

# A Blend of Magnificent Sustainable Architectural Design: An Overview of the King Abdullah Financial District; Potentials and Challenges; Riyadh Kingdom of Saudi Arabia

Maad Abdulrazzak Hassan<sup>1</sup>, Ibrahim Aljutaily<sup>1</sup> & Mohamad Alhulaibi<sup>2</sup>

<sup>1</sup> College of Architectural Engineering and Digital Design, Dar Al Uloom University, Riyadh, KSA

<sup>2</sup> School of Architecture, University of Nevada, Las Vegas, Nevada, USA

Correspondence: Maad Abdulrazzak Hassan, College of Architectural Engineering and Digital Design, Dar Al Uloom University, Riyadh, Kingdom of Saudi Arabia. E-mail: maad@dau.edu.sa

Received: March 22, 2022

Accepted: May 16, 2022

Online Published: May 22, 2022

doi:10.5539/jsd.v15n4p28

URL: <https://doi.org/10.5539/jsd.v15n4p28>

## Abstract

The research paper explores the impact of the construction of mega architectural projects on the surrounding area. The King Abdullah Financial District (KAJD), a magnificent and sustainable architectural masterpiece that consists of the largest cluster of high-rise buildings constructed in Saudi Arabia, with total of about 83 buildings that vary in heights and functions. The paper points out an overview of the KAJD project's and will elaborate on the potentials and future challenges on the surrounding transportation system and the social context. Numerous visits to the project site, aerial and current project images, provided insight into three anticipated challenges of the project; mainly the anticipated traffic that will generate on the surrounding transportation system, accesses that may improve the anticipated traffic congestion on the surrounding system and the impact of the project on the social context. The research paper has concluded that the KAJD project will impact the surrounding highway corridors and has developed several alternative solutions to mitigate the adverse impact of the project to further improve the local transportation system. The researchers also believe that this megaproject has a great potential of providing significant benefits to the public. The researchers strongly support this magnificent architectural masterpiece will certainly benefit the local and national economy. The researchers referred to other enhancements that may include continued improvements of the project area signage and bikeways (where appropriate) to encourage pedestrians and help reduce anticipated traffic.

**Keywords:** mobility and urban planning, transportation system, traffic congestion, access ramps, project impacts

## 1. Introduction

The Kingdom of Saudi Arabia has been politically stable, in spite of the surrounding instability in the region. Clearly, such stability has reflected positively on the economic state of the kingdom. Financially, the kingdom of Saudi Arabia has shown continuous signs of economic growth in the past two decades. More notably, the past decade, the kingdom has manifested tremendous growth and progressive development in every aspect of the economy.

Since the kingdom experienced tremendous wealth, along with major population growth, the two factors have led to significant increase in car ownership since early 70's, the era of oil boom. This period of growth was marked as the start of major travel congestion and air pollution due to increase in traffic and unsustainable travel patterns (Aljoufie, 2014). As an effort to improve and upgrade the city transportation system, the Riyadh City authorities in 2012, introduced an investment initiative of \$22 billion that includes a new Riyadh metro lines and public bus system, according to Royal Commission of Riyadh City (RCRC, 2015). Moreover, the improvement and construction of new sewer system around the country that has been started in Riyadh and in other major Saudi cities. The government of Saudi Arabia has paid distinct attention to upgrade the country's infrastructure. Several mega projects have been accomplished around the kingdom, many of which contain a distinct architectural design, e.g. the King Abdullah Financial District in Riyadh; Princess Nora University in Riyadh, the King Abdullah Economic City in Jeddah, Jazan's Industrial City in the southern tip of Saudi Arabia; Jabal Omar Development Project; Makkah Al Mulkarramah Information Technology & Communications Complex; in addition, the ministry of housing projects to build thousands of low income housing projects around the kingdom and so on.

## 2. Method

The researchers have applied field visits and observation method along with related literature review. The researchers, who are trained and experienced observers in the field of study, were the primary participators in the field visits to monitor the project construction progress and traffic growth near the two main entrance ramps (the king Fahad highway and Eastern ring road ramps). They developed a plan to rotate, where each observer spent two hours per day during working week to observe during working hours. In order to deal with the two traffic peak periods (morning and afternoon), the time-periods for observation were varied from day-to-day. To better gauge traffic volumes, observation studies were all carried out during working weekdays in Saudi Arabia starts on Sunday to Thursday.

## 3. Project Background

### 3.1 Study Area

The King Abdullah Financial District (KAJD) project located in the capital city of Riyadh in the Kingdom of Saudi Arabia is in the Arabian Peninsula, and it's the largest country in land and population estimated to be around 30 million that is the largest among the Arabian gulf countries. Since the early 80's, the kingdom of Saudi Arabia and specifically the capital city of Riyadh, have gone through significant infrastructure upgrade and construction boom that led to major urban growth. Such increase in urban growth, led to increase in car ownership and traffic. (Alotaibi & Potoglou, 2017). Thus, the focus of geographic study area will merely be on the capital city of Riyadh, and the surrounding area of the project, see figure A1 & A2, appendix A.

### 3.2 Entities that Manage Riyadh City Development

This mega project is expected to become the main central business district (CBD) in Riyadh, and thus it will generate numerous traffic counts that adds up to the existing traffic. So, it's imperative to point out the government entities that are directly or indirectly responsible for city development and the improvement of the project's surrounding transportation network. The following authorities are:

#### 3.2.1 Royal Commission for Riyadh City (RCRC)

Royal Commission for Riyadh City (RCRC) is created by royal decree in 2019 to replace the formerly known Al Riyadh Development authority (ADA). RCRC is directly responsible for developing and improving Riyadh City's urban plan, economic activities, environment management and social and cultural development (RCRC, 2015).

#### 3.2.2 Ministry of Municipalities and Rural Affairs

The Ministry of municipalities and rural affairs considered to be the responsible entity for development of urban and rural areas. That is including the Riyadh city roadway networks and infrastructure (MOMRA, 2011).

Recently, MOMRA formed a new strategy to manage city development and has identified main key transport strategies in Riyadh City that are relevant to the project's surrounding roadway network, include the following:

- 1) Improving traffic management.
- 2) The development of the integrated transportation loop system (ring roads) to improve and reduce traffic congestion in the city; and
- 3) Development of an integrated transportation system (corridor management program) in the city (RCRC, 2009, 2015).

#### 3.2.3 Riyadh City Transport System-Ministry of Transport (MOT)

The city transport system managed by MOT, which is similar to the department of transportation in the US. MOT has the authority to build, operates and manages all highways, bridges and roadways networks in and around Saudi major cities. (Ministry of Transport, 2011).

#### 3.2.4 Riyadh City Traffic Department

Riyadh city traffic system managed by the General Administration for Traffic (GAT), which is the main entity that is responsible for traffic operation, management in Saudi cities (GAT, 2016).

The financial district located in the northern part of Riyadh city and is surrounded with the city's four major highways and arterials that divides and define the capital city of Riyadh. The extent of the project location anticipated to be a major employment center that is expected to generate more traffic. That includes home to work, and home-leisure commuting trips. Merely, those two main types of trips will certainly contribute significantly to the existing traffic jam during rush (peak) driving hours. In addition to the recent opening of Riyadh Park, a mega mall and theatre that is located next to the project location on the ring road highway that will most certainly

contribute to the existing traffic jam by adding more home-leisure based trips and will negatively impact the traffic circulations, specifically during evening hours.

#### 4. Discussion

Most of the towers in KAFD are to house financial companies, administrative offices, and other multi-function facilities. Also, there are several towers and buildings that have residential levels. In addition, the project will include theaters, restaurants and upscale hotels that are operated by well-known service companies.

The financial district will include many recreational areas designed in a way that will give the impression of well-connected pedestrians' neighborhood and is displayed by fountains, artificial creeks, museums, and other recreational and educational facilities along with many sidewalks, all in and around the project that are enhanced with sequence of gardens, community parks, fountains, and landscape to please the public at large. (E-Architect. 2017). See figure A3 and A4, appendix A.

The project area consists of about three million square meters (MEED 2011) that houses all those magnificent buildings and surrounding areas of attraction. To better improve the transportation of people and goods, the KAFD will have an elevated magnetic monorail that connects all skyscrapers with the project main attractions. (Trade Arabia 2010). See figure A5 and A6, appendix A.

The aim of the paper is not limited to only pointing out the potentials of this mega project but also to point out the socio-economic implications of this fabulous project and its anticipated effect on the surrounding transportation system and future transportation growth, due to its location. In this regard, the paper will examine three major categories that may explain the impact of the project. There might be other categories that need to be considered, however, the following categories may reflect the major restrains to be considered in future studies and those are as follows:

##### *4.1 Anticipated Traffic Impact on The Existing Transportation System*

Currently, the King Fahad highway is considered one of the most congested main arterials in the city of Riyadh. The Northern Ring Highway is less congested in comparison to the King Fahad highway. However, traffic at the peak time hours is highly congested in both routes. See figure A7, appendix A. Therefore, any increase in traffic on those surrounding routes will add up to the current traffic congestion problem, because development in cities are associated with the growth of mobility and urban transport to better improve access for goods and people (Rode et al., 2017). However, Meanwhile, Amin A. (2013) maintains that in developing countries, cities have experienced a significant growth resulting in denser use of space and unaffordable challenges to their urban mobility systems such as congestion and air pollution, therefore, travel demand is expected to increase at a similar rate with urbanization (Javid, Okamura, Nakamura, Tanaka, & Wang, 2013). It is worth to mention that the traffic department at Riyadh municipality along with the Riyadh development commission has implemented state of the art transportation system management (TSM) techniques to improve traffic flow. Such measures were noticed at the site visits, where time for green lights were prolonged for through lanes at the exit ramps; and other intersection improvements were implemented.

The location of the KAFD is surrounded by two main highways, to the east by the king Fahad Highway that runs north and south bounds and by the Northern Ring Highway that runs east and west bounds. A local ring road was developed that surrounds the project area. This ring road will basically receive and transmit traffic from the surrounding highways. See figure B1, appendix B; for the KAFD's surrounding transportation system. A Central Business District (CBD) development plan shall have a transportation system study that consists of the existing and forecast system impact. Certainly, the KAFD once completed will be the prominent Central Business District in the capital city Riyadh. The project has the potential to becoming one of the world's most known financial hubs. Like all known financial hubs, the project will generate much of peak time traffic on both mentioned surrounding highways and thus will significantly impact traffic flow. Therefore, sequence of alternatives must be developed to elevate the anticipated traffic congestion. The paper suggests that a thorough analysis of current traffic issues should be taken into consideration (e.g., traffic congestion on local roads and ramps). Thus, the paper suggests alternative solutions that may elevate some of the anticipated traffic congestion surrounding the KAFD area.

As previously mentioned, there are traffic congestion issues that have persisted in the capital city of Riyadh and more specifically around the KAFD project area, even though several measures were implemented by the local transportation authorities. Therefore, any technical measure may not alleviate the problems categorically but certainly will help the anticipated traffic congestion within the project area.

#### 4.2 Proposed Solutions to Alleviate Anticipated Traffic Impact

The paper has examined the current surrounding transportation system carefully and has developed the following transportation alternatives to help ease the anticipated traffic congestion around the KAFD area. Figure B2, appendix B, will show all the proposed alternatives. Briefly, the paper will elaborate on each suggested alternative:

1) The construction of a two-lane elevated exit ramp at the south bound of the King Fahad highway starting at about 50 meters after the Thumamma road interchange with the King Fahad highway. The proposed ramp will have to be aligned to the existing ring road around the project. The length of the two-lane exit ramp shall be a minimum of 60 meters to store more vehicles without impacting the King Fahad highway traffic. This ramp will handle the anticipated traffic from the northern areas of the KAFD project. For further illustration of the first alternative, see figure B3, appendix B.

2) On the northern bound of King Fahad highway, the researchers propose the construction of a two-lane elevated exit ramp that splits-out of the current exit route of the King Fahad to the Northern Ring Road interchange. The proposed ramp will be smoothly curved to land at the existing ring road that is built to receive the anticipated project traffic. The researchers do not specify the degree of the curve but suggest that a smooth radius might be applicable for the proposed ramp. This ramp will handle most of the anticipated traffic from the southern districts of the KAFD project. For further illustration of the second alternative, see figure B4, appendix B.

3) The researchers propose the construction of a two-lane elevated exit ramp that starts at about 100 meters on the western bound of the Ring Road highway and the King Fahad interchange. The proposed elevated ramp will be slightly curved to land at the existing ring road that is built to receive the anticipated project traffic. This ramp will handle most of the anticipated traffic from the eastern district of the KAFD project. For further illustration of the third alternative, see figure B5, appendix B.

4) The researchers propose the construction of a two-lane depressed (underpass) exit ramp on the eastern bound of the Northern Ring Road highway that starts at about 50 meters after the current exit ramp from the Northern Ring Road to Takhassasi Road. The proposed ramp will be elevated to become an overpass over the Northern Ring Road and then curved to gradually land at the existing Ring Road that is currently built to receive anticipated project traffic. This ramp will handle most of the anticipated traffic from the western districts of the KAFD project. For further illustration of the fourth alternative, see figure B6.

5) The final suggested alternative solution that the research proposes for the anticipated traffic congestion around the currently built ring road that surrounds the KAFD project area, is to re-route the Thumamma road traffic that enters the project. The proposed one lane ramp will transmit traffic further south of the project area for the purpose of better traffic distribution within the project area. For further illustration of the fifth alternative, see figure B7.

It is worth to mention, that by no means have the researchers thought that these suggested alternatives are the key to tackle all listed challenges. On the contrary, researchers believe that there might be other alternatives that other engineers have thought of but did not come to surface or in the initial study process.

#### 4.3 The Impact of the Social Context

In the commercial assessment of such megaproject, it is necessary to consider the many aspects that can influence the project's overall performance, including concerns and potentials. Though, it is also imperative to observe the impact of the project on the social characteristics of the surrounding society and how it would impact the project's potentials. The KAFD project shall consider the effect of the social context of the Saudi society, particularly in Riyadh, which is considered one of the most conservative regions, in comparison to the eastern and western regions of the kingdom. Overall, the social aspects of Riyadh's region emphasize on the separation of the two genders. Anywhere else this main social element may underline the shopping experience and impact the buying power and profits. But the nature, of the Saudi society, particularly in Riyadh has been well adopted to such culture and thus those elements will not impact the commercial malls and shops within KAFD in the long run.

Riyadh city is wealthy in culture, and its society is very influenced by the Islamic teaching and many principles regarding privacy. Also demographically, Saudi Arabia has a high average of household size (Abdul Salam, 2013), in addition to the fact that for years Saudi women were prohibited to drive a car in the cities. Therefore, Saudi woman could not use their own cars, so they relied on hired drivers to meet their daily transport needs for all their errands and daily trips. About four years ago, a major positive change in the social context of the Saudi society occur, a royal decree has been issued to allow females to drive as of May 2018. Even though there are little social factors that may be considered as a minor economic constrain, but allowing women to drive is the kingdom, shall be considered as factor in the future for economic assessment of the project potentials. In many ways, the Saudi society is prone to such impacts since the country has been in a construction boom and several mega projects were

planned and are constructed to upgrade the country's infrastructure.

## 5. Conclusion

The research paper has stressed out the anticipated impact of the KAFD project on the surrounding Highway Corridors and has developed several alternative solutions to mitigate the adverse impact of the project to further improve the local transportation system. The paper revealed no socio-economic impact of the project but given the size of this megaproject, it was hard to predict the definite social impact.

In addition, the researchers would like to point out other enhancements that may include continued improvements of the project area signage and landscaping, the addition of sidewalks and bikeways (where appropriate), to encourage pedestrians and bicycle accesses that lead to the project area and to continue to work closely with the mentioned local authorities on the KAFD plan of improvement. Such measures shall be an environment-friendly practices to be integrated into the project local roadway networks to discourage the use of private cars and encourage people to walk.

The researchers strongly support this magnificent architectural masterpiece that will certainly become one of Saudi Arabia's top landmarks and will gradually benefit the local and national economy.

## Acknowledgements

This work would not have been possible without the financial support and the academic time granted to me and to my colleague Dr. Ibrahim Aljutaily by Dar Al Uloom University, and the college of Architectural engineering and digital Design to pursue the research. I am especially grateful to Dr. Ibrahim Aljutaily, a co-author, and a colleague, who have contributed tremendously to the research and worked actively to provide me with the professional inputs and written comments. I am also very thankful to my best senior student, at the time, Architect Mohamad Alhulaibi for his contribution to this paper. Architect Mohamad created most of the needed figures and organized the notes that pertain to the numerous site visits.

## References

- Abdul Salam, A. (2013). Population and household census, Kingdom of Saudi Arabia 2010: Facts and figures. *International Journal of Humanities and Social Science*, 3(16). <https://doi.org/10.1186/2193-1801-3-530>
- ADA (now RCRC). (2015). *Investment climate report*. Riyadh: ADA. Retrieved from A comprehensive strategic plan for the city of Riyadh: Now renamed as RCRC.gov.sa.
- Al-Hathloul, S. (2017). Riyadh development plans in the past fifty years (1967–2016). *Current Urban Studies*, 5(1), 97-120. <https://doi.org/10.4236/cus.2017.51007>
- Alotaibi, & Potoglou. (2017). Perspectives of travel strategies in light of the new metro and bus networks in Riyadh City, Saudi Arabia. *Transportation Planning and Technology, Taylor & Francis Journals*, 40(1), 4-27. <https://doi.org/10.1080/03081060.2016.1238572>
- Amin, A., Arimah, B., Halfani, M, K., Barrett, Jensen, I., Kinyanjui, M., Moreno, E., & Yemeru, (2013). *Planning and design for sustainable urban mobility: Policy directions: Global Report on Human Settlements*. Retrieved from [www.unhabitat.org/2013](http://www.unhabitat.org/2013)
- Estimo, R. (2015, June 30). *King Abdullah Financial District completion date uncertain: Arab News*. Retrieved from <https://www.arabnews.com/node/769521/%7B%7B>
- Furuto, A. (2013, January 30). *KAFD Men's and Women's Portal Spas Proposal. Arcdaily*. Retrieved from [https://www.archdaily.com/317832/kafd-mens-and-womens-portal-spas-proposal-worksbureau?ad\\_source=search&ad\\_medium=projects\\_tab&ad\\_source=search&ad\\_medium=search\\_result\\_all](https://www.archdaily.com/317832/kafd-mens-and-womens-portal-spas-proposal-worksbureau?ad_source=search&ad_medium=projects_tab&ad_source=search&ad_medium=search_result_all)
- GAT. (2016). *The general department of traffic*. Riyadh: Ministry of Interior. Retrieved from <https://www.moi.gov.sa/wps/portal/Home/sectors/publicsecurity/traffic>
- Henning, L. (2011). *The king Abdullah Financial District project*. [henninglarsen.com](http://henninglarsen.com) Retrieved from <https://henninglarsen.com/en/projects/0700-0799/0770-king-abdullah-financial-district>
- King Abdullah Financial District: Bombardier wins \$241m Saudi monorail contract. (2010, June 1). *TradeArabia*. Retrieved from [http://www.tradearabia.com/news/cons\\_180748.html](http://www.tradearabia.com/news/cons_180748.html)
- Middle East Economic Digest (MEED). (2011, October 16). *King Abdullah Financial District now the world's biggest green development*. Retrieved from <https://www.meed.com/sectors/construction/real-estate/king-abdullah-financial-district-now-the-worlds-biggest-green-development/3112344.article>

- Ministry of Municipal and Rural Affairs (MOMRA). (2011). *National development plans*. Retrieved from <http://www.momra.gov.sa/>
- Ministry of Transport (MoT). (2011). *National transportation strategy*. Riyadh: Author. Retrieved from <https://www.mot.gov.sa/Ar/Documents/Final%20Report%20English%20New.pdf>
- Ouroussoff, N. (2010, December 12). *Saudi Urban Projects Are a Window to Modernity*, *New York Times*. Retrieved from <https://www.nytimes.com/2010/12/13/arts/design/13desert.html>
- Rahman, S., & Al-Ahmadi, M. (2010). Evaluation of Transportation Demand Management (TDM) Strategies and Its Prospect in Saudi Arabia. *Jordan Journal of Civil Engineering*, 4(2), 168-172.
- Riyadh King Abdullah Financial District. (2013, September 13). *Middle East Economic Digest (MEED)*. Retrieved from <https://www.meed.com/king-abdullah-financial-district/>
- Timmons, H. (2006, May 10). *Saudis Plan Middle East Financial Center*, *New York Times*. Retrieved from <https://www.nytimes.com/2006/05/10/business/worldbusiness/saudis-plan-middle-east-financial-center.html>
- Welch, A. (2017, October 2). *Saudi Arabia: king Abdullah Financial District, Riyadh*, *e-architect*. Retrieved from <https://www.e-architect.com/saudi-arabia/kafd-riyadh>

## Appendix A

List of illustrated figures and images of the project. Please note, due to security issues, team were not able to take actual photos for KAFD. But the listed images are very resembled images that were obtained from KAFD web page or related sites.

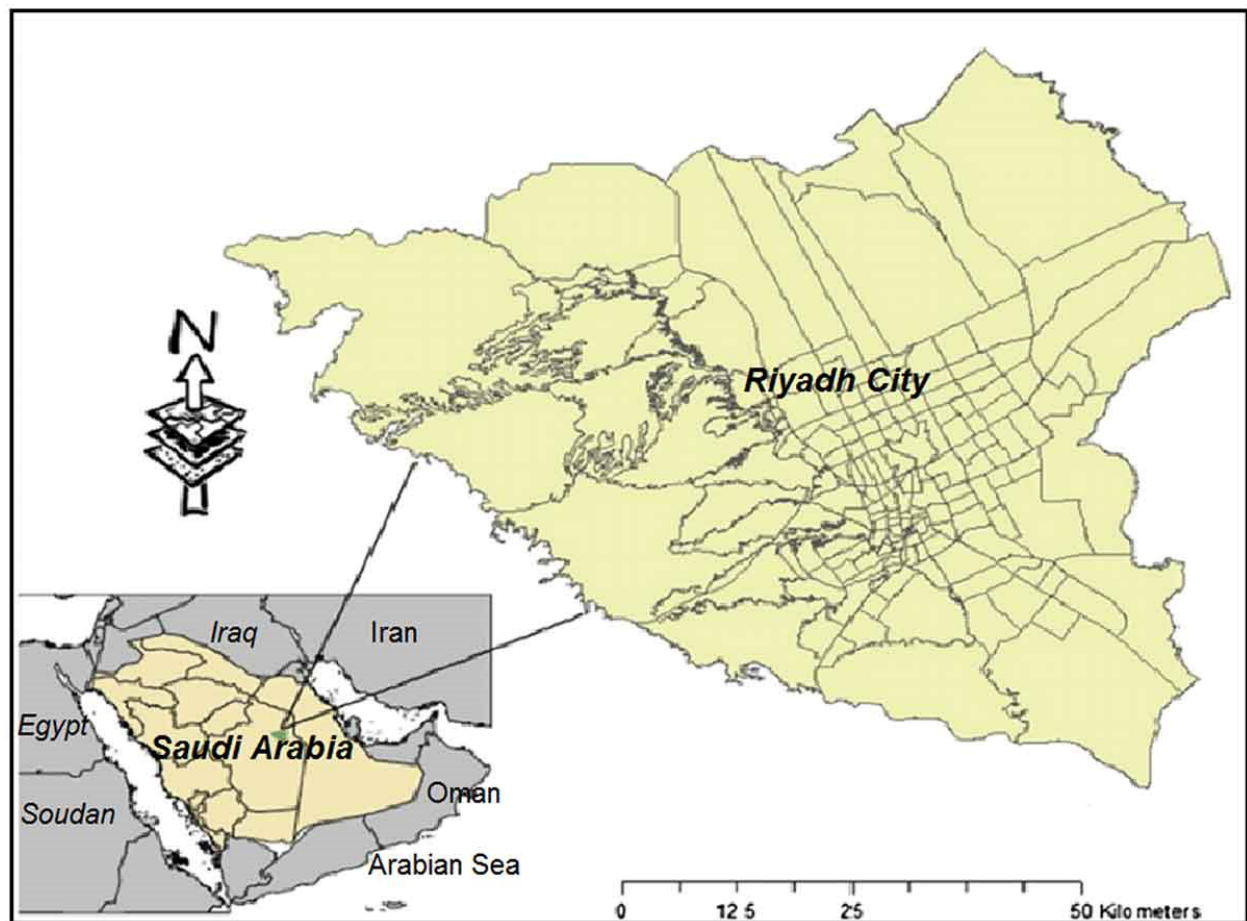


Figure A1. Map of the Kingdom of Saudi Arabia. Source: ADA 2013





Figure A2. Project location in the city of Riyadh, Kingdom of Saudi Arabia



Figure A3. View of Financial Plaza. Source: KAFD.com.sa





Figure A4. Night View of Financial Plaza. Source: Henning Larsen Architects



Figure A5. The monorail. Source: KAFD.com.sa





Figure A6. Sky Train- Monorail System. Source: KAFD.com.sa



Figure A7. Riyadh traffic congestion: King Fahad highway, source: <https://www.royalhaskoningdhv.com/en-gb/projects/riyadh-traffic/6003>

## Appendix B

List of project roadway circulation and suggested ramps.



Figure B1. Existing roads system



Figure B2. Proposed alternative ramps



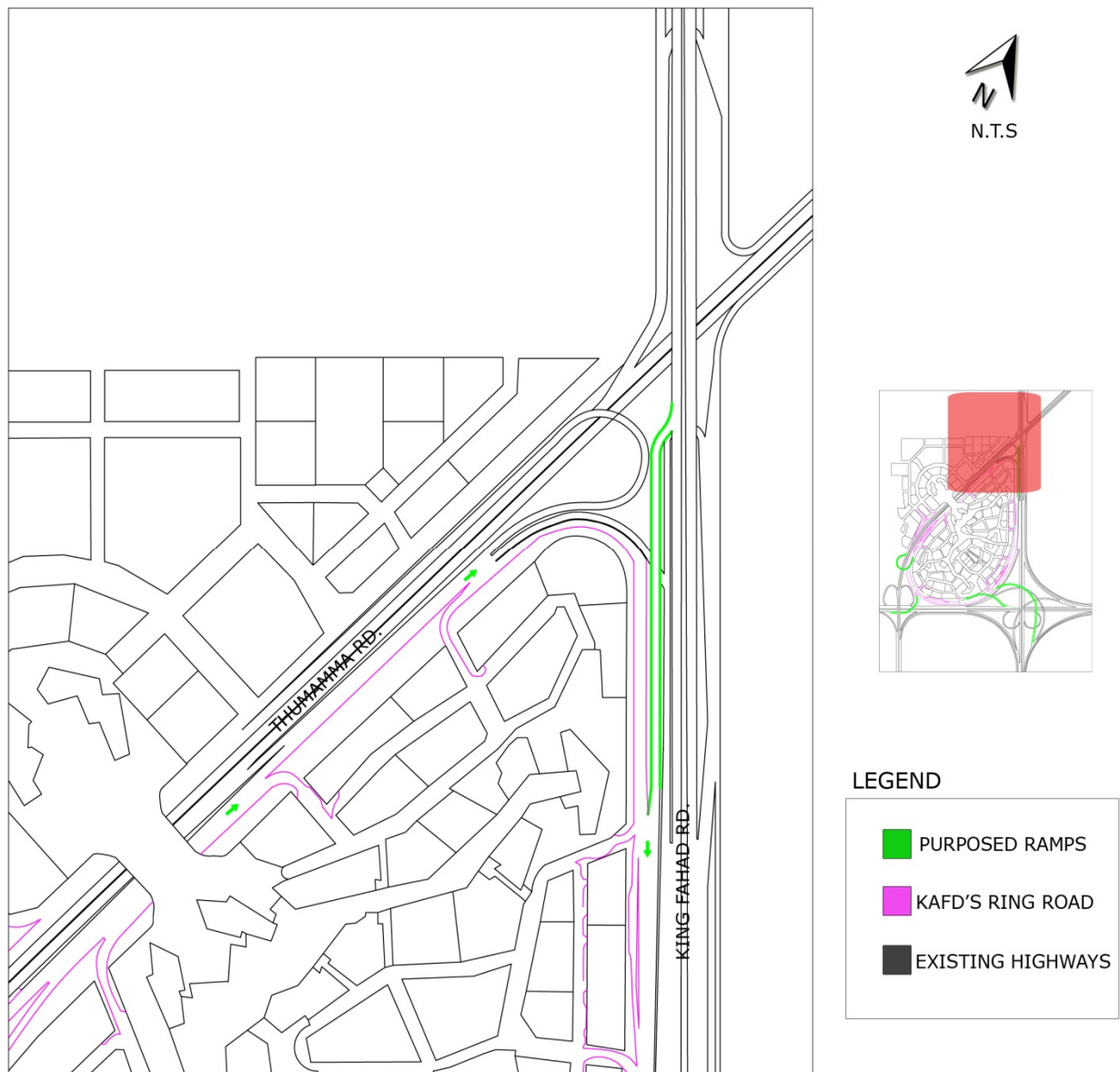


Figure B3. First proposed alternative



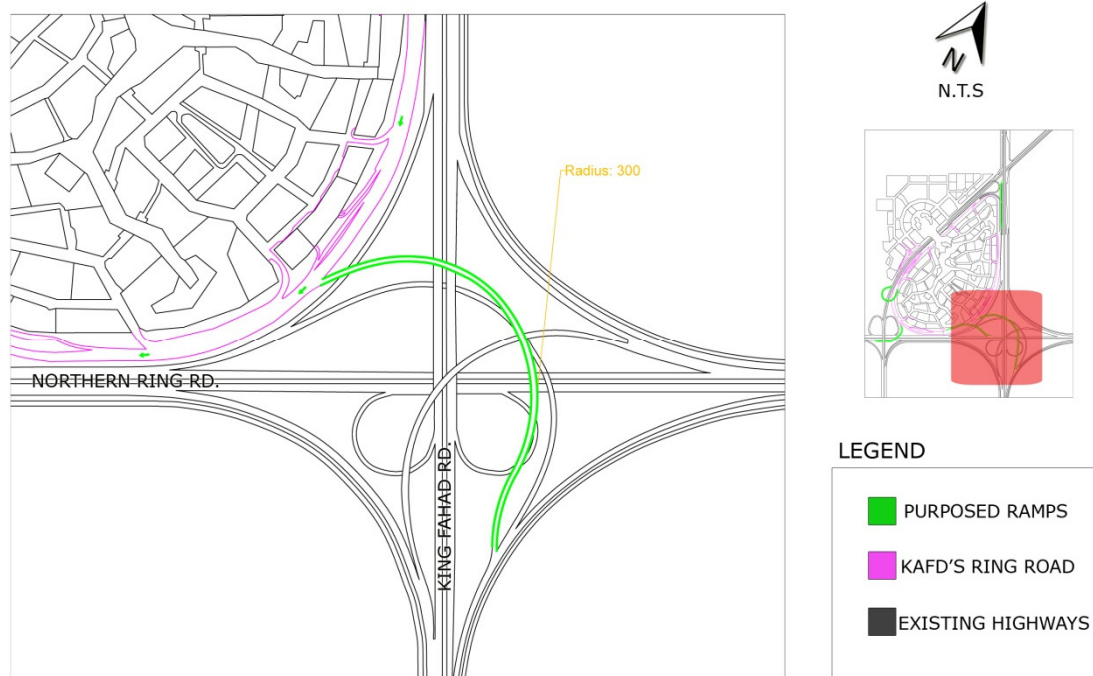


Figure B4. Second proposed alternative

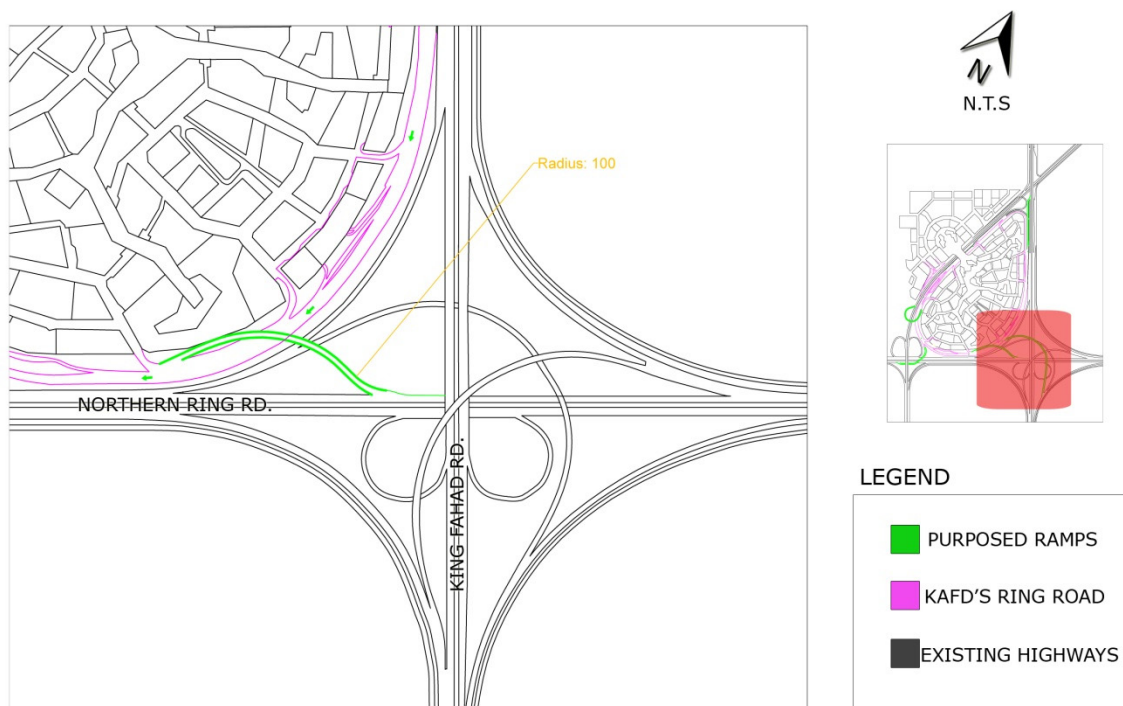


Figure B5. Third proposed alternative



Figure B6. Forth proposed alternative



Figure B7. Fifth proposed alternative

**Copyrights**

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).