TRANSIT-ORIENTED NEIGHBORHOODS IN AMMAN

NEIGHBORHOOD SELECTION, ANALYSIS, AND URBAN DESIGN
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QUALITY INFRASTRUCTURE INVESTMENT PARTNERSHIP

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This report was authored by a World Bank team led by Jon Kher Kaw (senior urban development specialist), Hogeun Park (urban specialist), and Ban Edilbi (young professional). Identification of potential neighborhoods for transit-oriented development was carried out in collaboration with the Greater Amman Municipality. The neighborhood spatial analytics and concept urban design proposals were carried out by Ecosistema Urbano. The urban design team included: Jose Luis Vallejo, Belinda Tato, Marco Rizzetto, Elena Castillo, Jorge Izquierdo Cubero, Vicky Vlachodimou, Lily Liebes, Jose Anelo Romero, Fernando Sanzana Agass, and Julia Casado, with the help from independent consultant Myriam Ababsa. The Greater Amman Municipality contributed valuable inputs to this report. The development of neighborhood urban design concepts received funding support from the Quality Infrastructure Investment (QII) partnership program.
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Amman, with a population of 4.3 million—nearly half of the national total—is the economic heart of Jordan, contributing 60% of the GDP and housing 80% of the country’s large firms. After decades of urban sprawl, Amman is a low-rise city on a hilly plateau with an average elevation of 950m. The city suffers from major traffic congestion as residents and commuters use cars (33%) or taxis (9%), walk (26%), and only 14% use public transport. On average, people in Amman can reach only 18% of total available jobs in under 60 minutes using public transport and walking.

The city has developed major structural inequalities in its layout, with vulnerable populations concentrated in the Eastern part of the city, in dense self-built neighborhoods. Commuting distances for residents from East Amman to jobs are twice as long as those from affluent neighborhoods. Access to education, health facilities, and green space differs across neighborhoods, reflecting income segregation.

**BUS RAPID TRANSIT LINES IN INTEGRATED URBAN PLANNING**

In order to improve traffic and the urban layout, the Greater Amman Municipality (GAM) has adopted integrated urban planning methods, combining a Transportation strategy to its Master plan in 2010. The main component has been the construction of two Bus Rapid Transit (BRT) lines connecting the north-eastern and north-western districts to the city center. It has been operational since 2021 (Phase 1). GAM is now working on Phase 2 to connect the eastern and southern districts of the city to the center, with a future link planned between Zarqa and Amman (Phase 3). The policy objectives are to increase public transportation use (from 14% to 40%) while promoting transit-oriented development with housing and economic growth along core transportation corridors.

Spatial analysis suggests that expanding the BRT network would improve access to jobs and services leading to productivity growth and demand for additional floor area in neighborhoods in the northwest (Sweileh District) and south of Amman. There is a strong opportunity to complement these infrastructure investments with more responsive land use and neighborhood improvements to leverage on these dynamics to further improve city productivity and livability.

**CLIMATE-CONSCIOUS URBAN PLANNING**

Climate-conscious urban planning is critical as climate-related shocks are predicted to greatly impact economic growth and quality of life. Located at the limit of the Arabian desert, Amman is particularly vulnerable to climate change and natural disasters. Within a span of eight years, the average surface summer temperature of the entire city has gone up from 45°C in 2013 to 46.8°C in 2021.

Since 2010, Amman has implemented environmental policies and is the first Arab city to adopt a Climate Plan, intending to become carbon emissions-neutral by 2050, fostering solar energy, rainwater harvesting, green areas development, solid waste sorting and reduction, and public transport.

A quarter of Amman’s residents live more than an hour’s walk from any public space or park, while another tenth of residents require over two hours to reach such areas. Amman lacks green spaces with only 11.7 km² of green areas, barely 2.7 m² per inhabitant. Amman Green Action Plan 2021 calls to limit urban sprawl and to create green corridors along the valleys and main roads, including the BRT lines.
OPPORTUNITIES FOR TRANSIT-ORIENTED DEVELOPMENT, PUBLIC SPACE ENHANCEMENTS, AND NEIGHBORHOOD REGENERATION

This report examines the potential for urban design solutions to (a) facilitate Transit-Oriented Development (TOD) in Sweileh District, and (b) enhance first-last mile connectivity along the Al-Yarmouk neighborhood, an area marked by low-income households, limited green and public spaces, heat islands, substandard urban environments, and poor access to planned Bus Rapid Transit (BRT) stops due to hilly terrain.

The aim is to turn mobility challenges into opportunities for innovative public space enhancements at various scales, involving community participation. The key areas of focus are publicly owned or vacant land and properties to address issues such as safety, greenery, heat islands, access, walkability, and services.

The concept proposal encompasses a comprehensive urban vision that combines social, environmental, and connectivity strategies to create an urban network of interconnected, accessible streets and public spaces that provide safe and pleasant access to new infrastructure while addressing other deficiencies in the targeted areas. The approach aims to embrace an integrated strategy with a holistic understanding of the complex interactions taking place in the city and their co-benefits for all stakeholders.
NEIGHBORHOOD SELECTION

As mentioned before the two selected areas of interest are the Al-Yarmouk Street corridor and the area surrounding the Sweileh Terminal. The Al-Yarmouk Street area is a 6.5 km long urban corridor characterized by very a complex and diverse urban and social context. It is located in the southeast of the city that will host one of the new BRT lines planned for the second phase. The area around the Sweileh Terminal is a consolidated urban area in the north of the city that hosts an existing BRT terminal and plays an important role in Amman mobility. The main challenge in this area is to improve pedestrian mobility and public space quality.
The selection of a set of transit-oriented typologies of spaces provides a framework for the possible interventions. This allows for a more generalized analysis and the development of a design methodology that can be applied to different areas of the city. In the case of the selected areas in Amman, leveraging on the improvement of existing assets is key. The neighborhoods affected by the new transit system are consolidated urban areas in which it is not possible to propose urban designs from scratch. The challenge is to identify networks of public spaces connected to the BRT, and improve them to encourage pedestrian mobility and improve accessibility to the BRT stations.

In the selected areas, eight types of public spaces were identified, each of them poses different challenges and offers new opportunities for improvement.

1. **CONNECTION STRATEGIES**

   Pedestrian connections are one of the most significant parts of the proposed transit-oriented neighborhoods that need to be improved around the new BRT infrastructure. After a comprehensive analysis of the selected areas around the new BRT lines, it was possible to detect a set of issues with pedestrian mobility and accessibility. In general, most of the streets have a car-oriented design that reflects the Amman car-centric mobility system, this approach is reflected in the section of the streets but also in their itinerary which is not optimized for pedestrian connections. In many cases, sidewalks are not continuous or not completely accessible, in other cases, the sidewalks are often occupied by cars or other elements that limit their accessibility. There is also a general lack of safe pedestrian crossings. There are also cases when alternative pedestrian routes are commonly used but haven't been formalized and therefore are not accessible at all.

   We identified four main strategies to improve connections:
   1. Improve existing connections
   2. Formalize informal pathways
   3. Create new connections
   4. Create vertical connections
2. ENVIRONMENTAL STRATEGIES
While defining the new transit oriented neighborhoods is also important to consider that this transformation is a great opportunity to implement environmental oriented strategies. The strategies under this topic relate to increasing the presence of nature, minimizing the impacts of extreme climatic events like floods, supporting urban ecosystems, and improving urban services like sewage or energy systems to minimize their impacts while making the city more livable. These four strategies must be considered in the design of every sub-project and the transformation of every area: The environmental strategies are:

1. Biodiversity
2. Climatic comfort
3. Water management
4. Metabolism

3. SOCIAL STRATEGIES
The last set of strategies that must drive all design decisions is related to the social framework. A key goal of the project is to increase the access for everyone, regardless of their capabilities or condition, to the new mobility system. Doing so will improve many aspects of the life of Amman's citizens, increasing the inclusiveness of the city and fostering the sense of community. These initiatives, together with the implementation of safer spaces, will also contribute to the improvement of public health conditions and a more equitable society. In terms of public space design it is important also to consider the importance of beauty in improving the quality of life. The social strategies are:

1. Inclusion
2. Community
3. Health
4. Equity
5. Safety
6. Beautification
The Amman BRT Phase 2 Preliminary Technical Assessment and Financing Options report suggests BRT stops along Al-Yarmouk street approximately every 1000 m and considers placing stops every 500 m a possible alternative. In order to be able to design and prioritize correctly the interventions and projects along Al-Yarmouk St., it was necessary to estimate the overall impact of the stops placement. The “catchment basins” approach was adopted to provide a data-driven analysis tool that can be used to quickly estimate the impact that the stops placement has on the overall accessibility to the BRT.

The definition of a catchment basin is borrowed from hydrology and, in this case, refers to an area where, starting from any point, all most convenient paths converge to a BRT stop. Paths cost is calculated using the averaged walking time that has been presented in the previous paragraph.

Each basin is a subnet of the whole network that refers to a specific stop. If a person wants to reach the most convenient BRT stop, i.e., the one that takes less time to reach, from any point belonging to a basin should go to the stop in which the basin converges.

Basins are a very useful way to visualize and organize the structure of the areas around the BRT infrastructure. In this project, this spatial organization has two main purposes, the first one being aid in the optimization of the stops number and position, and the second one the selection of the projects.

The analysis of the initial stops proposal, with one stop every ~1000 m, shows six large basins evenly distributed along Al-Yarmouk. The walking time between stops along Al-Yarmouk is generally less than 10 minutes.

When placing stops every ~500 m these criteria were followed:
- Proximity to main streets and pedestrian connections
- Prioritization of densely populated areas
- Conformity with existing BRT preliminary studies
- Results of pedestrian accessibility simulations

The same analysis obtained ensuring that stops are placed every ~500 m shows a significant reduction in basins size, indicating that the walking distance to each stop was significantly reduced.

Given that the project aims to generate transit-oriented neighborhoods, a spatial organization centered around the future BRT stops and their corresponding catchment basins is the most logical approach. This prioritizes interventions in areas with the highest potential ridership, ultimately ensuring equitable access to the public transportation system for all residents within these catchment areas.

1 WSP (2023) Amman Bus Rapid Transit Phase II, Preliminary Technical Assessment and Financing Options - Final Report
Basins corresponding to each stop along Al-Yarmouk street. Stops are approximately 1 Km apart. Grey basins refer to stops outside of the considered area.

Basins corresponding to each stop along Al-Yarmouk street. Stops are approximately 0.5 Km apart. Grey basins refer to stops outside of the considered area.

**ESTIMATION OF THE IMPACT OF ACCESSIBILITY IMPROVEMENT WITHIN 15 MINUTES FROM THE BRT STOPS ALONG AL-YARMOUK STREET**

Using the street network model with the weighted segments, it was possible to simulate within a certain degree of precision the walking times (and distances) from each point of the network. These simulations give a clear view of the impact that certain factors have on the accessibility to the BRT stops.

Using different combinations of factors - BRT stops location and pedestrian accessibility - it was possible to generate three different scenarios.

**Scenario A**

BRT stops are placed every 1 Km approximately. The location of the stops is based on the preliminary studies for the second phase of the BRT² - Line 4.

Only existing and formal streets are considered in this scenario. Informal paths, informal stairways, shortcuts, and the paths along the Hejaz railway are excluded from the simulation. This partially reflects the actual situation, in which routes and streets are designed for cars and not optimized for pedestrians.

**Scenario B**

BRT stops in this scenario are placed every 1 Km, like in Scenario A. The considered street network is now completed with all available connections. This takes into account the improvement of existing informal paths and stairways, the integration of the Hejaz railway as a pedestrian corridor, and the creation of new connections where necessary.

**Scenario C**

BRT stops in this scenario³ are placed every ~500 m. The placement of the stops is based on the BRT phase 2 proposal and is adjusted taking into account the pedestrian mobility in proximity of the stops. The considered street network is the same as in Scenario B.

² Ibid. It is important to notice that this is a preliminary study and that the final placement of the stops is still subject to more in-depth studies.

³ Ibid. A proposal for line 4 with stops at 500m intervals is considered in the final report. This project proposal considers a slightly modified version of the WSP proposal, optimized for pedestrian accessibility.
As expected, there is clearly an improvement in the accessibility times in the three scenarios. The first scenario can be considered the one that likely represents the implementation of the BRT line in the Al-Yarmouk segment without any improvement to public spaces and transit oriented accessibility.

The B scenario represents the option where the BRT is implemented with stops at 1000 m intervals, but with a consistent investment in pedestrian mobility, accessibility and public space improvement.

The C scenario maximizes the pedestrian accessibility to the BRT line along Al-Yarmouk street. Stops placed at 500 m intervals offer an improved access to the public transport system, reducing the walking time significantly, at least in the areas closer to Al-Yarmouk street. Between the scenarios B and C, the benefits in terms of accessibility are greater in the areas closer to the line in scenario C and decrease walking away from it. This could be explained considering that with starting points further away from the stops it’s easier to find alternative routes that minimize the walking distance and that the final segment represents a smaller portion of the complete route.

It is important to point out that in some areas adding a new stop or opening new connections brings a significant improvement in terms of pedestrian accessibility and access time. The impact of these localized improvements might be canceled out when looking at the greater picture but it is important to consider its importance at the pedestrian neighborhood scale. Localized interventions can drastically improve pedestrian accessibility in certain areas.
Scenario C
Spatial analysis of the walking times from each of the proposed BRT stops along Al-Yarmouk street (white line).

Simulation with stops every 500 m approximately.

This simulation takes into account all streets, paths and new proposed connections. It can be considered as a snapshot of the final situation with all the projects in the long list implemented.
SWEILEH TERMINAL ACCESSIBILITY

For the Sweileh terminal area the accessibility analysis must be considered from another perspective. The Sweileh terminal is an important node for private and public transport at a metropolitan scale and at the same time it is a lively and popular commercial area in the center of a popular area.

Sweileh Terminal is one of the main infrastructures built for the first phase of the Amman BRT. It is, in fact, the end of the line for the two existing BRT lines, and in the future it will be the end of a new line that connects it to Luminus College. It is located at the intersection between the Jerash Highway, an important artery entering Amman from the north, the Salt Highway, which enters the city from the northwest, Queen Rania Street that continues towards Jordan University and the city center, and King Abdullah II Street, which continues to the South and eventually connects with the Airport Road. Because of its position, Sweileh has been one of the main gateways to the capital for those coming from the North, and it is a very congested intersection. Its importance as a mobility hotspot makes Sweileh a strategic and crucial node in metropolitan Amman; the area around the terminal is also a stop for many coasters and service taxis. As a consequence of its importance as a transit node, the surroundings of the terminal are also very crowded by people waiting for buses or changing from one line to another. Because of its popularity, the whole neighborhood is lively, with many small shops, commerce along the main streets, and numerous vendors on the sidewalks. A downside of this popularity is that the whole area around the intersection is devoted to vehicle traffic. Generally, cars have priority over pedestrians and jaywalking is a common practice. Improving pedestrian accessibility around the terminal is especially important, as the area will be an even more central node of interchange in the future.

The activities related to this function -the metropolitan node- are limited to a very short range around the terminal, this range is determined by the organization of local bus stops and taxis waiting areas that generates a constant flow of people to and from the terminal and the surrounding commercial activities. This micromobility has to be managed at a very local scale and does not affect directly the surrounding neighborhoods.

On the other hand, Sweileh terminal is also located in the center of a large neighborhood with many public facilities and lively commercial areas. Around the terminal in a 250m radius, there are four schools and a large public park that is a vital infrastructure in a city like Amman that has a chronic scarcity of green spaces. Improving the accessibility and the connections between these infrastructures and the dense neighborhoods, which have a healthy mix of residential areas and neighborhood scale commercial activities, would generate a virtuous example of the 15 minutes city.
**Affected Population**

Calculating the population affected by the BRT is not a trivial task, obviously there are many possible approaches: estimating the population that will actually use the BRT, estimating the vulnerable population that most likely will benefit from a better access to public transport, estimating the population that will have access to the BRT using the feeders bus system, or estimating all the population living within a certain distance from any of the stops. This proposal focused on this last approach because the goal of the project is to enhance existing urban infrastructures and create new public spaces to enable transit oriented neighborhoods. This approach would benefit the whole population of a neighborhood and not only the population that would use the new BRT infrastructure. For this reason considering the population living within 15 minutes from any bus stop can provide a good estimation of the citizens that will benefit from this proposal.

For the Al-Yarmouk Street analysis the affected population is distributed along the 6.5 Km spanning from the Al-Mahatta terminal area to the Ash-Sharq Al-Awaat Interchange. The population that has access to the BRT stops depends on the stops position and distance (Scenario A and B consider stops every 1 Km, scenario C every 500 m) and on the pedestrian accessibility improvements that are implemented (Scenario A considers only existing streets, while B and C consider also the new and improved connections).

In the Sweileh area, the terminal is considered the main attractor in a large urban area that is densely populated and has a rich and diverse commercial tissue. The main challenge in this dense area is to improve pedestrian safety and accessibility, especially in the area close to the terminal.

**AL-YARMOUK STREET**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scenario A:</strong> 27.777</td>
<td><strong>Scenario B:</strong> 33.344</td>
<td><strong>Scenario C:</strong> 51.619</td>
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<td>86% INCREMENT</td>
<td>52% INCREMENT</td>
<td>79% INCREMENT</td>
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</table>

**SWEILEH TERMINAL**

43,697 Pop. Under 15 Minutes
20,218 Pop. Under 10 Minutes
3,065 Pop. Under 5 Minutes

Isochrone areas around the Sweileh Terminal. Population is estimated from 2020 population data.

The implementation of the suggested interventions along the Al-Yarmouk Corridor would significantly increase the accessibility to the public transport system affecting more than 200,000 people within a 15-minute walking distance.
The approach that was followed to select the long list of projects included the criteria listed below.

1. BASIN ORIENTED
Basins are the basic unit for organizing projects for generating a transport-oriented neighborhood. Considering that each basin refers to a BRT stop it is crucial to connect the basin to its stop, so that people living in the neighborhood can reach the BRT stop using an accessible path, that should be as short as possible. Prioritizing connections to and from the BRT stops does not limit the possibility of connections between basins, pedestrian mobility works best when it is based on a tightly interconnected network.

2. DATA DRIVEN
A good quantitative indicator that can be used to determine the most connected streets in the selected area is obtained through a network analysis algorithm called “betweenness centrality”. Betweenness centrality is “a measurement of the importance of a specific node in a network in terms of how often paths must go through that node”. Nodes that have a high centrality score in the network are the ones that are well connected to the rest of the network and therefore are most likely to be found in popular streets. Intuitively, most well-connected areas are important streets connecting to Al-Aarmouk Street and/or other commercial streets within each neighborhood and are good candidates to become the main connections to the BRT stations from each basin.

3. LOCALLY ADAPTED
The selection of the best paths to connect the BRT stops to the neighborhoods does not depend solely on the quantitative evaluation of the street network, but also on a qualitative and spatial one. Existing commercial streets or areas are preferred over secondary ones. An enriched pedestrian experience is a proven factor that increases a population's willingness to walk instead of using other means of transportation. The improvement of selected streets -both in terms of urban quality and pedestrian traffic- will also have a positive effect on commerce and other activities, triggering a positive transformation process.

4. ENRICHED BY ON-SITE OBSERVATIONS
All informal mobility and usage patterns (paths, stairs, vending areas, social gathering areas) were considered valid inputs for the project. These traces of unheard citizens’ necessities had to be acknowledged and considered to root the proposal in the local urban tissue. In many cases, informal paths are efficient shortcuts for pedestrians, in other cases are temporary uses of empty areas.

5. CONNECTING EXISTING AND NEW PUBLIC FACILITIES
The connection of important facilities to the public transport system determines, in many cases, the endpoint of the selected connections to the BRT. Connecting two important attractors, such as a metropolitan-scale transport stop and an important local (or metropolitan) facility creates a network of known places that can confer added value to a pedestrian connection.

6. LEVERAGING ON MUNICIPAL PROPERTIES
All selected sub-projects are located on available land, the project takes into account existing land use and current urban zoning to propose different interventions that vary in terms of scale, intervention grade, temporariness, and permanence. Municipally owned properties are considered the backbone of the neighborhood public facilities and are therefore a central part of the proposal. Existing public facilities and parks are selected to be improved and upgraded while available land is considered for the development of new local facilities.

7. CONSIDERING DIFFERENT TEMPORALITIES
Many unused areas along the Al-Yarmouk corridor and also around the Sweileh terminal are not municipal properties, determining the ownership of these plots exceeds the scope of this proposal but it is however possible and useful to include these long-time abandoned areas in the project. To be able to do so it is necessary to consider different temporalities, municipally owned plots can be transformed and improved permanently, or at least planned for the long term; abandoned plots can't be considered in the same manner. Interventions on available land that is not municipally owned must be conceived in terms of tactical urbanism: light and economic interventions that can improve the city in the short term and can eventually be removed in case of the development of the plot.
8. PRIORITIZE PROJECTS WITH CLIMATE CO-BENEFITS
Projects were also prioritized keeping in mind that generating a transport-oriented neighborhood was the main goal, but not the only one. Each selected project brings benefits that go further than just pedestrian mobility improvement. Urban reforestation, improvement of urban landscape, reduction of the heat island effect, nature-based solutions for the control of rainwater, and mitigation of flooding risk are just some of the climate co-benefits’ goals that the network of streets and areas must bring to be included in the long list of projects. Nevertheless in this case this has to be interpreted in a more general sense that goes beyond the financing and climate change aspect. Co-benefits in this conceptual design context has to be associated with the multiple benefits that a single transit-oriented project can bring to a neighborhood in terms of safety, accessibility, inclusion of vulnerable groups, etc.

9. FOCUSED ON THE 15 MINUTES CITY
Prioritized projects are, mostly, within the 15-minute walking limit from the BRT stops. As it was mentioned earlier the 15 minutes limit does not represent the acceptable walking distance that citizens are expected to walk to reach a public transport stop but represents an ideal distance for a walkable neighborhood. In this 15 minutes radius, centered on the BRT stop, a citizen must have access to basic public facilities (schools, parks, health centers, and so on) and public transport stops, without the need to use a car.

10. CONNECTED TO EXISTING PUBLIC TRANSPORT
The prioritization of the long list of projects took into account the available information regarding the existing public transport. This information could not be verified and will certainly change when the BRT line will be operative. Nevertheless, it is reasonable to suppose that the feeder lines will still use the existing streets. Intermodality, between the BRT and the feeders is a key feature for the functioning of the whole system.

2 According to the World Bank Climate co-benefits refer to the share of financing dedicated to climate change adaptation or mitigation in operations financed by the World Bank.
TRANSIT ORIENTED NEIGHBORHOODS IN AMMAN - LONG LIST

LONG-LIST OF PROJECTS
AL-YARMOUK STREET

Long list of projects, organized by basin.
LONG-LIST OF PROJECTS
SWEILEH TERMINAL
Prioritization of projects for the Al-Yarmouk Street corridor was made by basin. A single basin is the spatial unit used for the analysis. The long-list of projects was developed under the assumption that Al-Yarmouk Street would be served by 11 BRT stops, considering the Al-Mahatta terminal one of them. Changing the number of stops, or significantly altering their location along the street would also alter the spatial organization of the basins therefore altering the selected streets. Mainly for this reason is important to consider this study as a methodology guideline that is flexible and that can be adapted to different BRT implementations, if necessary.

As mentioned before, the 11 initial basins can be further divided using Al-Yarmouk Street as a limit, obtaining 19 basins. Sixteen basins refer to 8 stops and are divided between East and West, while three of them are not significantly divided by the main artery and are not further divided.

Prioritization is based on a score comparison. The considered parameters are the ones described below:

**Total population within 15 minutes**
An estimation of the total population living within 15 minutes from the BRT stop in each basin. The score is obtained using a min-max function with all the values. The basin with the most affected people will receive a 5 while the basin with the least people a 0.

**Land ownership score**
This indicator describes the land ownership of the projects belonging to a basin. Basins with available municipally owned land receive a higher score than basins with mostly private land. This indicator prioritizes the improvement of public owned land, which is easier develop and allows permanent projects. A basin will receive a 0 if there is no available municipal land and a 5 if most of the selected projects are located on available public land.

**Project Co-Benefits opportunity**
The aim of this indicator is to describe the potential co-benefits that the selected projects can bring to the basin. Basins with a very diverse set of projects (streets, parks, new infrastructures, large green areas, etc.) will receive a higher score than basins in which the only selected projects are street improvements. Although street improvement will bring benefits to the population in many ways (enhancing pedestrian mobility and accessibility for example) it will generate a smaller improvements in terms of green areas or public facilities. Basins are scored from 0 to 5.

**Neighborhoods with special parameters**
This is a score that benefits areas with special planning parameters, in most cases these areas have a very high urban density, a general lack of open spaces, a high rate of auto-constructed buildings. An example of this neighborhoods is the Wihdat refugees camp in the southwestern part of Al-Yarmouk street. Basins with large “special parameters” areas receive a 5, basins affected by “special parameters” areas receive a 2.5.

**Improvement of BRT access time, within 5, 10, and 15 minutes**
This indicator measures the improvement, in terms of served population, that the selected projects can generate within each basin. It is based on the increment of affected population between scenarios A and C. If the affected population in the scenario A was 0 and there is an improvement in scenario C the basin will receive 5 points. In the other cases the score is calculated using a min-max function: the basin with the most improvement will receive 5 points, the basin with the least improvement 0 points. This is calculated for the population living within 5, 10, and 15 minutes from the BRT stops.

**Cost effectiveness**
The aim of this indicator is to describe the effectiveness of the intervention comparing the estimated cost to the benefited population. The score is calculated using the obtained ratio (cost per inhabitant). The basin with the lowest cost per inhabitant receives 5 points, the basin the highest cost per inhabitant (thus the less effective) obtains a 0, the rest of the scores are calculated using a min-max function.

**Total weighted score and selected basins**
The final score is obtained with the weighted average of each score. The basins are then sorted by the final score and the top third are selected for the short list.
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<th>Total Population within 15 min</th>
<th>Population Score</th>
<th>Land Ownership Score</th>
<th>Short List Project Co-Benefits opportunity Score</th>
<th>Neighborhoods with special parameters Score</th>
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AL YARMOUK STREET

PEDESTRIAN CROSSINGS

Pedestrian mobility should be of utmost importance in Al-Yarmouk Street, especially at crossings where pedestrian safety is at high risk. Crosswalks should be included, marked on pavement and signalized, with medians and refuge islands to create a two stage crossing. They should be at least as wide as the sidewalks that connect to and not be less than 3 m wide. Sidewalks should include pedestrian ramps to facilitate access and mobility with tactile paving or detectable warning strips at ramps and other transitions between pedestrian and vehicular.

COMMERCIAL SIDEWALKS

The commercial character of Al-Yarmouk Street necessitates the implementation of an infrastructure that serves this purpose. Spaces for business activities should be incorporated into the design of the street. The pedestrian zones must accommodate the store’s needs while also ensuring the accessibility and continuity of a clear path for pedestrians. Widths of 1–4 m can accommodate commercial use extensions or vendors safely and comfortably with seating opportunities when clear walking paths of 1.8 m wide minimum are maintained.

SIDEWALKS WITH CAR ACCESS TO AUTO REPAIR FACILITIES

Auto repair businesses represent a significant portion of the commercial activity in Al-Yarmouk Street. It is important to clearly mark, sign and divide repair zones from pedestrian paths and to facilitate car access while ensuring the safety of pedestrians.
SIDEWALKS AREAS WITH STREET VENDOR SPACES

In order to support the commercial activity of street vendors, part of the sidewalk should be accommodated to host these activities as well as supporting equipment and vehicles. When sidewalks are wide enough, vendors and market stalls can be situated in the street furniture zone, providing a buffer between pedestrians and moving or parked vehicles. Allow at least 1 m of space for vendor customers in addition to a 1.8 m minimum clear path.

SIDEWALKS NEXT TO GREEN SLOPES

Al-Yarmouk Street often features hillsides, slopes and vacant lots, each of which represent an opportunity to create areas that can be transformed into active public spaces and/or green areas. These spaces play a crucial role in preserving biodiversity by providing a continuous network of vegetation and empowering the proper development of local flora and fauna. These spaces are also strategic elements for effective water management. Increasing permeable pavements allows water to return to aquifers, while mitigating the urban heat island effect and slowing down runoff water.

SIDEWALKS NEXT TO PARKING ZONES

The transformation of selected empty lots into parking spaces can contribute to the limitation of informal parking and encourage multimodal transportation. Parking zones can include green areas and permeable paving, which can also mitigate the effects of climate change.
STREET TYPOLOGIES

TWO-WAY CAR ORIENTED STREET (~24 M)
These wider roads combine residential and commercial uses. Pedestrian areas should be clearly marked and the use of markers such as bollards or changes in level is necessary. Sidewalks are widened, enhanced with swales, shading and resting areas while crossings are habilitated for pedestrian safety and efficiency. They should maintain a clear path of preferably 3 m in sidewalks on both sides, freeing up space from car parking as a widening of sidewalks or buffers that include green or blue infrastructure, and different equipment for pedestrians.

TWO-WAY PEDESTRIAN ORIENTED [SHARED] STREET (~13 M)
For two-way roads in residential areas, shared streets are proposed. They should maintain 3 m sidewalks at least on one side, reducing parking and replacing it with extended sidewalks and space to add green and blue infrastructure and equipment to make the street more inviting, prioritizing pedestrian circulation. Pedestrian areas should be clearly marked. Traffic speeds should be limited and accessible crosswalks must be incorporated, fostering pedestrian priority and reducing vehicle speeds.

ONE-WAY PEDESTRIAN ORIENTED [SHARED] STREET (~6 M)
On narrow roads in dense residential areas a continuous mixed-use surface without steps is recommended, ensuring a single pavement with pedestrian preference. Streets should be one-way, parking should be reduced to one lane and the remaining land should be replaced with extended space to add green and blue infrastructure and equipment. This will make the street more inviting, while also prioritizing pedestrian circulation. Traffic speeds should be limited with calming techniques. Accessible crossings should be incorporated on roads.
**STAIRS**

**L-SCALE**
These stairs are typically wider than 2.5 meters and many meters long, functioning as a connection between public spaces. They can serve as an extension of the public realm, as they are usually adjacent to green, underused lots. The improvements include the installation of railing and illumination, the improvement of the steps’ steel profiling for safety, adapting their dimensions to improve accessibility, the redesign of the access points to the adjacent public spaces, and the installation of enhancement infrastructure. Furthermore, planters are included to expand the green areas, incorporating a larger drainage surface.

**M-SCALE**
These stairs are approximately 2.5 m wide and connect densely populated residential areas to central public roads. They can serve a dual purpose, functioning not only as a passageway but also as small public spaces for the residents and passers-by to engage in everyday activities. The improvements include the installation of railing and illumination on adjacent walls, partial redesign in relationship with the residences' accesses, the improvement of the steps' steel profiling for safety and adaptation of the dimensions to improve accessibility.

**S-SCALE**
These stairs are approximately 1 to 1.5 m wide and are typically located in densely populated residential areas, leading to or being tangential to private homes. They serve primarily as a passage due to their limited width and are used by a limited number of users. The proposed improvements include the installation of railing and illumination on adjacent walls, partial redesign in relationship with residences' accesses, the improvement of the steps' steel profiling for safety and adapt their dimensions to improve accessibility.
HEJAZ RAILWAY

HEJAZ RAILWAY AS A LINEAR PARK

The railway path crosses a variety of situations. In instances where the line crosses steep topographies and the passage is narrowed along the rehabilitated slopes, the path should be wide enough to guarantee an accessibility standard of 2 m, including furniture, lighting and signage equipment.

HEJAZ RAILWAY NEXT TO LARGE PUBLIC SPACES

In order to enhance the railway path as a multipurpose public space, it is proposed that larger public spaces be developed along the corridor, where feasible, by incorporating existing adjacent vacant areas into open parks to consolidate the urban green corridor network.

In addition to the previously mentioned equipment, these spaces will include rest and shade areas, more vegetation, children’s playgrounds, and sports areas.

HEJAZ RAILWAY NEXT TO POCKET PUBLIC SPACES

In instances where the adjacent spaces to the railway’s pedestrian path are smaller, they will be transformed into small public spaces, which will also feature shading and vegetation.

By functioning as green infrastructure, pocket parks can help to connect and extend green corridors networks, thereby improving city renaturation and biodiversity. Additionally, this proposal can increase the ratio of green areas per inhabitant and provide public spaces with equipment.
HEJAZ RAILWAY TRENCH ZONES

In instances where the line crosses steep topographies and the passage is narrowed down into a trench, along the rehabilitated slopes, the path should be wide enough to guarantee an accessibility standard of 2 m, including furniture, lighting and signage equipment.

HEJAZ RAILWAY CROSSED BY NEW PEDESTRIAN CONNECTIONS

The Hejaz Railway presents an opportunity to transform the path into a green pedestrian corridor, which could also serve as a link between different levels of the city due to its intermediate position. In addition to reforestation, accessibility improvements and the installation of new equipment, the existing stairs connecting the railway line to the adjacent neighborhoods should be restored and improved. In order to guarantee safety and provide more accessible pathways, steps should be adequately designed with larger landing zones and handrails.

HEJAZ RAILWAY CROSSING WITH EXISTING STREETS

At the intersections of the railway path with existing streets, pedestrian accessibility and safety should be guaranteed. Crosswalks should be included, clearly marked on the pavement of the streets, and well-signaled with pedestrian ramps to facilitate access and mobility.
SHORT LIST: AL-YARMOUK

Selected Basins

Y07W

Y07E

Y10W

Y09W

Y09E

Y08E

Y08W

Y07W

Y02E

Y03E

Short-List of selected basins and projects.
### Area
Yarmouk Street Corridor

### Priority
HIGH

### Total prioritization score
11.4

### Potential and proposal
The connection of the higher part of the neighborhood to Al-Yarmouk Street is limited by a lack of streets and any other direct connection. This basin can be divided in two areas: a lower neighborhood, comprising Al-Yarmouk and the Hejaz Railway, and a higher area (large and densely populated) on the eastern side of the tracks.

In order to improve the accessibility to the BRT it is crucial to create new direct connections between the higher neighborhood and the main road. Said connections will cross the Hejaz Railway and the lower area.

The proposal also considers two existing spontaneous connections that can be improved even though the ownership of the two areas is not clear. In case of uncertain ownership it is important to reduce the footprint of the interventions to the bare minimum, and use the outer zones of the selected areas to limit the costs of possible expropriations.

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**Y02E-08**
**INFORMAL PATH CONNECTING HEJAZ RAILWAY TO AL-YARMOUK**

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**Y02E-09**
**AL-NASR STADIUM PUBLIC SPACE**
BASIN Y03-EAST

Area
Yarmouk Street Corridor

Priority
HIGH

Total prioritization score
13.6

Potential and proposal

Basin 3 East is structured around Adan Street, which is a primary transverse connection to Al Yarmouk. This axis is a crucial link for the areas of Jabal An Nasr, Prince Al Hasan, Princess Alia, and Alnarah, connecting them primarily to Al Yarmouk. As a primary intervention, the connection of Adan St. should be enhanced, reinforcing its role as a multimodal route with a pedestrian focus. This approach presents an opportunity to improve the area’s internal connectivity and its integration with the city.

Furthermore, the presence of Mahmoud Al-Qudah Park within this basin, adjacent to a large parcel of municipal property, creates an opportunity to enhance the network of facilities. Improving the Mahmoud Al-Qudah Park and the creation of a large multifunctional facility that includes a public space complementing the park are proposed.

Close to Amuriyah school there are two municipal parcels, which represents an opportunity to increase the public spaces in this zone and improve access to the surrounding of the Amuriyah School, creating a safe and comfortable space for students to socialize or wait for public transportation.

Y03E-01
INTERSECTION OF ADAN STREET WITH THE HEJAZ RAILWAY PATH

Y03E-A75
MAHMOUD AL-QUDAH PARK SOCIAL HUB
BASIN YO7-EAST

Area
Yarmouk Street Corridor

Priority
HIGH

Total prioritization score
12.3

YO7E-04
INFORMAL PATHS CONNECTING PR. NAYEF STREET TO AL-YARMOUK

Potential and proposal

The Basin 7 East area connects the northern part of An Nahariyyah with Al Yarmouk. In the higher part of the area, there are notable facilities such as the Qweismeh Medical Center and the Al Rayhan Mosque.

The residential area in the upper section is entirely cut off from access to the Al Yarmouk corridor due to vertical or steeply sloping terrain.

An informal connection structure currently exists between the upper part of this basin area and Al Yarmouk. This area includes public land that can be utilized to improve accessibility, enhance and formalize the informal paths, and create a public space, transforming a mobility challenge into an opportunity.

In the upper part of the area, there is a vacant municipal plot, which holds significant potential for the development of a public space and a multifunctional social facility. This facility would complement the existing medical center and mosque, which can also be upgraded to strengthen their role in serving the community.

The proposed transversal connectivity axis will serve as a connector at various levels, starting from Al Yarmouk, linking the railway line, and ultimately connecting to the facilities in the upper part of the area.
BASIN Y07-WEST

Area
Yarmouk Street Corridor

Priority
HIGH

Total prioritization score
11.8

Potential and proposal

This basin is structured around Al Imam Al Bukhary Street, which has a distinct commercial character in its upper section, further away from Al Yarmouk. Additionally, the basin includes vacant areas, steep slopes, and remnants of quarries near its contact with Al Yarmouk. The vacant spaces at the contact points between the basin and Al Yarmouk can be transformed into green, open areas where revegetation and renaturalization measures can be implemented.

Redesign Al Imam Al Bukhary Street to prioritize pedestrian traffic with wider sidewalks, pedestrian crossings, and traffic calming measures. Introduce shaded areas and seating to create comfortable public spaces for social interaction and relaxation. These actions will reinforce the potential of the street as a main axis and attraction point, enhancing its commercial and social functions.

Utilize centrally located municipal parcels in the northeast and southwest areas of Al Imam Al Bukhary to enhance the availability of facilities and public spaces. These can be connected through a network of streets linking to Al Imam Al Bukhary street and Al Yarmouk.

Improve existing parks and gardens in the basin, upgrading park facilities and increasing vegetation density.
BASIN Y09-EAST

Area
Yarmouk Street Corridor

Priority
HIGH

Total prioritization score
11.8

Potential and proposal

This basin is characterized by the presence of the King Abdullah II Stadium. It also includes several large GAM property parcels designated for various facilities. To enhance accessibility, a well-designed connection between the BRT line in Al Yarmouk and the stadium should be established, ensuring that users can safely and comfortably walk from the bus stop to the stadium.

Currently, the stadium is surrounded by extensive parking lots, which are only intermittently occupied and related to the stadium’s activities. These areas could be transformed into vibrant community spaces, hosting temporary markets, events, sports activities, and other compatible uses. Additionally, revegetation should be considered, along with surface treatments that aid in water management and infiltration.

The municipal parcels on the basin could be transformed into a network of facilities and green spaces, creating a green corridor that structures this part of the city, connecting to the railway line and to Al Yarmouk.

The municipal parcel where the weekly market is held lacks all kinds of amenities and is exclusively used for this function, remaining vacant when there is no market. By improving the conditions of this space, not only would the market experience be enhanced, but it could also serve as a public space during the rest of the week.
BASIN Y09-WEST

Area
Yarmouk Street Corridor

Priority
HIGH

Total prioritization score
11.1

Potential and proposal
This area in central Al-Wahdat is characterized by the absence of public spaces or green areas, featuring a very dense and fully built urban fabric. The area has a concentric structure following the shape of the hill on which it is situated.

The absence of significant vacant spaces makes the streets the primary public spaces in the area. However, their current car-centric design prevents them from fulfilling this role effectively. It is necessary to transform street sections by introducing vegetation, expanding pedestrian areas, and creating resting spaces along the streets. Given its characteristics and location, Sumaya Street is an ideal candidate for this transformation, converting it from a car-dominated street into a public urban space for the city.

As in other basins, there are several hillside spaces where informal paths have developed to connect the upper part with Al Yarmouk. These areas have the potential to be transformed into large green and open spaces by formalizing the paths, revegetating the slopes, and creating small public spaces along the routes. This would partially address the lack of open and green spaces in the basin.
BASIN Y10-WEST

Y10W-07
SUMAYA STREET CONNECTION TO AL- YARMOUK (AL-WAHDAT MOSQUE)

Potential and proposal
This neighborhood, originally established as a Palestinian refugee camp, is characterized by its extremely dense urban fabric, which retains the structure reminiscent of the original layout. The area suffers from a scarcity of public spaces and offers limited opportunities for substantial interventions to enhance communal areas. Consequently, the proposed actions focus primarily on improving the streets.

Improving the street section aims to transform them into vital public spaces, addressing the area’s scarcity of such amenities, as demonstrative projects showcasing how street sections can be redesigned to better serve the community.

The investment proposal seeks to elevate the significance of Sumaya Street as a central axis of Al-Wahdat by reimagining it from a vehicle-dominated thoroughfare into a vibrant public urban space and green corridor for the neighborhood.
TRANSIT ORIENTED NEIGHBORHOODS IN AMMAN - SHORT LIST

SWEILEH TERMINAL

TERMINAL BUILDING CENTRALITY & NEW PROGRAMS

The new terminal building offers an ideal opportunity to transform it into a social infrastructure that facilitates and supports social interactions, community development, and the overall well-being of its residents. It encompasses a range of facilities and spaces that can meet commercial, social and cultural needs of the community as social hubs and also work as community shelters during emergencies, disasters, or extreme temperature events.

To achieve these objectives, the proposal includes upgrading the terminal building, adding flexible equipment that facilitates conversion to accommodate different uses and programs in the existing building, and transforming it into an open public building accessible and available all days of the week.

PARKS & GREEN AREAS

The Sweileh area has an existing public park and some vacant lots that can be transformed into spaces dedicated to renaturation and social life, offering open and climatically comfortable spaces to rest while playing a crucial role in enhancing urban life and preserving biodiversity.

These spaces are strategic on two levels: the ecological and the social. For the former, a continuous network of vegetation should be formed to support the healthy development of local flora and fauna and permeable pavements should be utilized allowing water to return to aquifers, while mitigating the urban heat island effect and slowing down runoff water during heavy rains simultaneously.

For the latter, safety and accessibility measures, as well as a variety of activities, should be programmed for the enjoyment of all groups, including the most vulnerable. Furthermore, the spaces should be points along a continuous network of urban spaces that allow for seamless mobility and connection to green areas.

PUBLIC SPACE IMPROVEMENTS

People are more likely to walk from one destination to another if the experience is convenient, comfortable and enjoyable.

All streets around a key destination such as the Sweileh area should be universally accessible to accommodate different walking speeds, and be legible to all users. Sidewalks should be widened where possible, include pedestrian ramps to facilitate access and mobility, with tactile paving or detectable warning strips at ramps and other transitions between pedestrians and vehicles.

To improve streets walkability a specific area for urban facilities such as trees, furniture, lighting and other amenities should be included, as well as consistent pedestrian signage in a clear visual language that can be universally understood.
PUBLIC SPACE WALKABILITY & CONTINUITY

It is crucial to maintain the multimodal nature of access to the terminal, ensuring all types of mobility are supported. Car access should not be prioritized over pedestrian access, as is currently the case. Pedestrian safety zones should be established, which could involve clearly marked sidewalks or the application of more flexible demarcation (interventions adapted to different traffic volumes and street scales), to improve safety and accessibility without completely restricting spontaneous movement. Streets in the Sweileh area should include designated spaces for various activities and types of movement, ranging from pedestrian to cycle and vehicular activity. Specific areas should contain urban facilities such as trees, furniture and other amenities that improve walkability. Sidewalks and/or pedestrian areas should be continuous and provide a clear path consistent with pedestrian volumes, and they should always remain wide enough (maintain a minimum clear path of 3 meters or more). All streets should be universally understandable and accessible to accommodate different walking speeds.

STOREFRONTS & STREET VENDING

The new centrality of the Sweileh Terminal has the potential to create commercial opportunities while enhancing urban activity and life. The design of the public space should promote commercial activity on the ground floor of buildings and support street vendors, in line with encouraging movements of multimodal transportation. Once the sidewalks are widened, the extension of commercial activity from businesses onto the street should be encouraged, as well as the presence of street vendors. Integrated transition and interaction zones with buildings should be incorporated, especially in areas with commercial activities or facilities. Vendors and market stalls can be situated in the street furniture zone, providing a buffer between pedestrians and moving or parked vehicles. Allow at least 1 m of space for vendor customers in addition to a 1.8 m minimum clear path for pedestrians.

PEDESTRIAN CONNECTIVITY TO TERMINAL

It is necessary to create safe and comfortable environments in and around the terminal, thus facilitating the movement of residents and travelers. This should also include improving access to and from bus stops and going towards the terminal. Pedestrian priority should be of utmost importance in the Sweileh area, particularly at crossings. It is essential that a safe and clear pedestrian path be established to provide access to the station from the surrounding neighborhoods. Separated sidewalks—measuring at least 3m wide—should be included with signals and crosswalks marked on pavement and signalized. Medians and refuge islands should be utilized to create two-stage crossing.
NEW HYBRID BUILDING

The existing vacant lot with an ongoing construction next to the Terminal was recently acquired by GAM. Its location adjacent to the Sweileh Terminal building, presents a valuable opportunity to transform it into a new hybrid building with a multifunctional and adaptable program that can help to activate the area. The need for a large parking lot, as expressed by GAM, due to the Terminal’s central location and multimodal character, can be enhanced with additional uses that generate urban activity. The proposal includes full parking levels on the intermediate floors, a public space on the roof with sports activities, and a spacious open commercial area on the ground floor, seamlessly connecting with the central park.

COMMUTING EXPERIENCE (FEEDERS STOPS)

Around the Sweileh area there are multiple informal stops for commuting. To redesign these areas, the stop zone spaces, designated for the waiting and boarding of transit riders, should be integrated into the sidewalk, the median, or on a dedicated boarding island. When curbside, the stop zone should be adjacent to the pedestrian clear path. Shelters, seating, signs, and transit information must be located so as not to impede pedestrian accessibility. The stop zone may also be aligned with the parking lane or cycle lane, and may include green infrastructure or other curbside amenities at non-stop locations. Stops should allow vehicles to load to a sidewalk or an island from the transit lane without pulling out of traffic. Transit shelters should be provided to offer seating for waiting passengers, allowing space for people with strollers and in wheelchairs. These stops should be connected by pedestrian routes to the terminal building.

UNDER-FLYOVER NEW PEDESTRIAN PATHWAY

One of the principal connections between the western part of the city and the Sweileh Terminal is made by an overpass highway. The space beneath the highway can be restored and transformed into a new pedestrian area, liberating for commercial activities, furniture and equipment, green areas and accessible connectivity to the surrounding pedestrian network. This new pedestrian pathway can safely and comfortably channel foot traffic from the feeders on both sides of the street to the terminal.