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# TSJC 2008

5th Traffic Safety Conference In Jordan 2008



## 5th Traffic Safety Conference in Jordan 2008

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**ROAD SAFETY STRATEGIES THROUGH EXCELLENCE IN SERVICES,  
AWARENESS, AND LAW ENFORCEMENT IN JORDAN**

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**ABSTRACT**

Safety is a primary concern and goal of highway and traffic engineers. Authorities and highway engineers in Jordan are struggling to make Jordan's highways safer to drivers, pedestrians, and highway users. The road network in Jordan experiences high traffic volumes particularly in urban areas and in downtown areas of major cities. Highways and expressways perceive a good percentage of the entire average daily traffic volume of Jordan's road network. Jordan ranks one of the top countries worldwide in terms of having higher number of road accidents leading to a relatively high number of road accident fatalities and injuries.

In the last few years in particular, the number of registered vehicles especially private passenger cars in Jordan has increased dramatically. As a result highway traffic volumes and vehicle-miles traveled have significantly increased leading to deteriorating traffic flows and escalating congestions. Consequently, the number of road accidents has also increased considerably in Jordan for the last ten years.

According to police reports in Jordan (PSD, 2006), speeding is a direct cause of many of the accidents that take place on highways and expressways. Nevertheless, a quite good percentage of accidents normally occurs on local urban streets and roads, and in congested areas

inside cities. Pedestrian and driving behaviors are a major factor for such accidents. Driving behaviors range from as low as vehicle zigzagging and maneuvering to as high as speeding in school and congested zones and disrespect and disobedience of drivers to traffic control devices. On the other hand, pedestrian behaviors include on-street walking, continuous pedestrian crossings from different locations on the roadway or street, and disrespect of pedestrians to traffic law and systems.

Urban areas particularly business district areas in cities of Jordan are typically crowded with retailers, vendors, and pedestrians, who normally do activities on street curbs and pavements. And therefore, this situation results in disruption in traffic flows and distractions to drivers and roadway users. In addition, garbage cleaners and workers typically do their jobs on streets and most of the time they use movable trash pushcarts shocking and causing lot of troubles to drivers and sometimes blocking an entire lane of the roadway.

In this study, an evaluation of these behaviors and some of the important traffic system issues will be conducted. Traffic and pedestrian movements will be monitored and related behavioral issues will be extracted and evaluated. Safety strategies will be put forward for highway and traffic engineers, road users and drivers, as well as responsible authorities to improve safety aiming at reducing the number of accidents on Jordan's highways and roadways.

**Key Words:** Safety, Highway Safety, Road Accidents, Car Accidents, Traffic Accidents, Safety Strategies, Driving Behaviors, Pedestrian Behaviors, Traffic Systems, Traffic Awareness, Law Enforcement, Roadways, Highways, Traffic Engineering.

## INTRODUCTION

Jordan is considered one of the top countries worldwide in terms of having higher number of car accidents involving fatalities and injuries. In addition to the increasing number of private vehicles using the highways and roadways of Jordan, there are extremely escalating numbers of public transport buses and taxi passenger cars.

The highway mode of transportation is composed of four major components: the driver, the pedestrian, the vehicle, and the roadway. The bicycle is also becoming an important component in the design of urban highways and streets. In order to understand the transportation highway mode and to provide safety and efficiency on highways and roadways, several key factors have to be taken into consideration:

1. Proper engineering design for highways and roadways should be conducted.
2. Appropriate design of traffic control devices including traffic signals, signs, markings, ...etc should be provided.
3. Traffic control devices should achieve the purpose or goal they were designed for, control attention, convey a clear and simple message and meaning, command the respect and obedience of road users, and provide enough time for proper action or response.
4. Adequate skid resistance should be provided for roadways.
5. Good drainage systems should be available including side ditches, culverts, gutters, ...etc.
6. Good lighting systems should be available for highways and streets.
7. Sufficient cross slopes should be provided.
8. High level of service (LOS) of at least LOS C should be available for highways and streets.

9. Adequate number of lanes should be provided for highways and for approaches at intersections.
10. Grade-separated intersections should be designed and provided when traffic volumes are high and cannot be carried by at-grade intersections.
11. Separate pedestrian signal phases should be available for pedestrians at intersections.
12. Visibility should be provided on highways and in areas where it is needed.
13. Curbs, sidewalks, and crosswalks should be provided properly for pedestrians.
14. Capacity analysis should be conducted for highway segments and at intersection approaches to determine the capacity and the saturation flow rate for these locations.
15. Behaviors of drivers and pedestrians should be studied and evaluated frequently.

Roadways in Jordan experience severe engineering functional problems. These include access control on highways and expressways, some geometric design problems, low skid resistance on roads, low visibility, lack of proper guardrails on high fill highway sections and segments located in mountainous terrains, long steep highway segments, lack of appropriate lighting systems, lack of markings and lane striping, and some others. This is not to talk about structural behaviors and failures on some of Jordan's major highways and even on other secondary roadways. These highway structural issues are mainly related to the highway pavement design and quality control and assurance of highway pavement construction.

Traffic systems in Jordan including traffic signals also undergo serious problems such as: inappropriate lane grouping, improper phasing systems, low saturation flow rates for approach lanes due to existing traffic and geometric conditions at intersections that are highly deviated from standard or ideal conditions, inadequate lane width, high traffic demands at intersections, absence of pedestrian phases, ...etc. On the other hand, pedestrians and drivers' behaviors escalate the problem and make it more complex. Many of these behaviors and manners are default results of the lack of awareness and responsiveness, the intolerance of drivers during driving, and the disrespect and disobedience of drivers and road users to traffic control devices. Subsequently, this situation reduces safety on roadways, creates inconsistency and continuous interruptions in traffic flows and movements, and increases the number of road accidents.

In this study, the focus will be directed to the behavioral issues as well as some major traffic system issues. Evaluation of these issues will be conducted by presenting the outcomes and results of such issues and their impact on the safety on highways and the traffic conditions in Jordan. Engineering strategies, solutions, suggestions, and recommendations to highway and traffic engineers, drivers and users of roadways, and decision makers at traffic and highway agencies in Jordan will be provided as well.

## **LITERATURE WITH IMPORTANT FACTS AND STATISTICS**

Road traffic accidents get plenty of local attention where and when they occur especially when they involve fatalities or injuries. Traffic accidents are vivid reminders of the harm vehicles and their users can cause anytime there is a catastrophe.

Globally, traffic accidents on roads are on the scale of an epidemic. Traffic fatalities and casualties resulting from road accidents are so high worldwide. According to the most recent estimates, road traffic accidents kill 1.2 million victims worldwide and injure 50 million each year. Ninety percent of them occur in developing countries, and more than half of all victims globally are between the ages of 15 and 44. In addition to human suffering traffic accidents cause, they result in considerable additional costs to societies. This global loss has enormous

implications for the security of families. Estimates show that road traffic injuries cost nations as much as two percent of their gross national product (WHO, 2007).

Low-income and middle-income countries account for well over three quarters of the casualties, affecting the most vulnerable groups including pedestrians and other road users. Road traffic accidents are already the fourth leading cause of death for 15–59 years olds in low- and middle-income countries. According to statistics in the year of 2005 by the National Highway Traffic Safety Administration (NHTSA) of the United States (US), the economic cost of the disaster for all age groups in the US is estimated to be between \$65 and \$100 billion per year (NHTSA, 2006).

Iran is considered number one worldwide in terms of having highest number of road traffic accidents leading to 38,000 deaths and injuries per year. In Iran, road traffic accidents account for majority of deaths with a share of 12.7 percent of total deaths a year according to reports of Health Ministry of Iran (2007).

The annual number of traffic accidents in Jordan is among the highest in the world according to statistics. Jordan ranks second only to Egypt in the Arab world for the number of road traffic accidents as traffic regulations are often deficiently enforced. According to statistics and reports in Jordan, more than 98,000 road accidents were recorded in 2006, averaging one every 5 minutes and resulting in a death every 10 hours. In 1998, the registered traffic accidents were 43,343 resulted in more than 612 deaths and 17,177 injuries, apart from material losses that exceeded JD130 million.

While in some developed countries, nations lose one citizen in traffic accidents for every 10,000 registered vehicles, Jordan loses 16 citizens annually for a similar number of registered vehicles. Jordanian statistics show that five children die every week in traffic accidents and that there is a traffic accident every 7.5 minutes on average. Numbers like these look terrifying when compared to international road safety standards.

Jadaan (1989) presented a review of the problem of road traffic accidents in Jordan with a special reference made to hospitalized accidents. Analysis of time-series data on road traffic accidents between 1979 and 1985 showed a rising trend. Over three-quarters of accidents occur in urban areas and during daylight while pedestrians constitute over 40 percent of all injuries. A detailed analysis of 1986 road traffic accidents revealed that more accidents occur on Saturdays (the first business day of the week at that time) and during summer months. Three-quarters of injured pedestrians were less than 20 years of age, a group that composes 60 percent of total population, and 73 percent of total injuries involved people less than 30 years of age.

Another fact about road traffic accidents occurring in Jordan should be mentioned herein that the number of accidents during the holy month of Ramadan normally increases. As an example in the holy month of Ramadan, 594 accidents were registered in the city of Zarqa alone before even the end of the month killing 22 and injuring 560 according to accident reports from Zarqa Civil Defense Department (2007). Around 70 percent of the accidents took place in the afternoon, when most citizens rush home from work, mentally and physically exhausted from fasting.

## **TRAFFIC ACCIDENTS IN JORDAN AND COMPARISON WITH OTHER COUNTRIES**

As Jordan is considered one of the highest countries in the world in terms of traffic road accidents (Figure 1), it was compared to other countries in order to evaluate the accident rate.

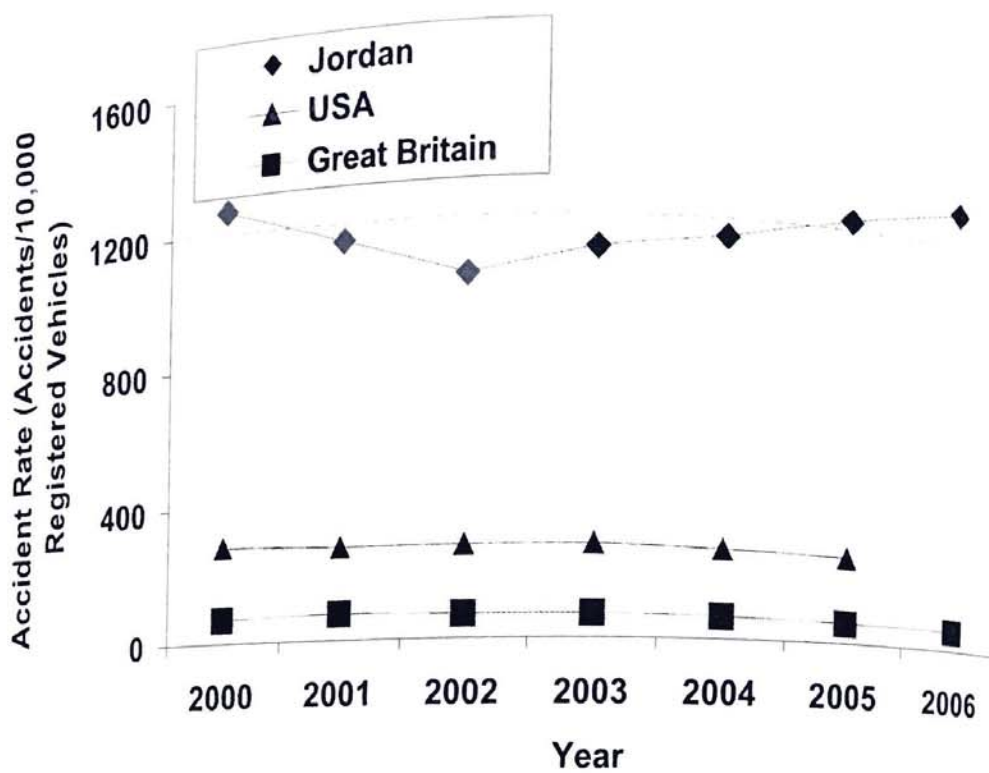


**Figure 1: Road Accidents in Jordan.**

fatality rate, and injury rate in the last six or seven years in Jordan. These three rates were determined with reference to the number of registered (licensed) vehicles per year in each country. These rates were monitored over these years to investigate the change in each rate with time.

The United State of America (USA) and Great Britain (GB) were selected for this comparison. The statistics data about the number of accidents, fatalities, injuries, and number of registered vehicles for the USA were obtained from the U.S. Department of Transportation, National Highway Traffic Safety Administration, National Center for Statistics and Analysis Databases (2004) and the U.S. Department of Transportation, Federal Highway Administration, Highway Statistics Summary (2006) and Annual Issues (2007). The statistics data for GB were obtained from the Department for Transport (DfT) annual reports and statistics in Great Britain (2006). On the other hand, the statistics data for Jordan were obtained from the Department of General Statistics annual reports (2007) and the General Security Directorate annual reports (2007).

The accident rate, fatality rate, and injury rate in these two countries along with the same rates in Jordan over the time period from 2000 to 2006 were determined and plotted with time. Figure 2 shows these trends for the three countries. Several important facts can be drawn from these trends. In the last five years Jordan experienced a rapid increase in the accident rate (number of accidents per 10,000 registered vehicles) as shown in Figure 2. Despite the fact that the accident rate in the USA is considered among the highest rates in the world, the rate in Jordan is approximately 4 to 5 times higher than that in the USA. This is an alarming trend that should be investigated carefully. Comparing Jordan with Great Britain shows that the accident rate in Jordan is on average about 18 times higher than that for GB. Once again this is a serious drift in the accident rate for Jordan.



**Figure 2: Accident Rate with Time.**

In Figure 3, the fatality rate (number of fatalities per 10,000 registered vehicles) in Jordan was also compared to those in the USA and GB. An encouraging decline in the fatality rate, when the number of registered vehicles is taken into consideration, is observed. The fatality rate for Jordan declined from the year 2000 to the year 2005 in a relatively good rate of change particularly when this rate is compared to those rates of the USA and GB. However, the fatality rate is on average about 8 times higher than that of the USA and 13 times higher than that of the GB. This is considered a frightening situation.

Similar trend was obtained for the injury rate (number of injuries per 10,000 registered vehicles) as shown in Figure 4. The figure shows that the injury rate for Jordan decreased from the year 2000 to the year 2006 consistently. However, this rate when compared with those for the USA and GB is significantly high. It is on average about 2.5 times higher than that for the USA and 3.2 higher than that for the GB.

## TRAFFIC SYSTEMS AND TRENDS IN JORDAN

Traffic systems and trends in Jordan undergo major problems. Traffic systems including signals and signs are part of the overall transportation system in Jordan. Any defect or deficiency in traffic systems will lead to a case of imbalance and inconsistency in the traffic flows and streams. Many issues and problems were monitored in order to investigate and evaluate them closely. Some of these issues are summarized below:

1. Improper location and placement of traffic signals (lights).
2. Inadequate number of approach lanes and capacity at intersections.



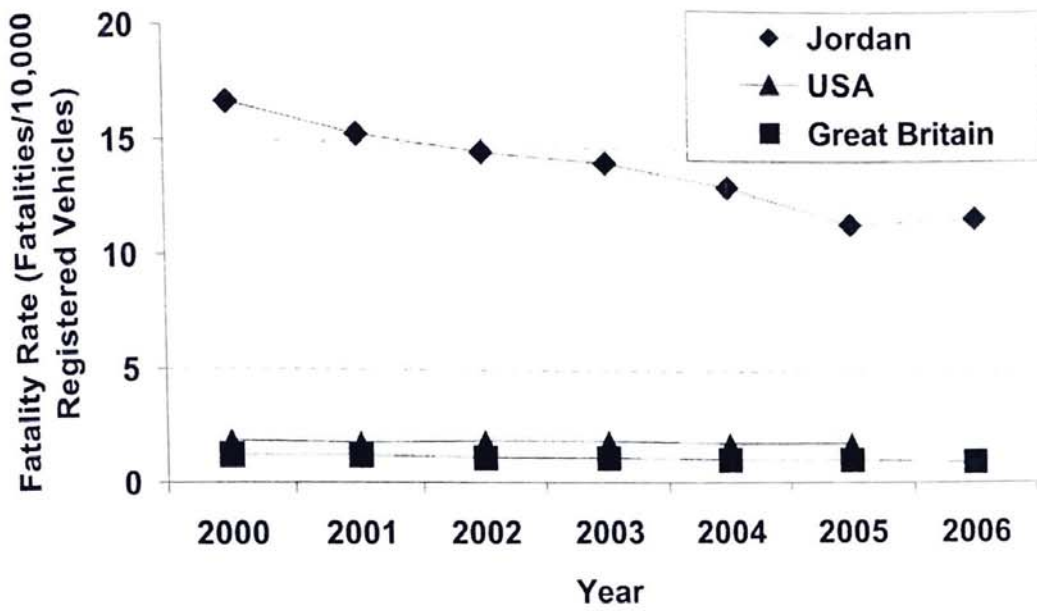


Figure 3: Fatality Rate with Time.

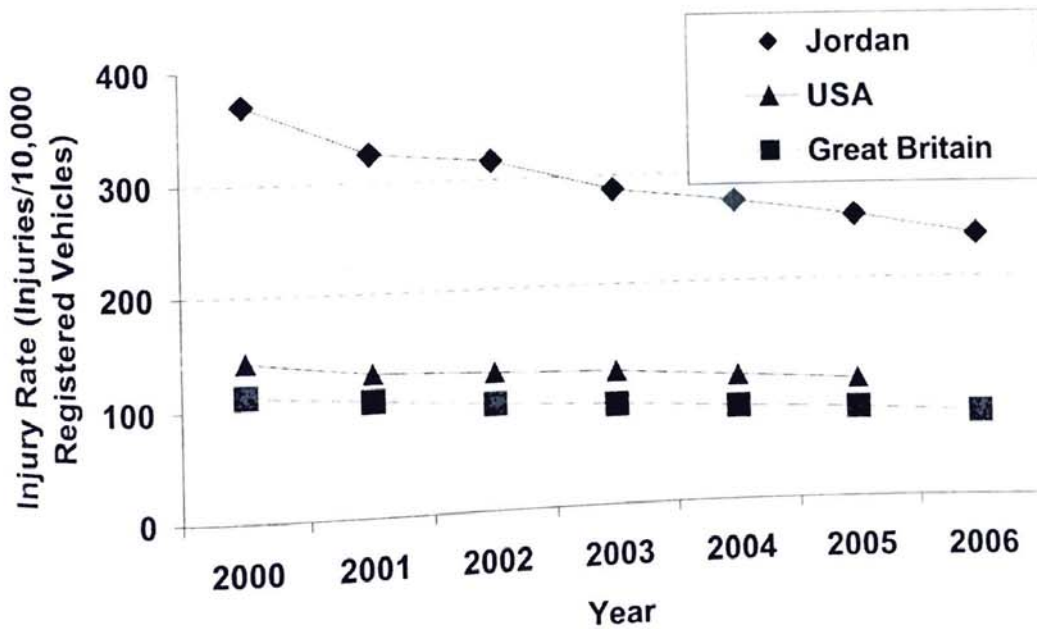
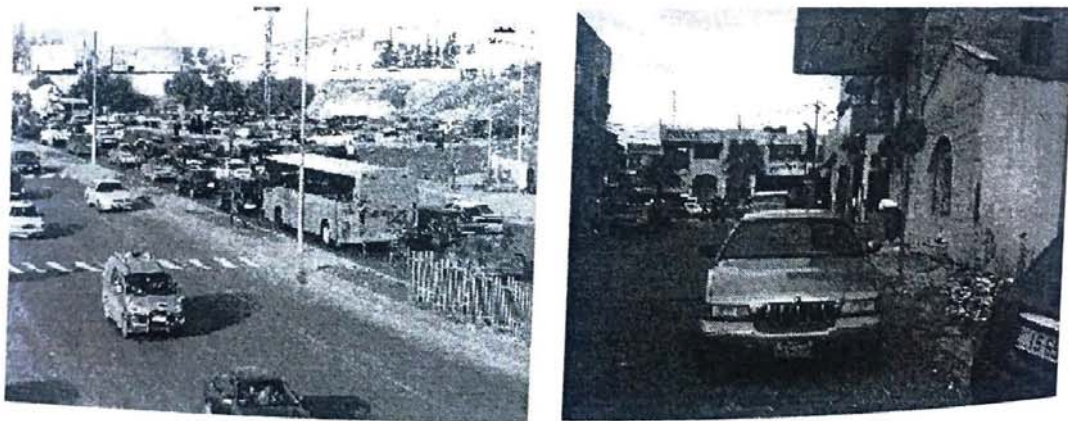


Figure 4: Injury Rate with Time.

3. Lack of marking and channelization (Figure 5).
4. Improper location and placement of other traffic control devices including stop signs.
5. Lack of maintenance for control devices (Figure 6).
6. Low saturation flow rates at intersection approaches.
7. Inadequate lane width for streets and roadways.
8. Insufficient width for sidewalks (walkways).
9. Existence of obstacles such as trees, luminaires, ...etc in walkways.
10. No pedestrian phases in the design of traffic signals.
11. Imbalance in the number of lanes at intersections between the different approaches.
12. No all-red phase in traffic signals.
13. Improper design of traffic signals.
14. Improper phasing of traffic signals.

One key step prior to any signal design is establishing lane groups of the intersection under study. A lane group is defined as a set of one or more lanes on an intersection approach with the same green phase. The following guidelines are used to establish a lane group: (1) exclusive left-turn lanes should be given separate lane groups, (2) exclusive right-turn lanes should be given separate lane groups, (3) when exclusive left-turn lanes or/and right-turn lanes are provided on an approach, all other lanes are normally given a single lane group, and (4) when an approach with more than one lane has a shared left-turn, the operation of the shared left-turn lane should be evaluated (Garber and Hoel, 2002). The second step is to set up the phasing



**Figure 5: Lack of Markings and Channelization.**



**Figure 6: Lack of Maintenance of Control Devices.**

system based upon the traffic demand volumes on each approach and lane group. A good phasing system provides an optimum cycle length with a minimal delay time for all vehicles. In addition, a good signal design at an intersection should also avoid oversaturation at that intersection and provide efficient operation and smooth flow of traffic.

At signalized intersections in Jordan, many of the signalized intersections lack proper lane grouping and phasing system. And thus, most of the time cycle lengths at these intersections are not most advantageous and do not provide optimal solution. For this reason, delay times are higher, oversaturation normally takes place, and lower operational efficiency is produced.

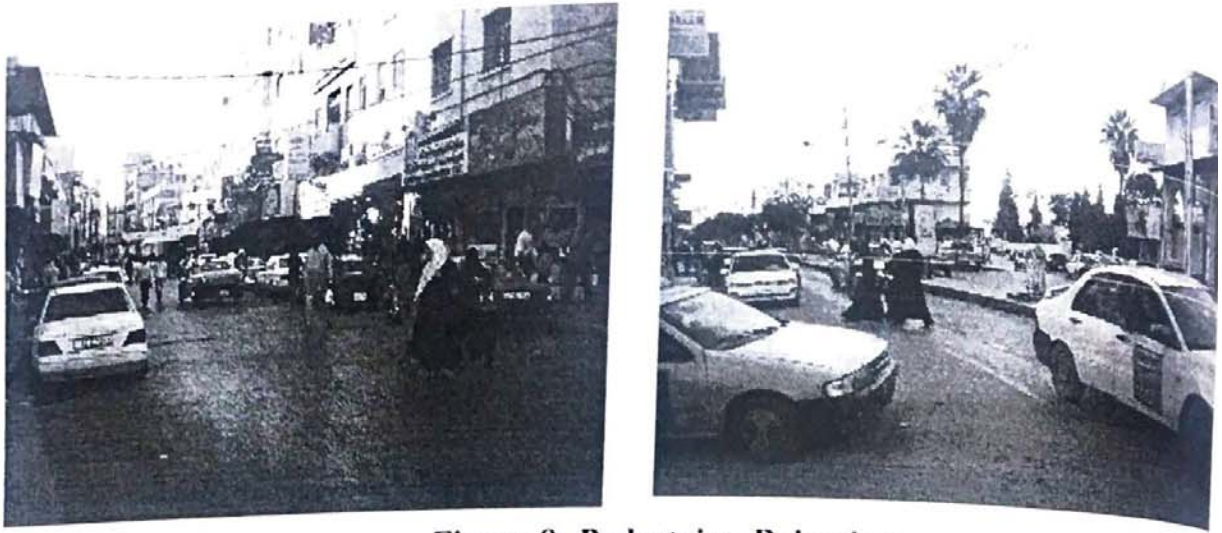
Shared left-turn lanes and shared right-turn lanes create a troubling situation most of the time at signalized intersections in Jordan particularly when there is a separate green phase for the left-turn movement. In this case, vehicles intend to move straight will obstruct vehicles plan to turn left when the green light is for left-turn vehicles and vice versa. The same situation applies for shared right-turn lanes. For this reason, at some signalized intersections, vehicles have to wait two or three signal cycles in some cases in order to cross the intersection. These situations lead to long vehicular queues, higher delay times, and oversaturations at these intersection approaches. Hence, the operation of such lanes should be evaluated and investigated especially when traffic demand volumes are high.

Oversaturation at signalized intersections is a result of short cycle length, low saturation flow rate or capacity of lane groups, or high traffic volumes or demands of lane groups. Many of the signalized intersections in Jordan are located in urban areas, and therefore, these intersections perceive higher traffic volumes. Add to this, intersections in urban areas normally experience existing conditions that are further beyond ideal conditions. For instant, lane width is typically less than the standard of 12 ft (3.6 m). Parking is most of the time allowed near intersections or at close distances from intersections (Figure 7). And in cases if parking is not permitted, some vehicles are still seen parked close to intersections particularly in congested urban areas. Public transport buses and cabs stop frequently for passenger loading and unloading and sometimes at signalized intersections. These conditions result in low saturation flow rates for lane groups of intersections and consequently the capacities of lane groups are reduced significantly.



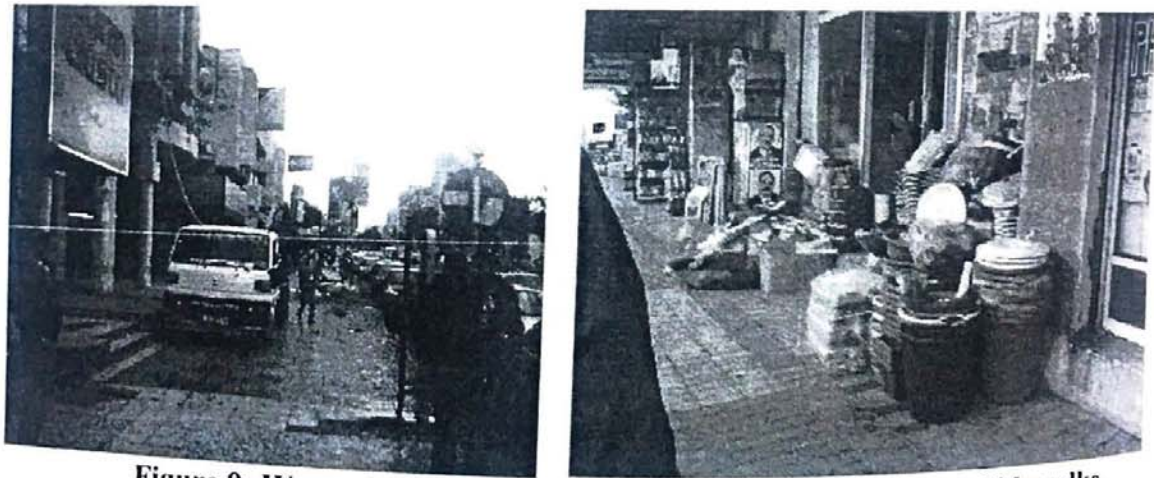
**Figure 7: Parking in the Vicinity of Signalized Intersections.**

Unexpected and extraordinary conditions are also part of the problem. These conditions include pedestrians walking on streets and crossing during the green phase for vehicles in other approaches (Figure 8). Not to blame pedestrians only, but part of the accountability is due to vendors and merchants who normally do their activities on street curbs and sidewalks supposedly



**Figure 8: Pedestrian Behaviors.**

reserved for pedestrians. Those retailers not only use curbs and sidewalks for their daily activities (Figure 9), but they also use streets in some cases to display their merchandise. Into the bargain, street curbs and sidewalks are normally narrow with many obstacles including trees and luminaires that force pedestrians to use streets for walking. However, this is not always the case, sometimes pedestrians are blamed for doing this due to the fact that they get used to this situation and police has no or minimum control on pedestrians.



**Figure 9: Wrong Parking and Merchandise on Curbs and Sidewalks.**

Improper placement of traffic light set up is another riddle that faces traffic systems in Jordan. The location of the traffic light set up is at the near side of drivers close to the stop line where vehicles stop at the signalized intersection. This situation is inappropriate as it results in invisible case for drivers particularly those of vehicles stopping close to the stop line in the front of the platoon. It also creates a case of confusion and ambiguity to drivers especially those in the front lines. It would be much more suitable if the traffic light set up is located at the farthest side opposite to vehicles stopping at each approach of the intersection. In this case, drivers will be able to see the traffic light clearly and visibly without any problem.

Other important issues that exist and generally trouble vehicles during the crossing of a signalized intersection are lack of markings, lane striping, and channelization. Vehicles at signalized intersections are normally piled randomly without any order. In other words, vehicles are not stopped in lanes distinguished by clear white stripes or marks. And in cases where there

are lane stripes, these lines are not clear or/and their color is not phosphoric, and sooner these lines disappear due to the poor quality of the paint used for striping.

In some congested urban areas, heavy vehicles are allowed to enter, and therefore these vehicles create troubles at intersections particularly when they try to make a permitted U-turn or left turn. This situation again affects the saturation flow rate and so the capacity of lane groups carrying heavy vehicles resulting in oversaturations, traffic flow interruptions, and “stop and go” trends.

All previously mentioned traffic issues have lead to a complex and hysterical case of arbitrariness in driving and randomness in traffic flows. Some of these issues are considered traffic violations by law and others are unfortunately not considered violations; the matter that complicates the problem.

## **BEHAVIORS OF DRIVERS AND PEDESTRIANS**

Living with the traffic system issues discussed earlier is a fact, and complicating these issues with random and unsystematic behaviors of both drivers and pedestrians is another fact. These behaviors include the following:

1. “Stop and go” driving patterns especially for public transport vehicles.
2. Disrespect and disobedience of drivers and road users to traffic control devices.
3. On-street retailers and vendors.
4. The use of cell phones during driving.
5. Pedestrian crossings for streets and roadways.
6. On-street pedestrian walking.
7. On-street cleaning workers and the use of mobile trash pushcarts.
8. On-street parking (Figure 10).
9. Continuous vehicle maneuvering and weaving throughout short segments.
10. Speeding in congested urban areas.
11. Speeding in school zones.
12. Speeding in low-speed limit areas and the disrespect of drivers to posted speed limit.
13. Inconsistency in driving behaviors.

Complex traffic scenarios become more complicated when all the components of the traffic system undergo severe and imbalanced conditions. Consequently, the existence of the above drivers and pedestrians’ behaviors on streets and roadways in Jordan indicates that engineering strategies as well as traffic awareness are required in order to deliver the right message and propose optimistic solutions to drivers and roadway users. Nevertheless, reasonable strategies and good solutions may be introduced, but practicing delivered messages by drivers and pedestrians will be hard to achieve sometimes especially when there are many limitations and restrictions related to existing road and traffic conditions. In other words, pedestrians may accept the fact that walking on streets is an undesirable act, but at the same time pedestrians believe that in order to avoid this behavior enough sidewalks and appropriate curbs should be available.



**Figure 10: Double and Wrong Parking.**

One of the major intolerant driving behaviors is the continuous maneuvering and zigzagging throughout short roadway segments particularly in congested urban areas. This behavior neither assists drivers nor helps other users of the road. It can only result in frantic and inconsistent traffic flows, lead to confusion and frightening situation to other drivers, and cause "stop and go" driving patterns.

Speeding on highways in Jordan is considered a major traffic violation by law and violated drivers are punished by speeding tickets imposed by highway police. Highway police do normally exist on highways where drivers are likely to drive at speeds significantly above speed limits. Speed limit on most of the highways in Jordan is 80 kph for lightweight vehicles or passenger cars. On some highways, however, it can reach up as high as 100 kph. For heavy vehicles it is about 20 kph less than that for passenger cars. Highway police in many cases use speed-measuring radars to enforce law and punish violated drivers. Nonetheless, police unfortunately do not enforce this law in congested urban areas, residential areas, or even in school zones despite the fact that these areas rather deserve higher attention and special attentiveness and require law-enforcing police officers to be around most of the time.

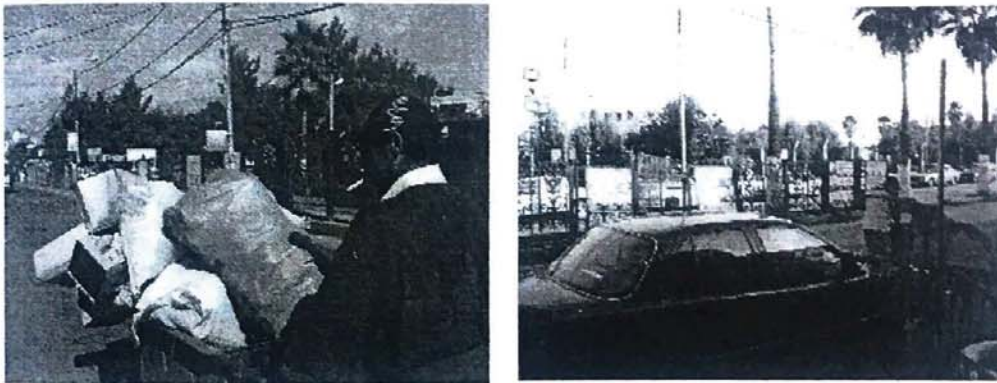
For the above reason, in this paper, speeding in these areas was given a good concern. Drivers generally do not worry about speeding in such areas but on highways where highway police are possibly to exist. This situation is unfortunate as numerous number of roadway accidents occurs in urban congested areas. The case becomes even worse during the night when visibility is minimal due to the lack of appropriate lighting systems and proper road marking and striping. With the existence of on-street retailers and pedestrians, the situation reaches an ultimately inferior scenario.

Pedestrian phases at signalized intersections normally do not exist and these phases are not within the scope of traffic signal designers. Subsequently pedestrians intend to cross a signalized intersection do this either within the green phase of parallel-moving vehicles or on their own from different locations at the intersection; the case that creates hazardous situation to drivers and unsafe traffic conditions that may easily result in accidents. At locations where pedestrian bridges or tunnels do exist or pedestrians are given the right of way, there are some pedestrians who can still confuse drivers with wrong or crazy street crossing or even force drivers to stop due to reckless actions in the middle of the roadway. Hence, part of the blame goes to pedestrians and another part is due to the traffic system.

Inconsistency in driving is another important issue that should be investigated when talking about driving behaviors. Inconsistency in driving implies differences in vehicular speeds and deviations in vehicular accelerations among drivers. It also involves significant discrepancies

between vehicular movements on highways and roadways including weaving, merging, diverging, and maneuvering. Differences between speeds on highways can be as high as double in some cases. Drivers particularly on highways generally do not follow posted speed limits. Some drivers, however, who drive within speed limits, are normally annoyed by others trying to speed up especially for two- and four-lane highways. As a result, drivers are either encouraged or forced to violate.

On-street cleaning is a hazardous activity that takes place on many of urban streets and highways (Figure 11). Trash cleaning workers normally use mobile trash pushcarts that impede driving and block an entire lane in some cases. These pushcarts not only cause traffic congestions and bottleneck conditions, but they also create a hazardous and unsafe situation for drivers and workers as well. Most of the time, these workers shock drivers especially when they are invisible to drivers due to front vehicles.



**Figure 11: On-Street Trash Cleaning.**

## **STRATEGIES AND RECOMMENDATIONS TO IMPROVE THE OPERATION OF TRAFFIC SYSTEMS AND FLOWS IN JORDAN**

According to the evaluation and discussion presented in the previous sections, the following strategies and recommendations are suggested in this study:

1. The guidelines and criteria set up for establishing lane groups for signalized intersections should be followed.
2. The operation of shared left-turn and shared right-turn lanes should be evaluated at signalized intersections to improve the operation of these intersections.
3. Parking in the vicinity of signalized intersections no matter what must be prohibited to improve the saturation flow rates and hence capacities of lane groups and approaches.
4. Heavy vehicles must be prevented from entering congested signalized intersections even if these intersections are located outside business district areas or downtowns. Again in this case, saturation flow rates and capacities are improved.
5. Phasing systems for signalized intersections need to be evaluated constantly as today's good phasing system may not be applicable or appropriate tomorrow depending on demand volumes of all traffic movements at these intersections, which are variable with time.
6. Retailers and pedestrians must be disallowed in any case to use streets and roadways to do their activities.
7. On-street and side-street retailing must be also prohibited.

8. Appropriate marking, lane striping, and channelization should be used for streets and highways to organize traffic flow operations, reduce traffic arbitrariness and randomness, and minimize the possibility of accidents occurrence.
9. Good lighting systems should be used for streets and highways especially in congested areas to improve safety and minimize the number of accidents.
10. Public transport buses and caps should be continuously monitored. The stops of these buses should be controlled and minimized particularly at signalized intersections and major rotaries.
11. On-street and double parking should be monitored continuously. Police should impose towing in places where wrong parking creates hazards and dangers.
12. Higher price penalties and fines must be imposed on drivers and pedestrians violating traffic laws. In addition, some of the traffic violations discussed in this paper should be included to be violations by the law of traffic departments especially speeding in congested areas, speeding in residential areas, speeding in school zones, zigzagging, continuous maneuvering, and hazardous weaving.
13. Pedestrian bridges and tunnels should be constructed as necessary in places where high numbers of pedestrians are likely to cross streets and highways and in locations with high expected number of accidents.
14. Phases for pedestrians should be introduced at signalized intersections to ensure their safety and minimize the possibility of accidents occurrence.
15. Sidewalks and street curbs should be always monitored to ensure their availability for pedestrians only and not for retailing and other activities.
16. In places where sidewalks and street curbs are not wide enough for pedestrians such as those in downtowns of some cities in Jordan, other solutions should be made available including prohibiting vehicles to enter these streets especially during the day so that pedestrians can use streets instead.
17. On-street cleaning should be monitored. Mobile trash pushcarts must be prohibited as they cause extremely unsafe and risky situations. On-street cleaning should be conducted after midnight when traffic volumes are minimal. During the day if necessary on-street cleaning should be done using other means in specified times outside rush hours.
18. Traffic laws should be enforced in congested areas, downtowns, and business district areas not only for wrong and double parking but also for speeding, zigzagging, and other hazardous traffic movements.
19. The use of cellular phones during driving should be prohibited when used without earpieces or headphones and fines should be imposed on drivers who violate this law.
20. All-way or four-way stop signs must be installed at unsignalized T- or four-leg intersections. Drivers must respect and obey these signs on the basis of "first come first go" principle.

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