of electronic that dominates the market place.

1) Solar tera:

This site is known as "Solar tera" just because of the importer of the Solar panel around Electronics market is mostly found on this side of the market, so as a solar panel shops.

2) Masjid chaf:

This site is mostly having house electronics materials, such as receiver, Television, refrigerator, oven, water filter…, for that matter some shop less mans are used the pedestrian to sell reserve remote controller, wood panel to put refrigerator and dish, and other accessories.

3) Tach Medeb:

This third site is known as Medeb, because of the construction of the front of the site, the displaced merchant has nowhere to work for their lives, for that matter they used to make medeb and used it for second hand electronics accessories market.

And also, the taxi and bus have station on that site for Transportation like Bus and Taxi found in the left side of the space. In the morning and evening more crowd is visible as the walkway is used as waiting space for the bus transport users.

Figure 16. *Transportation nodes.*

The functional characteristics such as usage activity, boundary, security, contribution to the urban activity, and environmental influence of the case study spaces are analyzed in the following table in different time of the day.

4.2.3. Analysis and Findings Investigated Through Interviews in Segment 01

(i). Types of Activities Taking Around the Space (Segment 01)

This data was collected from individuals who participated in random data gathering both during the morning, evening and at night. Both those who work nearby and those who visited or used the space during data collection were the respondents in this study. By contrasting the activities that occur nearby with their response, the major goal of this

investigation is to clearly understand how the space functions in different times of the day. The following table analyzes the many types of activities that are carried out in the space.

Table 4. *Types of activities taking around segment 01.*

No	Activity	Duration	Influence		Pulling factor	Suggestion	
1	Eating Breakfast	- In the morning and evening	High	50%	The Labor market	Enhance	50%
			Medium	42%		Adapt	50%
			Low	8 %		Neglect	0%
2	Making wudu In the surrounding	In the evening (1:00pm and 4:00pm)	High	8%	Anwar mosque Openness of the space	Enhance	33%
			Medium	16%		Adapt	41%
			Low	75%		Neglect	25%
3	Vendors	More after midday (from 1:00pm up to 5:00pm)	High	91%	Openness of the space	Enhance	83%
			Medium	8%		Adapt	16%
			Low	0%		Neglect	0%
4	Sleeping	Night	High	58%	Openness of the space	Enhance	8%
			Medium	33%		Adapt	16%
			Low	8%		Neglect	75%
5	Sitting	Day time	High	33%	Openness of the space	Enhance	91%
			Medium	50%		Adapt	8%
			Low	8%		Neglect	0%
6	Other (vehicles movement, crowd)	Day time and night	High	41%	Other	Enhance	83%
			Medium	41%		Adapt	16%
			Low	16%		Neglect	0%

As the data is being collected there were many activities that the respondents talked about which happens on the surrounding of the space and inside the space itself. People are attempting to interact around the space by engaging in activities like sitting, sealing, and eating, as seen in the table above. And in the above table I tried to summarize their response including the pulling factors and future suggestion to the existing activities in addition to their feedback whether the activities should be enhanced, adapt or neglect.

(ii). Perception of the People on the Existing Situation

People's perceptions on the leftover space are crucial for the research since they can help determine what the design needs of the space should be for respondents and how they actually feel about the space's current use.

Table 5. *The perception of peoples on the existing situation of the space.*

no	Type of Influence	Response	Perception %		
			pass-through	workers around the space	users on the space
1.	Positive	Greenery	75%	75%	50%
		Public Space	25%	25%	50%
		Waiting area	0%	0%	0%
		Nothing Positive	0%	0%	0%
2.	Negative	Bad environmental contributor	25%	75%	50%
		Place for homeless peoples	50%	25%	50%
		Low security	25%	0%	0%
		Nothing negative	0%	0%	0%

In the above table to show how the society perceive the existing situation of the site by considering both positive and negative influences of the space on day-to-day life of the respondents.

(iii). Future Recommendation of the People (Segment 01)

Table 6. *Future recommendation of the people.*

no	Response: -Future recommendation	Recommendation		
		Pass-through	workers around the space	users on the space
1.	Program it and make use of the space	25%	75%	50%
2.	Well-designed Public Space with sitting area and shade	25%	25%	50%
3.	Make it Green Space with many trees	25%	0%	0%
4.	Build Fence around it for protection	25%	0%	0%
5.	Leave it as it is	0%	0%	0%

The future recommendations made by the interviewees are shown in the table above, along with how strongly they agree with one another. Because they believe that leaving it open to the public and as an open space is a loss of potential, the majority of workers and users of the space wish to see the space used for other purposes. In the other hand the pass by users of the space focused on making the space a well-designed public space.

4.3. Segment 2:- Abinet, Addis Abeba, Ethiopia

4.3.1. Location and Description of the Segment

The site is located at Abinet, Addis ketema sub-city, Addis Ababa, Ethiopia. The site is occupied by different types of character according to the frontage commercial zone, but at the back both sides have a residential distinct.

Figure 17. *Location of the segment 02.*

Abinet square is considered as a main transition point of Merkato from south west, south and south east side of Addis Ababa. This character is become a major influence of the site so, the site is highly dens after 11:00 am (L. T).

Figure 18. *Characteristics of the surrounding space.*

4.3.2. Analysis and Findings Investigated Through Observation in Segment 02

Functional characteristic

1) Taxi node: there are two taxi nodes that highly activate the demographic movement of the peoples.
   a) To Autobistera
   b) To Piassa
2) Vendors: As mentioned on general information the site is highly active on work start time and after work time for that matter, usually peoples are going home after work time or after 11:00 (L. T). Based on after working time vendors are used to sell vegetables and fruits.

The functional characteristics such as usage activity, boundary, security, contribution to the urban activity, and environmental influence of the case study spaces are analyzed in the following table in different time of the day.

4.3.3. Analysis and Findings Investigated Through Interviews in Segment 02

(i). Types of Activities Taking Around the Space (Segment 02)

Table 7. *Types of activities taking around the space.*

No	Activity	Duration	Influence		Pulling factor	Suggestion	
1	Selling of goods	In the morning and evening	High	50%	The crowdedness of the site by the society nearby	Enhance	75%
			Medium	33%		Adapt	33%
			Low	17%		Neglect	0%
2	Transport waiting	In the evening (1:00pm and 4:00pm)	High	33%	Availability of taxi nodes	Enhance	75%
			Medium	41%		Adapt	25%
			Low	26%		Neglect	0%
3	Sleeping area	More after midday (from 1:00pm up to 5:00pm)	High	25%	Openness of the space	Enhance	16%
			Medium	41%		Adapt	16%
			Low	34%		Neglect	68%
4	sitting	Night	High	25%	Openness of the space	Enhance	91%
			Medium	25%		Adapt	8%
			Low	75%		Neglect	0%
5	Shoe shining	Day time	High	66%	The crowdedness of the site by the society nearby	Enhance	83%
			Medium	10%		Adapt	8%
			Low	24%		Neglect	8%
6	Other	Day time and night	High	-	Other	Enhance	-
			Medium	-		Adapt	-
			Low	-		Neglect	-

(ii). Perception of the People on the Existing Situation

People's perceptions on the leftover space are crucial for the research since they can help determine what the design needs of the space should be for respondents and how they actually feel about the space's current use.

Table 8. *Perception of the people on the existing situation.*

no	Type of Influence	Response	Perception %		
			pass-through	workers around the space	users on the space
1.	Positive	Greenery	50%	75%	50%
		Public Space	25%	25%	0%
		Waiting area	0%	0%	50%
		Nothing Positive	25%	0%	0%
2.	Negative	Bad environmental contribution	25%	25%	0%
		Place for homeless peoples	50%	25%	50%
		Low security	25%	0%	0%
		Nothing	0%	50%	50%

As we can see from the above table, the society appears to be more satisfied with the site's current state. The site's current green space has a positive influence on the neighborhood, and the way that space is managed well by clearly delineating the boundary has drawn most of them to agree and provide answers that are similar.

(iii). Future Recommendation of the People (Segment 02)

Table 9. *Future recommendation of the people (segment 02).*

no	Response:-Future recommendation	Recommendation		
		Pass-through	workers around the space	users on the space
1.	Program it	25%	50%	0%
2.	Well-designed Public Space	50%	25%	100%
3.	Make it Green Space	25%	0%	0%
4.	Build Fence around it for protection	0%	25%	0%
5.	Leave it as it is	0%	0%	0%

4.4. Segment 3:- Agona, Addis Abeba, Ethiopia

4.4.1. Location and Description of the Segment

Figure 19. *Location of segment 03.*

The site is located at Agona cinema, Kirkos sub-city Addis Ababa, Ethiopia. The site is occupied by different types of furniture shops at one side and other service and commercial on the other side.

This site is mainly known by commercial activities like Funeral manager service, furniture selling and Agona cinema.

This area has a unique character where the space under the railway path is developed and managed by one individual company who Owens a funeral directorial service and used the space for his advantage which is as a parking space for the company funeral service cars.

In the morning the space is more used by cars as a parking space for the funeral company and as awaiting place for Ladas (mini taxis). The surrounding environment is more crowded by cars as the place found in the entrance and exit from Gotera square. In addition to these activities some vendors and shoe shiners found in across the street.

When viewed as a separated from the railway structure, the space has a good composition of trees and greenery, but when the railway construction is there, it loses some of its appeal because of reasons like the structure is not painted, and this makes it unattractive. Both color and texture are ignored, the structure is solid, and there is no perforation on the structure design.

4.4.2. Analysis and Findings Investigated Through Interviews in Segment 03

(i). Types of Activities Taking Around the Space (Segment 03)

Table 10. *Types of activities taking around the space.*

No	Activity	Duration	Influence		Pulling factor	Suggestion	
1	Parking space	- In the morning and evening	High	66%	Lack of parking space	Enhance	83%
			Medium	33%		Adapt	16%
			Low	0%		Neglect	0%
2	Taxi's waiting area	In the evening	High	41%	Taxi nodes	Enhance	75%
			Medium	33%		Adapt	25%

No	Activity	Duration	Influence		Pulling factor	Suggestion	
			Low	33%		Neglect	0%
			High	41%	Being at the Entrance	Enhance	66%
3	Vendors	All day	Medium	33%	and exit of Gotera	Adapt	16%
			Low	25%	square	Neglect	25%
			High	75%		Enhance	91%
4	Sitting	Day time	Medium	25%	Openness of the space	Adapt	8%
			Low	0%		Neglect	0%
			High	-		Enhance	-
5	Other	Day time and night	Medium	-	Other	Adapt	-
			Low	-		Neglect	-

(ii). Perception of the People on the Existing Situation

Table 11. *Perception of the people on the existing situation.*

no	Type of Influence	Response	Perception %		
			pass-through	workers around the space	users on the space
1.	Positive	Greenery	100%	75%	100%
		Public Space	0%	25%	0%
		Waiting area	0%	0%	0%
		Nothing Positive	0%	0%	0%
2.	Negative	Bad environmental contribution	25%	0%	50%
		Place for homeless peoples	0%	25%	0%
		Low security	25%	0%	0%
		Nothing	50%	75%	50%

As the above table shows there is most of the respondents agree on the space as a greenery space some individuals added they want to see the space full of amendments and make it accessible to the public.

(iii). Future Recommendation of the People (Segment 03)

Table 12. *Future recommendation of the people (segment 03).*

no	Response:-Future recommendation	Recommendation		
		Pass-through	workers around the space	users on the space
1.	Program it	0%	75%	0%
2.	Well designed Public Space	25%	25%	100%
3.	Make it Green Space	25%	0%	0%
4.	Build Fence around it for protection	25%	0%	0%
5.	Leave it as it is	25%	0%	0%

According to the above table we can see that most of workers around the space suggested that by taking the funeral organization as an example the space should be given an additional program that goes with the surrounding activity.

4.5. Principal Findings

The findings are structured to provide complete answers to each research question and primarily concentrate on the two research questions that form the basis of the study. Therefore, the principal findings about the functionality of the space and the observed issues around spaces are covered here.

A, Functionality of the spaces

1. The existing situation of the space is more active by different types of activities which emerged from the unique context of the surrounding.
2. The type of programs and the type of surrounding context plays the crucial role in adding positive or negative influence in the space.
3. In some areas lack of Good physical characteristics is affecting the functional characteristics of the site.
4. Little number of People including, Passerby and users try to use the space for sitting, and interacting, because the space lack the proper amendments.
5. Most of the spaces attracts income-generating activities. These activities will have an impact on the entire surrounding.

B, Existing Physical and Functional Problems of the spaces

1. The Leftover space is no longer giving any advantages to the local community. And it doesn't have programs that attract the community to use the space.
2. The existence of unplanned spaces and urban voids throughout the city is playing a role for the emerging of different kinds of activities of opportunities. One of the activities that are emerging in the space is the association of these spaces with illegality and criminality in which most of the spaces are under the influence of irresponsible activities like waste dumping site; urinating area and sleeping area.
3. In some parts of the spaces the space is designed as a public space but lacks public amendments that invites to use the space and plus since this space beneath the railway is in the middle of the road the presence of a lot of noise from the side of the road and air pollution can be

witnessed all of the time which pushes the community from using the space.
4. Based on the response given from the respondent the space because of lacks a responsible individual or organization that take cares of the space.
5. In some spaces areas of conflict between pedestrians and vehicles found where clearly defined zones.
6. The leftover space beneath the railway is difficult to use it as a sociable space due to a lack of interaction and poor design. Most of the spaces lack defined entrance or access in to the site.

Are some of the observed problems of the leftover spaces found below the railway structure in Addis Ababa.

5. Recommendation

By upgrading the features and functions of the leftover spaces found under railway path in Addis Ababa, this research will demonstrate how to construct a space that satisfies both present and future needs. The following recommendations will influence future work.

1) *Consider the local community needs when the space under railway lanes.* Numerous activities can be planned for the space under railway paths, but if they have no connection to the neighbourhood, the facility lacks relevance and is less likely to draw visitors. The first stage in deciding the goal and program of the site is to learn more about the preferences of the nearby community.
2) *Add a program that goes with the surrounding context. The programs should be selected by considering the surrounding neighbourhood context.* Adding a suitable program to the space can attract users to and use the space effectively. There are many different outdoor activities that can be planned for these leftover spaces, but not all of them may be appropriate. The appropriate programs should come from the surrounding neighbourhood context.
3) *Have open and public green spaces with the appropriate public amendments.* Create a public space where users will be able to use the spaces with their own choice of activities by establishing certain open areas with passive recreational usage. Green open areas encourage spontaneous or organized group meetings.
4) *Create a buffer element between the planned program area and traffic.* To minimize the negative effects that the vehicular movement creates in the space elements like a vegetation, furniture or other solid element between the newly planned program and the traffic should be used.
5) *Follow and reflect the neighbourhood characteristics by studying the surrounding neighbourhood culture.* The image, quality, contextual characteristics of the surrounding space should be expressed in the use of the space.
6) *Create transparent boundaries.* Create permeable or transparent boundaries to encourage passer-by to explore the area and enter the area through a variety of entry points. Because it makes users visible and makes it possible for anybody nearby to detect any wrongdoing, visibility into an area fosters a sense of security. In addition to fostering a sense of security, this visibility has the power to prevent crime.
7) *Create topographical level changes to break up the space.* Terrain changes of can aid the visual interest throughout the site and act as a buffer between the space and the street.
8) *Choose appropriate materials.* Select materials for the space's ground, vertical, and ceiling planes that will support its program and function without removing its culture. The greatness of the structure and space can be emphasized or diminished depending on the material choices made for the hardscape, softscape, or vertical forms. Paint and features with vibrant colours can make the area livelier, while wood, plants, and water can soften the site's tougher aspects.
9) *Pick vegetables types that give additional purpose beside being green cover.* To make the area more attractive the vegetation types should have an additional advantages like smell, test, colour and fruits.
10) *Mix some commercial programming with open space and public activities.* The addition of public activities to a commercial area underneath the railway can offer the area some open characteristics and prevent the area from getting overrun with unwanted activities because the owners of the commercial activity will start to take care of the open and the public space as their own.
11) *Clearly define and distinguish the accessed zones from the green areas.* When mixing other programs with green zone, without the limitations of the human activity the green area like vegetation covers might be destroyed. Protecting the area from careless human activities can be facilitated by separating the accessed zone from the public greenery. However, restricting visual access to the greenery should be avoided.
12) *Provide clearly well-defined circulation path inside the new programmed space.* Defining circulation routes encourages more people to enter the area, which boosts security perceptions and relates the city's neighbourhoods to one another. As long as the walkway is large enough to accommodate the number of visitors during peak hours, it encourages a variety of people to go through the site.
13) *Use the elevated rail way column structures to give multiple functions.* The column structure can be used for multiple purposes changing it from having a single function. For example, it can be used as a structural support for additional elements like benches, artwork, lights, advertisement banners and other amenities. It can assist by contributing additional purpose for the community rather than being just huge vertical support element. In addition to that user of the area can have a physical link with the structure, which can strengthen relationships between people, the road, and the area

beneath it.

6. Conclusion

The research described in this document explores the relationship between existing urban activity found in near the lost space under railway lines and the desire to create spaces that are safe and inviting to local residents.

This study was conducted by analyzing the functionality of spaces under rail way lines and existing problems related to the lost spaces under the railway to improve the functional and physical characteristics of the space through architectural interventions. To do that, the existing situation of space around and the perception of respondents about the space are studied.

The space is primarily being used as greenery areas which also give definition, access control, and act as a median but the provision of these functions are not determined by the society need, the purpose of the space, and the context.

There are different functional problems around the spaces under railway lines in Addis Ababa, such as lack of comfort, unnecessary functions, being visually unattractive, haven't environmental contribution as expected, not interactive, poor design quality, lack of integration with the society, and context, etc. These problems are started and developed from the weakness of authority related to laws and regulations, and the society's needs.

In general, these spaces require careful consideration in the design process in the future.

Architects also should design the spaces as the way designing buildings. The integration, aesthetical value, urban contribution is should consider in the design development.

Now a day, different spaces under railway lines around Addis Ababa are used by different purposes by the local society. They try to improve the quality, the design concept, and function but not on a studied way. So, this research proposes a new design approach about, how the space can be redesigned to meet the current and future needs by studying the needs of the society and the government, the needs of urban, context analysis, professionals' perception.

Acknowledgements

First, I would like to express my praise to the Almighty Allah Subhanahu wa ta'ala for giving me strength, patience and hope for doing this project from the beginning up to the end. Next to Allah Subhanahu wa ta'ala I would like to express my sincere and immense appreciation to my thesis advisor Dr. Essayas Deribe (Phd). For continuously providing his guidance, comments and encouragements to the best flow of this project. It is a pleasure to thank department of Architecture for allowing me to do my thesis project. Finally, I would like to thank my families with the deepest gratitude for showing me unconditional support, love, and encouragement during the study. Last but not least, I would like to thank Ustaz Beshir Abbas, my spiritual teacher (Ustaz), for his generosity, inspiration, and ongoing support of my thesis work.

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