New Vision of Transportation Systems in Jordan

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Objectives

- Highlight current associated problems in transportation systems.
- Explore current and future perspectives of transportation systems in Jordan.
- Utilize ITS as a promising solution to transportation systems problems.
Jordan Transportation Systems Problems

1. Congestion and traffic jams.
2. Increase of car ownership ratio.
3. Roads capacity problems.
4. Traffic demand management issues.
5. Traffic regulations issues.
6. Drivers and pedestrians cultural and behavioral issues.
7. Mobility and safety issues.
8. Lack of reliable public transportation system.
Problems Caused by Congestion

• Increased…
  – Travel time
  – Travel cost
  – Air pollution
  – Accident risk
Jordan’s Options

• Construct new roads
  – Budget deficit Problems
  – PPP and BOT
  – Toll roads

• Reduce Traffic
  – Incentives to change old vehicles
  – Travel demand management
  – Alternative transportation modes
  – Public transit (BRT, light rail, and National Railway)

• Increase existing infrastructure capacity
  – Uses Intelligent Transportation Systems (ITS)
Development Projects in Jordan

- Construction Sector contributes mainly in the Gross National Development (12%).
- Employment opportunities.
- Global Investment Attraction.
- Local communities developments.
- Ministry of Public Works and Housing (MPWH) is the legal agency that is responsible about road construction.
Amman Ring Road

Objectives

- Encircle the City of Amman and bypassing the urban development areas with the objective of relieving the city from traffic congestion.
- Removing regional truck traffic from the streets of Amman and Zarqa.
- Improving access.
- Reducing travel cost.
- Minimizing road accident.
The Ring Road is a dual 2 lane carriageway with 3 m outer shoulders on either-side, 4.25 m central median and Service Roads at selected locations. The total length is 118 Km divided into three phases as detailed below.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Length(km)</th>
<th>Cost MJD’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1</td>
<td>41</td>
<td>160</td>
</tr>
<tr>
<td>Phase 2</td>
<td>50.5</td>
<td>443</td>
</tr>
<tr>
<td>Phase 3</td>
<td>27.2</td>
<td>107</td>
</tr>
<tr>
<td>Total</td>
<td>118.7</td>
<td>710</td>
</tr>
</tbody>
</table>
Amman Development Corridor
Amman Ring Road

Typical Cross Section
Amman Development Corridor (Section 1)

Length 18.5 Km
Cost MJD 60
Arab Fund Financed
Amman Development Corridor (Section 2)

Length 13.5 Km
Cost MJD 40
World Bank Financed
Amman Development Corridor (Section 3)

Length 8 Km
Cost MJD 46
EIB Financed
Amman Development Corridor (Section 3)

Length 8 Km
Cost MJD 46
EIB Financed
Amman Ring Road / Phases II & III
Objective

- Road widening and rehabilitation of the Airport Road to international standard with the provision of new service roads on either side to separate the through traffic from the local traffic and serve the local communities surrounding the Airport Highway

This project is 22.5 km long and divided into 2 Sections /Contracts
Airport Road Widening

The Project executed through 2 Contracts

CONTRACT -B-

From Naour Intersection to Madaba Intersection
(Extension and Service Roads)

CONTRACT -C-

From Madaba Intersection to Airport Intersection
(Extension and Service Roads)

Upgrading Queen Alia International Airport Road With a length of (22) Km and total Construction Cost of (100) million dollars

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Airport Road Improvement
IRBID RING ROAD

CONSTRUCTION STAGES :

STAGE 1
OUTER LENGTH = 28.50 km
INNER LENGTH = 7.00 km
TOTAL = 36.50 km

STAGE 2
LENGTH = 16.00 km

STAGE 3
LENGTH = 5.50 km

STAGE 2 :
STARTING FROM STA. 23+900 TO STA. 39+560

STAGE 3 :
STARTING FROM STA. 39+600 TO STA. 47+970.491

IRBID RING ROAD
GENERAL PLAN

ARABTECH JARDANEH
engineers & architects

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A comprehensive database of physical/structural characteristics and condition the whole national inter-urban road networks as well as socio-economic data relating to.

A diagnostic analysis of existing road network, leading to the identification of missing road links, bottlenecks and the need for other road sector improvements.

A time-phased road sector development plan for the period 2010 to 2030, broken-down by 5-year target development plans, including maintenance.
NEW ROAD CLASSIFICATION

- The new Classification Criteria, based on the functions pertaining to each road section (or a complete itinerary) within the network, issued the following classes:
  - **Trunk roads:** Access to borders and to major poles with regional function and to ports/airports, connection between Amman and the Governorates (1,600 km),
  - **Primary roads:** Interconnection of major cities, connection to/from main production poles (existing or planned) and main consumption areas, main tourist circuits (1,150 km)
  - **Secondary roads:** Interconnection between primary roads, connection of main settlements to primary roads, access to poles of medium importance (1,900 km)
  - **Tertiary roads:** Access to other settlements (2,800 km)
  - **Agricultural roads:** Access to farmed areas
  - **Special roads:** Access to special installations

- The new Classification requires an amendment to the current Road Law
New Road Classification

Syria

Trunk, Primary, Secondary, Tertiary
ROAD GEOMETRY

According to the new classification there are:
- 1680 km of trunk roads
- 1080 km of primary roads
- 1840 km of secondary roads
- 2830 km of tertiary roads
for a total of 7430 km of national roads

Pavement widths are (excluding tertiary roads):
- 1110 km of dual roads
- 880 km of roads with width exceeding 7.5 m
- 2285 km of roads with width between 5 and 7 m
- 325 km of roads with width narrower than 5 m

Most roads (60 to 70%) have good alignment and profile, but standards worsen for secondary roads and for roads in hilly terrain.
Some problems of alignment-junctions

Bad pavement and winding alignment on the road from Petra to Wadi Araba

Poor longitudinal profile of Petrol road south of Irbid

Unusual intersection at Fuhais
SOME HIGH STANDARD ROADS

The desert highway
Over-pass
New road to JUST
Salt Ring Road
SOME CRITICAL CASES

- Poor shoulder – Petrol road
- Wrong location of guard-rail on Desert road
- Crocodile cracks Abu Nuseir road
- Unusual drainage on Mahes/W. Shuaib road
TRAFFIC STUDY

The Master Plan requires a comprehensive traffic study based on road surveys aiming to:

- Obtain a measure of the traffic flows and their structure (classes of vehicles) on the network
- Determine the main directions of flows among the different zones of the country
- Provide a basis for the forecast of traffic for the coming 20 years

Traffic flows will be compared to the capacity of each road to determine present and future levels of service (degree of congestion of the road)

The daily capacity of a road is:
- 2-lane 35,000 veh/day, 4-lane 55,000 veh/day
# Traffic Survey

**Survey results on some of the major roads**

<table>
<thead>
<tr>
<th>ROAD and N. of lanes</th>
<th>STATION</th>
<th>Daily Flow</th>
<th>% HEAVY VEHICLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irbid – Ramtha (4L)</td>
<td>Near Ramtha junction</td>
<td>12,000</td>
<td>15</td>
</tr>
<tr>
<td>Syrian Border-Mafraq 4L</td>
<td>South of border</td>
<td>9,000</td>
<td>27</td>
</tr>
<tr>
<td>Mafraq – Zarqa (4L)</td>
<td>Near Hashimieh Univers.</td>
<td>20,000</td>
<td>20</td>
</tr>
<tr>
<td>Amman -Qatraneh (4L)</td>
<td>Near Dhiban junction</td>
<td>15,000</td>
<td>25</td>
</tr>
<tr>
<td>Qatraneh – Ma’an (4L)</td>
<td>North of Ma’an</td>
<td>11,000</td>
<td>33</td>
</tr>
<tr>
<td>Ma’an – Aqaba (4L)</td>
<td>Near Wadi Rum junction</td>
<td>10,000</td>
<td>40</td>
</tr>
<tr>
<td>Amman - Salt (4L)</td>
<td>East of Ain Basha junct.</td>
<td>50,000</td>
<td>3</td>
</tr>
<tr>
<td>Irbid – Jerash (4L)</td>
<td>Before JUST University</td>
<td>20,000</td>
<td>7</td>
</tr>
<tr>
<td>Jerash – Amman (4L)</td>
<td>South of Jerash entrance</td>
<td>38,000</td>
<td>3</td>
</tr>
<tr>
<td>Amman – Madaba (4L)</td>
<td>After Um Al Amad junct.</td>
<td>24,000</td>
<td>8</td>
</tr>
<tr>
<td>South Shouna (2L)</td>
<td>North of Karamah</td>
<td>8,000</td>
<td>12</td>
</tr>
<tr>
<td>Ghor Safi (2L)</td>
<td>North of Karak junction</td>
<td>4,000</td>
<td>18</td>
</tr>
</tbody>
</table>
Jordan National Railway Project

Objectives

- Stimulating the economy through development of a national standard gauge rail network linking major centers in Jordan (Aqaba, Amman, Zarqa, Mafraq, Irbid),
- Offering a better infrastructure for transport inside Jordan and across the borders with the neighbouring countries.
Network Layout

Zarqa – Iraq Link:
L = 291 km
Q = 7
T = 7M

Mafraq-Irbid Link:
L = 78.5 km
Q = 1
T = 1M

Aqaba – Syria:
L = 508.6 km
Q = 36
T = 38M

Link To KSA:
L = 90.5 km
Q = 6
T = 6M

L = Length of main route and links
Q = Average daily traffic per direction in 2030 (trains)
T = Average annual tonnage in 2030 (million tons)
Jordan National Railway Project

Project Description

- Estimated length of the system is 1,080 km
- Main links:
  - Aqaba to Syrian border
  - Zarqa to Saudi border and Iraqi border
  - Mafraq to Irbid and eventually to Jordan Valley
- Single track running either single or double UIC length trains (750 to 1,500 feet in length) powered by diesel locomotives.
- 3 tunnels, 72 railway bridges and viaducts, 116 vehicular bridges and underpasses.
- 12 terminals and 2 depots
Jordan National Railway Project

Total cost of initial infrastructure development of JD 2.9 billion, excluding rolling stock, and fixed maintenance facilities.

- Preliminary Engineering Design completed
- Tender documents for infrastructure and operations are under preparation
- Legislative framework and financing are being sorted out
Bus Rapid Transit (BRT)

1. Amman-Zarqa Project:
   - Middle of Amman-Zarqa road
   - Reliable public transportation system
   - Reduce congestion and traffic accidents
   - 100 thousand passengers daily
   - Employment
   - Energy consumption
   - Prequalification for contractors and consultants

2. Great Amman Municipality (GAM):
   - Infrastructure
   - Contract
Amman-Zarqa BRT Route
Station Interior Perspective
Amman-Zarqa Light Rail System

Project Main Data

- 24 Km long segregated corridor and urban integrated line (within the Hijaz ROW)
- 6 stations (up to 5 more in the future)
- 1 Depot (nearby New Zarqa)
- Projected Capacity: 4,000 (pass/hour/direction) extendable to 10,000
- Commercial speed
  - Interurban areas ≤ 90 Km/h
  - Urban areas ≤ 50 Km/h
- Headway
  - At peak hours: headway as low as 3 min
  - At off peak hours: headway ≤ 15 min
Toll Roads
- Needs legislations for fees.
- Alternatives for Infrastructure
- Private sector involvements.
- PPP and BOT
- Operation strategies
Which vehicle has the priority??

Of course, the Yellow Cab!!
Drivers` Behaviors

- Mobile: 54%
- Seat Belt: 43%
- Near Foll. D. Park: 34%
- Smoking: 34%
- Sud. Stop: 20%
- Eating: 18%
- Zigzag Ov.: 16%
- Parking: 15%
- Direction: 10%
- Others: 6%

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Ranking of Reasons Behind Speeding

- Emergency: 9.9%
- Habit: 8.4%
- Jam: 8.4%
- Grade: 7.9%
- Social Culture: 5.8%
- Posted Speed: 5.7%
- Wrong Overtaking: 5.5%
- Traffic Culture: 5.3%
- No Enforcement: 5.1%
- Intermediary: 4.8%
- Traffic Regulations: 4.7%
- Vehicle: 3.6%
- Drunk: 2.2%

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Increase Existing Infrastructure Capacity

• An alternative to expensive new highway construction is the implementation of strategies that promote more efficient utilization of transportation infrastructures.

• These strategies are through the utilization of Intelligent Transportation Systems (ITS), which aims to reduce travel time, ease delay and congestion, improve safety, and reduce pollutant emissions.
Challenges for ITS in Jordan

- System Architecture and Infrastructure.
- System liability (Accidents)
- Willingness of the public to pay
- Public acceptability of in-vehicle advice (cultural issues)
- Bylaws
- Institutional cooperation among public & private institutions
- Privacy issues
- Educational and capacity buildings issues
• Intelligence in ITS in terms of:
  – Vehicle (in and on)- end-users.
  – Right-of-way (stationary cameras in urban roads and portable at highways)
  – Control systems (TCD only)

  ➢ Complete ITS is required!
Traffic Control System for MPWH and General Security Directorate
Stationary Cameras and Microwave System
Microwave System

- Point-to-Point
  Point to Point Wireless LAN
  Ultra broadband up to 1.25 Gbps
- Backbone Link
  Backbone Backup Link
- Wireless Backhaul
  MW Repeater, Cell/PCS Repeater
  2G/3G Repeater
- Surveillance
  CCTV, Security Wireless
Amman ITS:
– Control cameras (24 recent)
– 12 movable and 10 stationary.
– Control system for signals and TCD
– Navigation GIS system (RGC)
– 3 Es: Engineering, Education and Enforcement
– No traffic operations companies (Private sector!)
– No sensors for infrastructure
FUTURE ITS DREAMS
Public Transit
Real-Time Traveler Information is a goal.
Advanced Vehicle Control Systems

Intelligent Cruise Control (ICC) System
Traffic and Transit Management
Current systems and need for ITS

Arterial Management

Emergency Management

Electronic Payment

Traveler Information

Information Management

Crash Prevention and Safety

Freeway Management

Transit Management

Incident Management

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Concluding Remarks

- New strategy to set priorities (Development Roads, BRT, light and national Railways).
- Move toward Public Transit Systems.
- Efficient travel demand management systems, and increasing of the existing infrastructure capacity through utilization of Intelligent Transportation System (ITS).
- ITS is a cost efficient system, however, it requires a lot of requirements and experiences in new advanced technologies.
- Implementation of ITS requires institutional capacity buildings through academic and research institutes, awareness, deployment and finally being operational.
Thanks

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