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A Study on Rehabilitation of Darul Aman-Kabul City Railway

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Abstract

As it is well known, the railway route between Kabul city and Darulaman region was built and operated during the reign of King Amanullah Khan. On one hand this railway alignment was not extended and developed for unknown reasons. On the other hand, unfortunately, this vital infrastructure was destructed due to civil war and its locomotive scraps still can be seen in national museums in Kabul city. Since the majority of ministries will be moved to administrative complex in Darulaman region and the growing population in Kabul city on the other hand necessitate the rehabilitation of this significance railway. Hence, with being this route in operation, many advantages are achievable for both Kabul municipality and residents. Therefore, the purpose of the current study is to investigate the efficacy of rehabilitation of this railway network on traffic congestion, reduction of environmental pollution, and to provide reliable transport for all residents evenly. This research was conducted based on both library research and field survey method. The earlier part was performed through the investigation of different reliable books, journals, and other scientific resources while the latter part was accomplished with data acquisition through a questionnaire. The main hypotheses of this research are as following: Is it possible to revive this railway line using new models, facilities, and current conditions? whether the rehabilitation of this issue is of importance or not. The results obtained in this research, therefore indicate that the rail systems are used commonly in cities. Since the value of land increases steadily in Kabul and on the other hand a restricted urban space is available in this city, hence the current research findings propose the revitalization of this railway through constructing of Tramway and Monorail. The reasons for the current suggestions regarding the construction of railway transport are less destruction of current infrastructures and low negative impact on the ambient. In addition, the data obtained through the distribution of questionnaire support the rehabilitation of this historic railway in Kabul. In other words, the data which collected from total 150 persons in

different points of this route indicated that 70 respondents answered that they averagely waste 30-45 minutes per day in this path. The 132 contributors in this research showed their agreement with the reconstruction of this railway. Briefly the data acquired illustrate that the Kabul residents are complaining for air pollution, and lack of reliable and convenient transport system.

Keywords: Monorail, Tramway, Environment, Historic railway, Urban space, reliable and convenient transport

1. Introduction

Kabul is situated in the eastern part of country and is the capital and biggest city in Afghanistan. Kabul can be considered as one of the fastest-extending cities in the world and the center of economic activities in Afghanistan. Based on some statistics a 3.5% population growth was recorded in Kabul city over the last 15 years and this growth rate was 3.7% in 2015. This city's population increased from 1.5 million in 2001 to 4.9 million in 2015[1]. Kabul has poor public transportation and social services as a result of varying factors. Among all, lack of investment in public transport and other infrastructures, and the absence of an integrated land use policy in urban planning and urban transportation planning, and briefly is of significant reasons for this issue. Consequently, air pollution has changed to a challenge due to the aforementioned factors. Additionally, weak and undesirable traffic management posed a bad and unfavorable condition to Kabul residents during the day times [2].

Despite the current disorders, a small urban railway first started operating in Kabul in 1923 during the domination of Amir Amanullah Khan Ghazi. The length of this railway was about 7 km and the gauge used was 762 mm. The railway was being operated by the traction power of the heater, whereby three small heater locomotives were purchased from Germany.

Sustainable development of urban is one of the crucial issues of the current time. Hence to have sustainable urban planning, sustainable public transport is of importance and has to be provided for urban residents. Railway transportation systems are most sustainable among other kind of transportations such as bus rapid transit (BRT) and hence it is more advisable to be utilized in Kabul city.

Transport, especially the urban transport system is a multidimensional issue that includes several fields of study including economics, geography, architecture, and politics [3] [4]. Concerning this issue, thereby transportation infrastructures including railway networks can be considered as a contributor to the economic and social power of cities. Regular and managed transportation systems support the community and promote the economy. But inefficient and ineffective infrastructure, and improper management negatively affect the mobility of the city , the mobility of residents and damage the economy [5]. In this regard [6] stated that the mobility of children in recent years decreased due to a huge number of cars in urban areas. To

increase the mobility, the passengers should persuade to use the public transport rather than private cars. Although [7] showed that public transport does not have a tangible effect in reducing the private car, the case for Kabul city can be different and the influence of public transport could be plausible due to some factors such as the low monthly income of citizens.

Although no specific research has been done on the revitalization of the Darul Aman-Kabul railway, limited research has been done to address traffic challenges. The challenge of traffic congestion on Kabul's streets can be attributed to varying factors such as poor management, rapid population growth, increasing private car index, lack of convenient and reliable buses, lack of parking and blocked streets by some government and nongovernment organizations [8]. The Bust Rapid Transit (BRT) is regarded to connect the Kabul city and new city (Deh Sabz). However, the construction of the Light Rail Transit (LRT) system may be required between the new city (Deh Sabz) and the current city of Kabul in the future due to the increasing population and traffic [9]. The proposed LRT route between Deh Sabz and Kabul City is depicted in Figure 1. The suggested LRT network will connect the Deh Sabz to Kabul City and afterward will be extended to Darul Aman as can be readily seen in Figure 1. Therefore, in this research, the portion of this route from Darul Aman to Deh Mazang was studied with respect to feasibility, environmental impacts, and vision of Kabul residents.

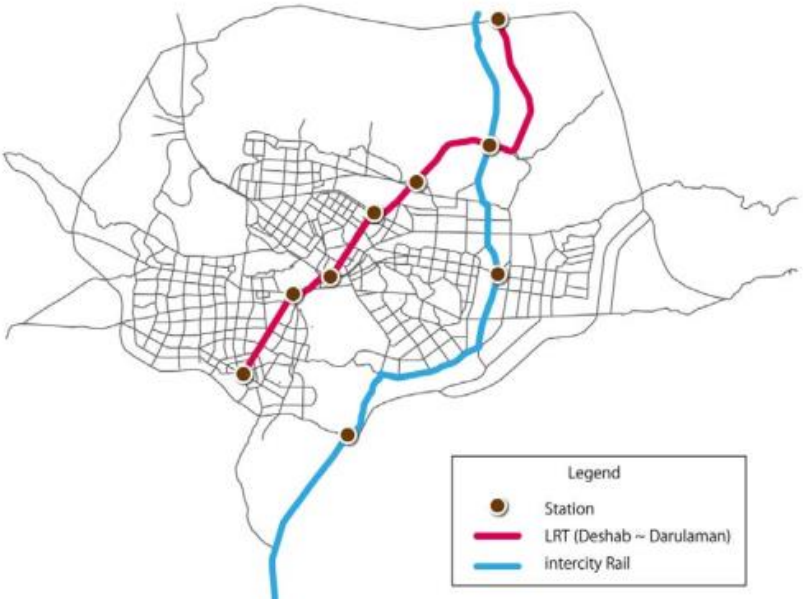


Figure 1. Proposed LRT between Deh Sabz and Darul Aman [9]

2. Location of Study

This study was carried out on the reconstruction potentials of the Darul Aman-Kabul city railway which was opened for operation in 1923. This route is situated between districts of 6 and 7 of Kabul city from Darul Aman to Deh Mazang as depicted in Figure 2.

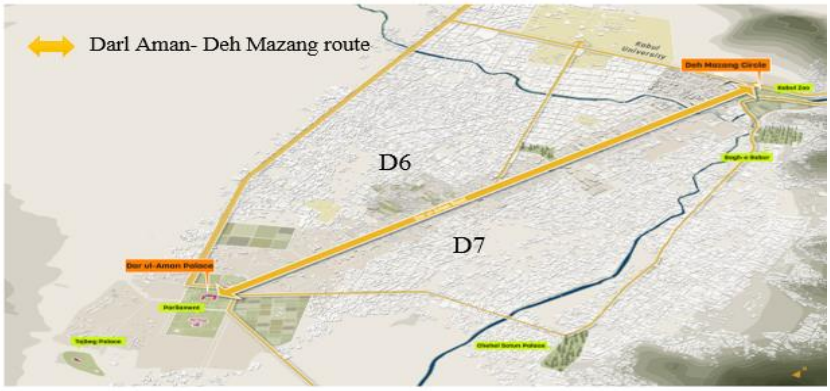


Figure 2. Darul Aman- Deh Mazang route [10]

3. Methodology

The current research was done through both library-based methods and field surveys. The first part was performed by reviewing the existing literature, but the second part was carried out with a distributed questionnaire along the studied route.

4. Research Objectives

The main objective in the current study is the investigating the significance of reconstruction of the Darul Aman-Deh Mazang. In order to perform this, the influences of this historic railway were studied concerning different aspects. The first issue considered in this study was traffic congestion problems and searching the possible solutions. The visons of Kabul residents regarding the selected railway route were the next issue studied in the study.

5. Problems and Solutions

The population growth of Kabul is a challenge in several ways, including traffic jams and environmental pollution. Although the problem of traffic jams on the roads can be reduced to some extent by considering some measures namely proper management of intersections, and effective use of roads, these measures are not effective for the long term future. Therefore, for long term period public transport

and proper management system can play a vital role in urban transport. Though bus and rail are two significant urban mass transportation systems, the capacity of rail systems is much more high compared with bus systems as illustrated in Figure 3. Therefore, for overpopulated cities like Kabul the Tramway and LRT should be planned and designed. However, according to [11] tramway can be measured as a proper system if the construction of the metro and light rail transit is not justifiable.

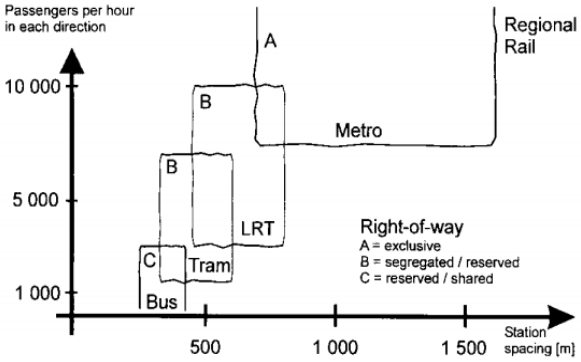


Figure 3. Capacity of different urban transportation systems [12]

Kabul municipality planned the BRT system and will be implemented in the future. Although intrinsically this decision is effective to reduce the traffic jam in Kabul city, the existing infrastructure such as roads network may be demolished extensively by the implementation of this project. On the other hand, as shown in Figure 4, the index of personal vehicles is increasing day by day, and therefore we should not destroy the current infrastructure. In other words, the new system should be constructed with less or no destruction of existing infrastructure. Figures 5 and 6 show the existing and the post-construction conditions of the studied route respectively in the case of the BRT system. As can be seen from Figure 5 and 6 the construction of BRT poses a huge deformation in the current roads and a huge amount of budget might be needed to do so. In this regard [13] stated that the changing infrastructure from bus to tramway takes a huge amount of time. Therefore, since the Darul Aman- Deh Mazang road possesses quite a wide median and access roads, rather than BRT, the construction of monorail and tramway systems can be implemented suitably without less destruction of existing roads.

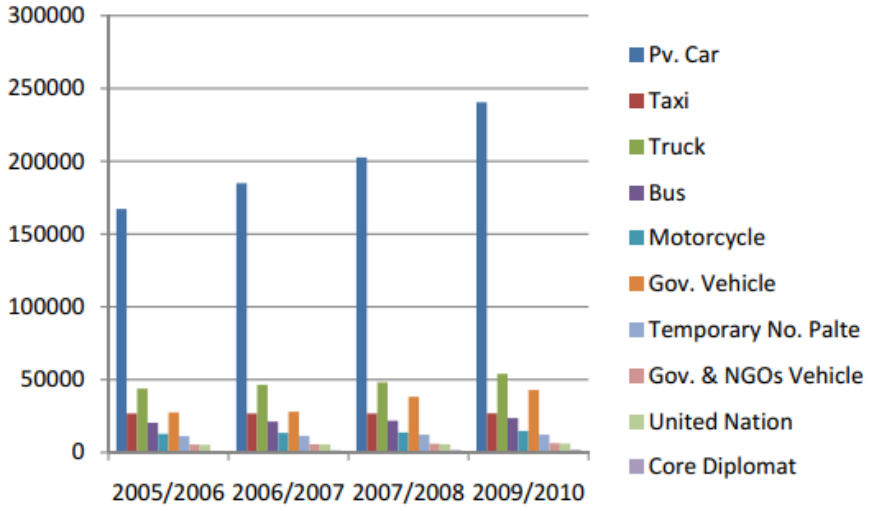


Figure 4. The increasing trend of car index [8]

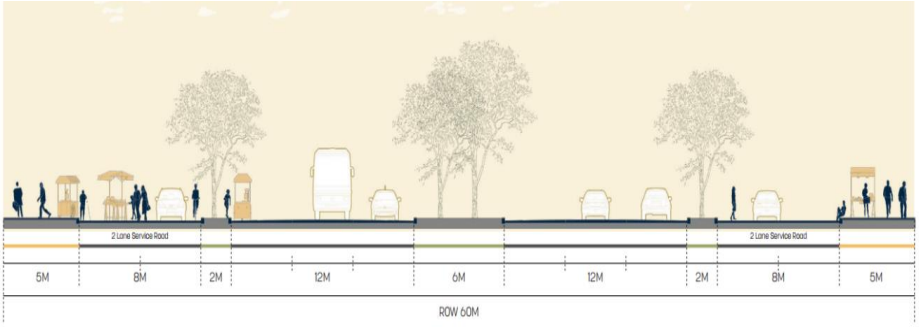


Figure 5. The existing condition of Darul Aman-Deh Mazang road [10]

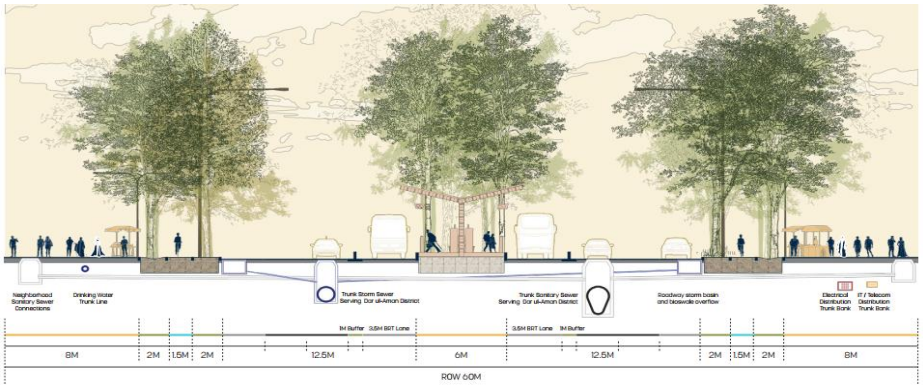


Figure 6. The post-construction of Darul Aman-Deh Mazang road with BRT [10]

In addition, the reconstruction of this route has economic, social, political and environmental effects. Totally the major contributions of this project can be summarized as following:

1- Reduction in needed energy
2- Execution of discount in ticket for students and retired workforces
3- Decreasing of accidents
4- Increasing the aesthetic of the city
5- Maintaining a historical and ancient route is valuable
6- Reducing the cost of repairing and maintaining roads due to reduced vehicle traffic
7- Less required land when compared to BRT
8- Reducing traffic congestion
9- Reduction in environmental pollution when compared to car transport

On the other hand, traffic jams in Kabul are increasing steadily due to increasing population. Therefore, to reduce private cars in Kabul, it is necessary to encourage citizens not to use private cars and instead use the public transportation system. To do so, a reliable, convenient, managed, and cheap public transport plays a vital role. Rail transits can be considered as a possible solution in this regard since they possess the aforementioned features. The city is a common home for the whole society, therefore in urban and transportation planning, the needs of all people within a society have to be taken into consideration. But unfortunately, Kabul city does not have a regular transportation system for all classes, especially the disabled and female citizens. Many disabled are not able to move around freely due to inefficient and improper public transport and public transport station and terminal [14]. To solve these kind of problems urban rail transits are the most effective. Punctuality, conductivity to urban life, and comfortability are the main advantages of tramway over buses [15]. For instance, as shown in Figure 7(a), due to the alignment of the tram gate with the station platform, people with disabilities can easily enter the tram. In addition, Figure 7(b) illustrates a specified portion inside the tramway for women with children and the disables. Therefore, with the revitalization of the Darul Aman-Kabul railway, the problem of access to a convenient and reliable transportation system will be resolved for all citizens including disables and females, and traffic irregularities would be eliminated.



a b

Figure 7. Suitability of tramway for disables and women with children a) accessing of wheel chairs to tramway b) specified place for women with children and disabled [16] [17]

Climate change is of importance globally and almost every country focuses on measures to reduce the agents that adversely affect climate. Greenhouse gases are one of the factors having a huge portion influence on global warming. These gases are produced from various resource but transportation has around 14 % contribution to this issue as can be depicted in Figure 8. Since the Kabul city suffers from air pollution and a portion of this pollution is produced by transportation systems. As a consequence of environmental pollution (air, noise, visual) the physical and mental health problems are common among urban residents [18] [19]. Particulate matter with a diameter of less than 2.5μm ($PM_{2.5}$) is one the most noxious agent to health produced from traffic [20]. The particulates concentration due to traffic congestion and vehicle queuing in the light is +47% and +35% respectively [21]. A 600,000 death a year has been recorded in Europe due to air pollution [22]. To reduce the air pollution many researches have been carried out by researchers. For instance, the results obtained by [23] showed that increasing rail service decreases the carbon monoxide (CO) and nitrogen oxide (NO) by roughly 1% and 2% respectively. In addition [24] investigated the environmental and economic impact of a monorail in Colombo City, Sirilanka. Based the results obtained by authors [24], 189 million USD per year and 42% reduction of CO_2 are the implication of a monorail running at an average speed of 40 km/h respectively. Shifting from private vehicles to public transportation is one of the most common practice that was utilized by many urban areas' authorities to reduce the air pollution [25]. Hence, the urban rail transit systems should be planned in Kabul city since the efficacy of these systems is tangible in reducing greenhouse gasses and environmental pollutions. For instance, the diesel train pollutes the environment less when compared with cars while the

electrical ones do not pollute the ambient. Therefore, the reconstruction of the proposed railway route can considerably reduce the pollution in Kabul city.

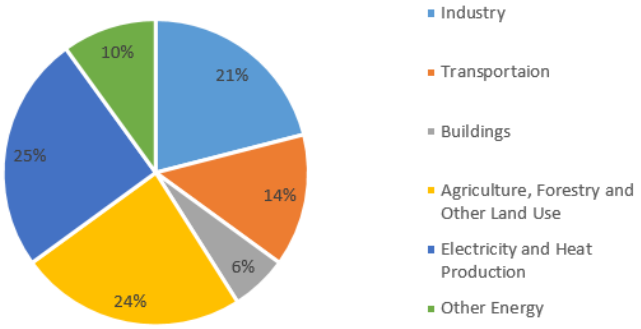


Figure 8. The share of the different sectors in greenhouse gas emissions globally [26]

In addition, the Darul Aman-Deh Mazang trajectory is of great political and historical significance wherein populated residential areas, several entertainments parks, Kabul zoo, several large government offices, the embassy of Russia, few private universities, private and public schools, Afghanistan Parliament house, Darul Aman and Tajbig palaces are situated around this route. Besides, an administrative complex with an area of about 315 hectares from the Green Belt to Tajbeg Palace around Darul Aman Palace was considered [10]. Hence as shown in Figure 9, the majority of government ministries and departments would be relocated from the city center to the administrative complex. Therefore, the future traffic of this route has increased dramatically, which is an urgent need for a regular and efficient high-capacity transport system would be required. Since urban rail transits can provide a high capacity to carry the passengers, thus the reconstruction of the considered path would solve the current traffic problems, and the future traffic problems would easily be justified with these systems.



Figure 9. Administrative complex plan in around Darul Aman palace [10]

Briefly, sustainable urban development is one of the most important issues that require sustainable transport. In this regard, [27] stated that transport has a vital role in global sustainable development. But according to [28] the ineffective performance of transports results from rapid spatial expansion of cities and an imbalance between urban planning and transportation systems. Since the existing transport systems in Kabul city are not sustainable due to the above-mentioned reasons, thus the sustainability issue is not possible to be considered in urban planning as well. In Figure 10 the triangle of transportation sustainability is depicted for more clarification.

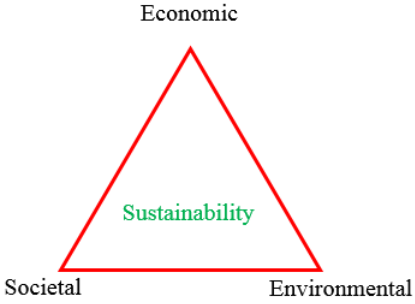


Figure 10. Sustainability triangle of transportation system

The sustainability of a transportation encompasses the three major issues as illustrated in Figure 10. Having considered this topic, the existing transportation system of Kabul city is not sustainable. Therefore, city of Kabul has the following challenges due to the lack of convenient and proper transport:

1. Excessive environmental pollution
2. Heavy traffic and wasting a lot of citizens' time
3. Lack of regular public urban transport for different segments of society

6. Field Survey

The field survey was conducted using questionnaire along the Darul Aman- Deh Mazang road. The data obtained from this survey were collected from a total of 150 respondents at different points along this road. The results of this survey as illustrated in Figure 11 support the previous results obtained from the library-based method.

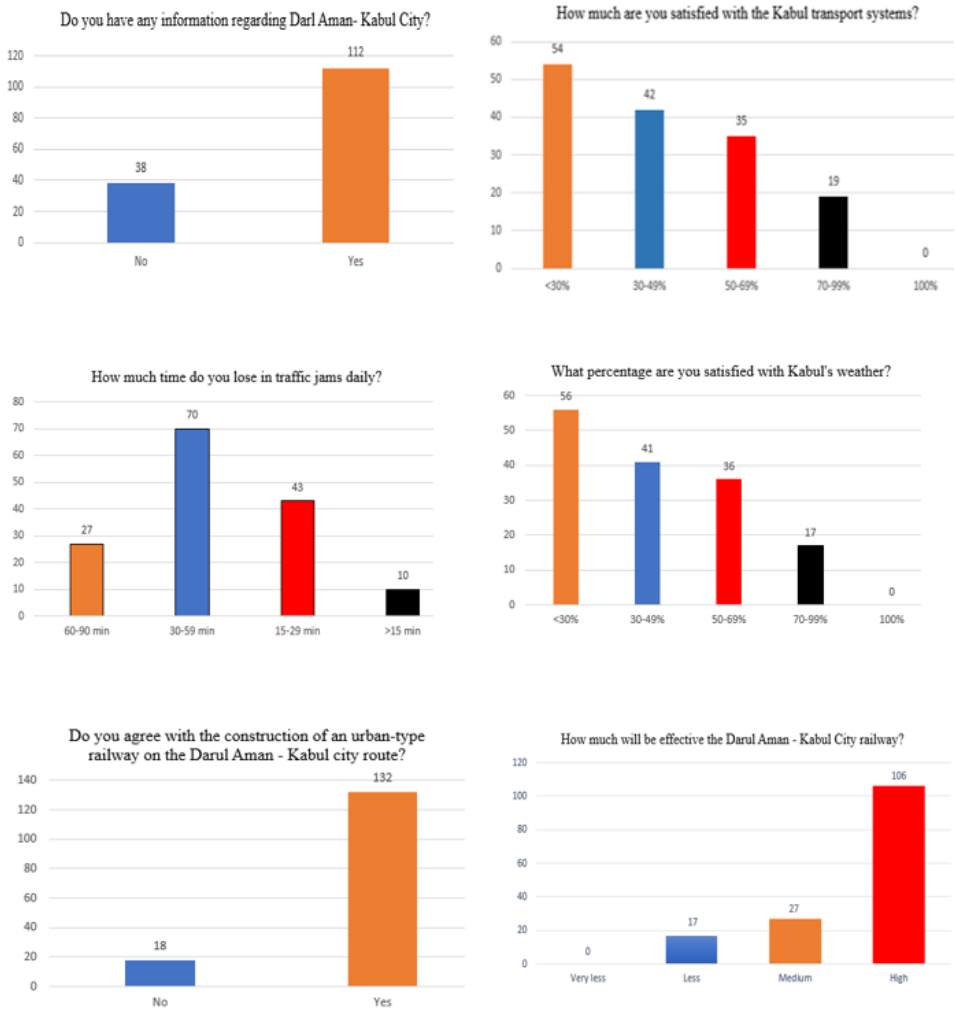


Figure 11. Questionnaire analysis graphs

7. Conclusion

This study reveals that since the majority of government ministries and departments would be moved the administrative complex in the future, thus traffic on the Daru l Aman-Dehsabz road will become more problematic. Therefore, with the revitalization of the Darul Aman-Kabul railway, besides the current traffic problem, the above challenges have been solved and the sustainability issue would be ensured by it. In addition to the above issues, the revitalization of the Darul Aman railway has historical and political dimensions. On the other hand, in the master plan of Kabul city, the BRT system has been proposed in the first stage, and it needs to be transformed to the LRT system in the future if necessary. But this decision is not economical and it would be more effective if the LRT system could be planned and built rather than BRT in the first stage with respect to significant population growth and catastrophic air pollution. Besides, the results obtained from the field survey enlighten the importance of reconstruction of the Darul Aman-Kabul railway with respect to several angles. Therefore, it could be concluded from this research that the revitalization of the Darul Aman-Kabul railway is not only a historical issue but also a required need for a solution to current and future traffic problems. In addition, its construction is achievable without large destruction of the current infrastructure.

8. Recommendations

Due to the issues discussed above, the following suggestions can be delivered from this research:

1. Reconstruction of Darul Aman- Deh Mazang railway due to high demand and transfer of ministries and offices to administrative complex
2. Reconstruction of this railway from Tramway type of system on access roads of this path
3. Reconstruction of this railway from Tramway type of system on median of this route
4. Reconstruction of this railway from Monorail systems on the median of this route

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