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Urban Transport in the Mediterranean Region

Under the subject

QUALITY OF LIFE AND COMPETITIVENESS OF CITIES : **A CHALLENGE FOR THE AUTHORITIES**

THE URBAN TRANSPORT CHALLENGE-Recent Innovative Policies and Measures In Tehran

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The Context

- Tehran Metropolitan area covers an area of 780 sq. km with a population of 7.5 million residents which is swelled to 12 million people during the day. The number of registered vehicles is around 4m (61% cars &taxis; 24% motorcycles) and the person trip modal split is car 32%; taxis 17%; motorcycles 7%; bus/minibus 37%.

- Tehran comprises of 22 municipal districts


Map of Tehran

Institutions for transport policy and traffic management

Over the past decade sufficient institutions are set up to deal with policy issues and traffic management measures. These include.

- National High Traffic Council; Responsible for national transport policy. Most major traffic management plans and measures developed by Tehran have to be approved by the Council. The Council functions under the Ministry of Interior.

Institutions for transport policy and traffic management

- Tehran Municipality; several entities under the Tehran Municipality have a role in traffic management, namely;
- Deputy Mayor for Traffic and Transportation,
- Tehran Traffic and Transportation Organization; responsible for traffic management strategy, planning , design and implementation,

Institutions for transport policy and traffic management

- Tehran Traffic Control Company; responsible for ITS, Traffic Command Center, ATC, CCTV, VMS,
- Tehran Comprehensive Traffic and Transportation Studies Company, responsible for transport studies/ research, transport modeling, preparation of Transport Master Plan, etc,
- Tehran Air Quality Control Company (AQCC), Vehicle Inspection Co., Terminals org., Orf Iran,
- Tehran United Bus Company,
- Taxi Organization,
- Tehran Traffic Police.

Serious levels of congestion and pollution

In Tehran the level of congestion and pollution is severe and most junctions at peak hours are over-saturated in the city center. Surveys have shown that delay and stopped time accounts for nearly 50% of journey times. Over 35% of urban highways and 19% of major arterials have a v/c ratio of more than 1.0.

The fundamental causes of congestion

The causes are:

- The availability of cheap fuel (about 10 US cents per liter),
- Massive increase in private vehicle ownership, and the development of local capacity in car manufacturing (Vehicle Registration since 1999),
- Poor land-use planning and poor communications infrastructure,

The fundamental causes of congestion

The causes are:

- The lack of a good functional road hierarchy,
- The lack of a good road-based PT network,
- Poor road user behavior,
- Poor enforcement.

The limitations of what traffic management can achieve in a city like Tehran

- In developed countries, traffic management is well developed and techniques have evolved over many years in the context of moderate traffic growth.

- In Tehran, however, and in fast developing cities there is sometime unrealistic expectations of what traffic management can achieve.

•Traffic management measures can mitigate some of the symptoms of deficiencies, but given the variable nature of travel demand, any benefits are swamped by newly generated or diverted trips from other parts of the road network .

•Low fuel prices also mean throughout the day vehicles search for quickest routes to get to their destination.

•IT is therefore, important to realize the limitations of traffic management policies and tools in a city like Tehran.

Need for more radical TDM to complement PT improvements

- At some point, Tehran has to adopt more radical TDM measures because it is not possible to build a way out of congestion.

- The foundation of TDM needs to be road-based public transport solutions. Tehran needs to move from a tentative approach and consider more radical and comprehensive TDM measures if the city is not to become even more grid-locked and polluted. While the need for more radical TDM is recognized, the authorities remain cautious in its approach.

- Supporting measures such as increasing parking charges and rationalizing parking, and increasing the fuel levy are also currently considered to be politically unacceptable.

Since 1980, a number of schemes have been introduced to deal with congestion levels, namely;

- **Congestion Charging,**
- **Expansion of RTZ,**
- **Staggered working hours,**
- **Odd/Even number plates,**
- **Expansion of Dedicated Bus Lanes,**
- **Removal of Electric Trolley Buses and Replacement by BRT,**
- **Fuel Rationing.**

An overview of each scheme with their effects on travel conditions and demand will be presented here;

Congestion Charging Scheme:

- Around 1981, shortly after the Revolution, Tehran implemented a simple congestion charging scheme. A Restricted Traffic Zone (RTZ) of 19km2 was set up in the central city area. At that time, there was serious congestion and the scheme was easily implemented and accepted by the people. The scheme was subsequently extended to 31km2 and remains to this day.

- Currently, there are 65 gateways signed by overhead gantry signs on major roads and roadside signs on minor roads. Vehicles have to be pre-registered and pay an annual fee to enter the RTZ which operates between 0600 and 1730 hours Saturday to Wednesday (the Iranian working week). The RTZ does not operate on the Iranian weekend (Thursday and Friday) nor on public holidays.

- Around 80,000 vehicles pay an annual fee ranging from US$ 800 for government vehicles to about US$500 for private vehicles. About 40% of vehicles are government ones and pay the lower charge. Over 0.5 million trips into the RTZ are made each day with an average of over 50,000 per hour. Buses, taxis, motorcycles and trucks making key deliveries (foodstuffs, for example) are exempt.

- Permits are issued on a needs basis. Annual revenue is estimated to be US$46 million and this goes to the Tehran Traffic and Transportation Organization (TTTO) who are responsible for the RTZ scheme and who use it to fund traffic improvements. The stated objective of the TTTO is not to generate revenue but to manage traffic.

- Operation and enforcement is manual. The RTZ is enforced manually by the traffic police who staff selected gateways.

- The difficulties of manual enforcement mean that the violation rate is very high at over 30%.

- It is clear that the scheme is not being fully utilized as congestion remains a problem in some parts of the RTZ area (high no. of permits, violations ,etc.)

- However, by reducing the number of permits congestion levels could be improved, but this means filtering more trips. The idea being not to eliminate essential trips, more studies need to be carried out to ascertain optimal number of permits. The share of public sector at 40% seem high!, Public sector pressures ?

- The authorities are poised to extend the area to 51km2 and to implement camera enforcement at the gateways which should reduce the violation rate. The cost of mechanizing controls is estimated around $6m-$10m.

Staggered Working Hours:

The Staggered working hours for schools, offices, banks and commercial centers was introduced in 2006 as a supporting measure to the RTZ. However, the scheme proved difficult for the public to adjust to and was viewed as impractical with little effect on total daily travel demand. The scheme was abandoned about a year later.

Odd/Even number plate Scheme:

- In August 2004, after a trial, an odd/even scheme was introduced as a temporary emergency measure to reduce pollution on days where there is extremely high pollution during temperature inversions.

- The area covered is 150km2 of the city. Vehicles are only allowed to enter on certain days depending on whether their license plate ends in an odd or even number.

- Introduction of this scheme had severe dis-benefits. It caused traffic to shift to peripheries causing congestion around the scheme area. Trips unable to enter the area simply changed their destination outside the defined area, new traffic peak and traffic jams are created when the scheme is not in operation i.e 6:00 pm.

- Some, though a small percentage of the people, have purchased additional vehicle to enable them to enter the scheme area daily. Traffic violations have increased with the introduction of this scheme , as entries are controlled by police officers, putting greater strain on police resources.

- As a result ,the scheme is not favored by the police. As yet no study is carried out on the social and economic implications of the scheme in the CBD or the designated area. Overall, people do not seem content with the scheme.

Bus Lanes and Expansion Program

- Share of public transport is low as a proportion of total number of motorized trip;

Private vehicles	35.2%
Motorcycles	6.9%
Taxi	16.7%
Bus	36.7%
Metro	4.3%

Modal Shares

The modal shares of public and private transport modes, and of the various categories of public transport are shown below;

Tehran: AM Peak Trips by Mode

Mode	Trips	%
Private car & Pick-Up	433,412	35.2
Motor cycle	43,590	6.9
Taxi	205,527	16.7
Transit Bus	231,225	18.7
Minibus	157,481	12.8
Service bus	64,640	5.2
Metro	52,486	4.3
Others	3,127	0.3
Totals	1,232,488	100

Modal Shares

Tehran Daily Trips by Mode (ex Metro)

Mode	%
Private car & Pick-Up	34.4
Motor cycle	7.2
Taxi	17.5
Transit Bus	21.6
Minibus	13.0
Service bus	5.3
Others	1.0
Totals	100.0

This compares with share of public transport in selected Latin American cities, where bus share in Mexico city, Santiago (Chile), Sao-Paulo are 63%, 49% and 40% respectively.

The main factors in the context of public Transport in Tehran are;

- It is a committed national political strategy to keep fares and fuel prices low,

- Fare revenue covers less than 20% of the cost .

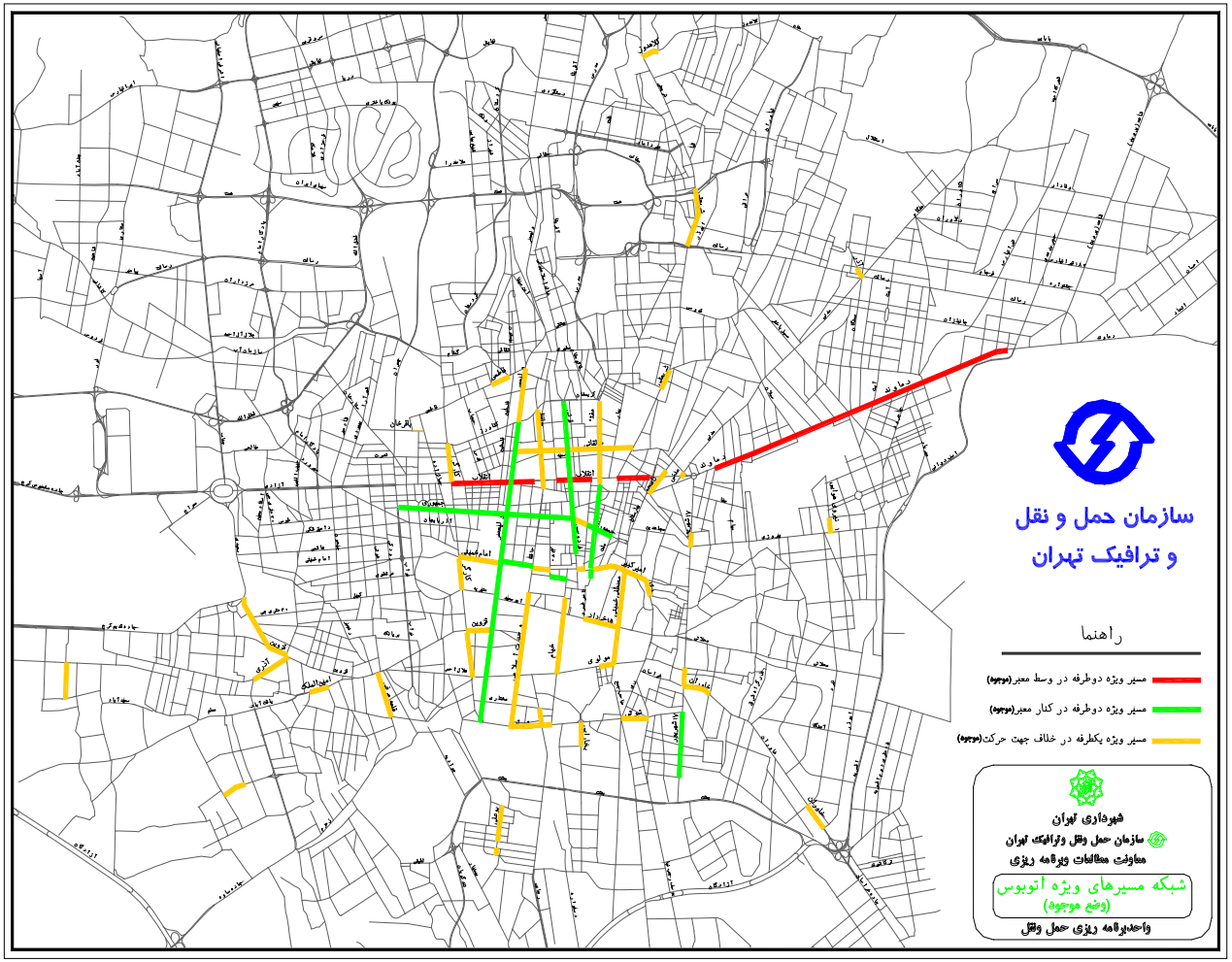
Dedicated Bus Lanes

- The current total length of dedicated bus lanes in Tehran is 84 km. The length of one-way lanes is 31 km. Eleven lanes totalling 26 km are two-way with a dividing kerb.

- There are 47 contra-flow lanes on one-way streets.

- 154 bus routes use dedicated lanes for part of their route length.

- Tehran has 2,892 kms of bus route and 84 kms of dedicated lanes, thus priority measures have been applied to about 2.9% of the bus network.

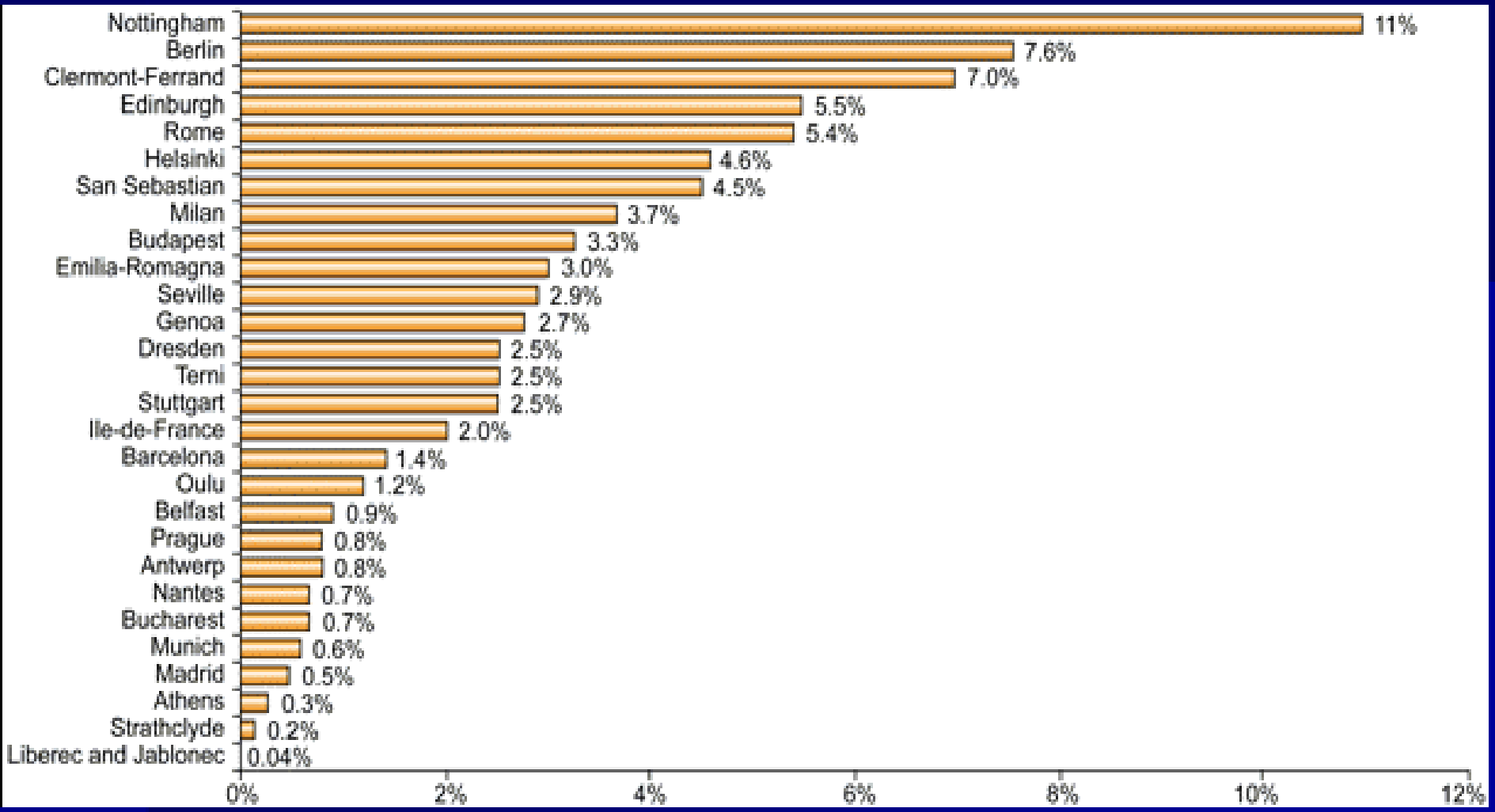


Central Median 2-way lanes

Kerb side 2-way lanes

Contra-flow lanes

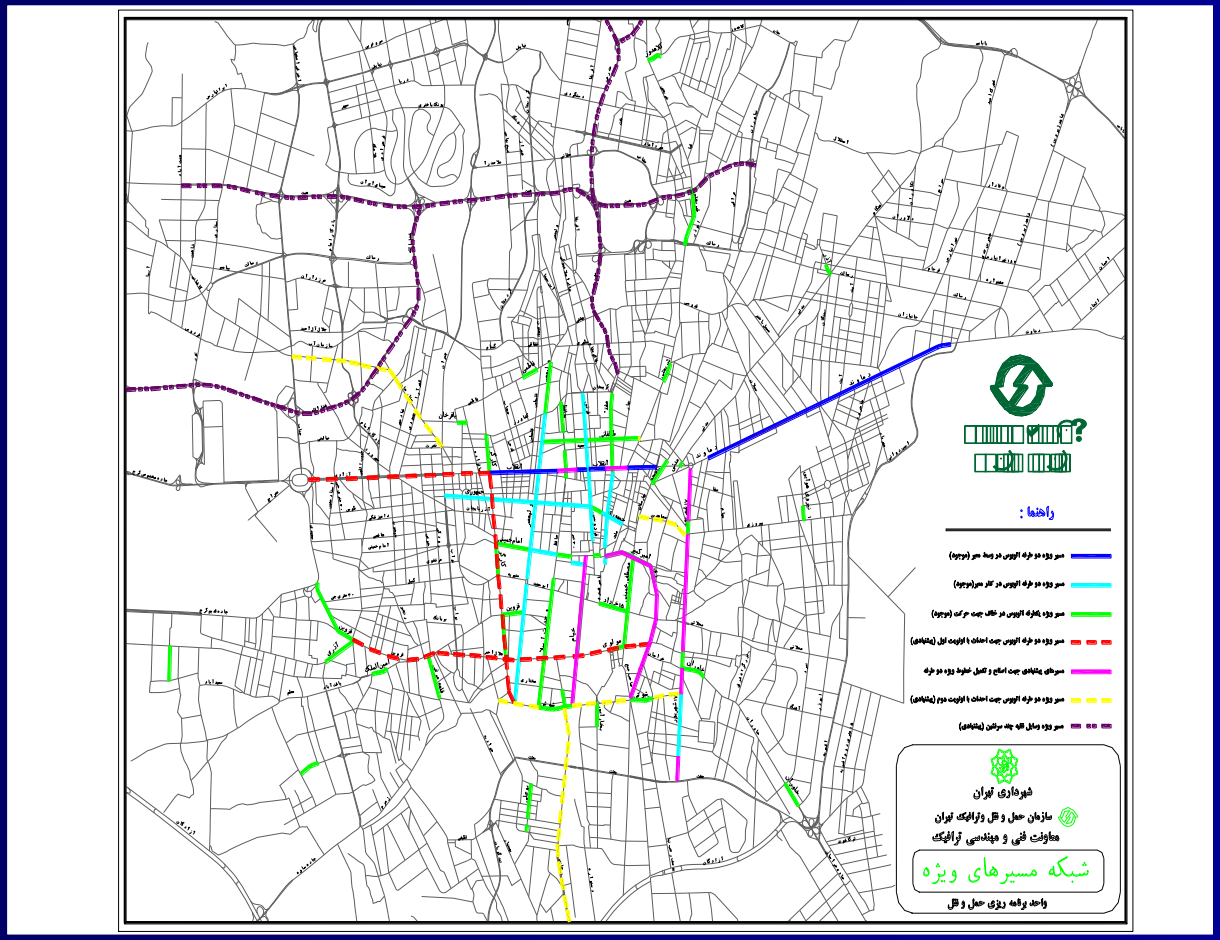
Existing Bus Lanes by Category



Reserved Bus Lanes in Relation to Total Network Length

in European Cities . Tehran compares well at 2.9%

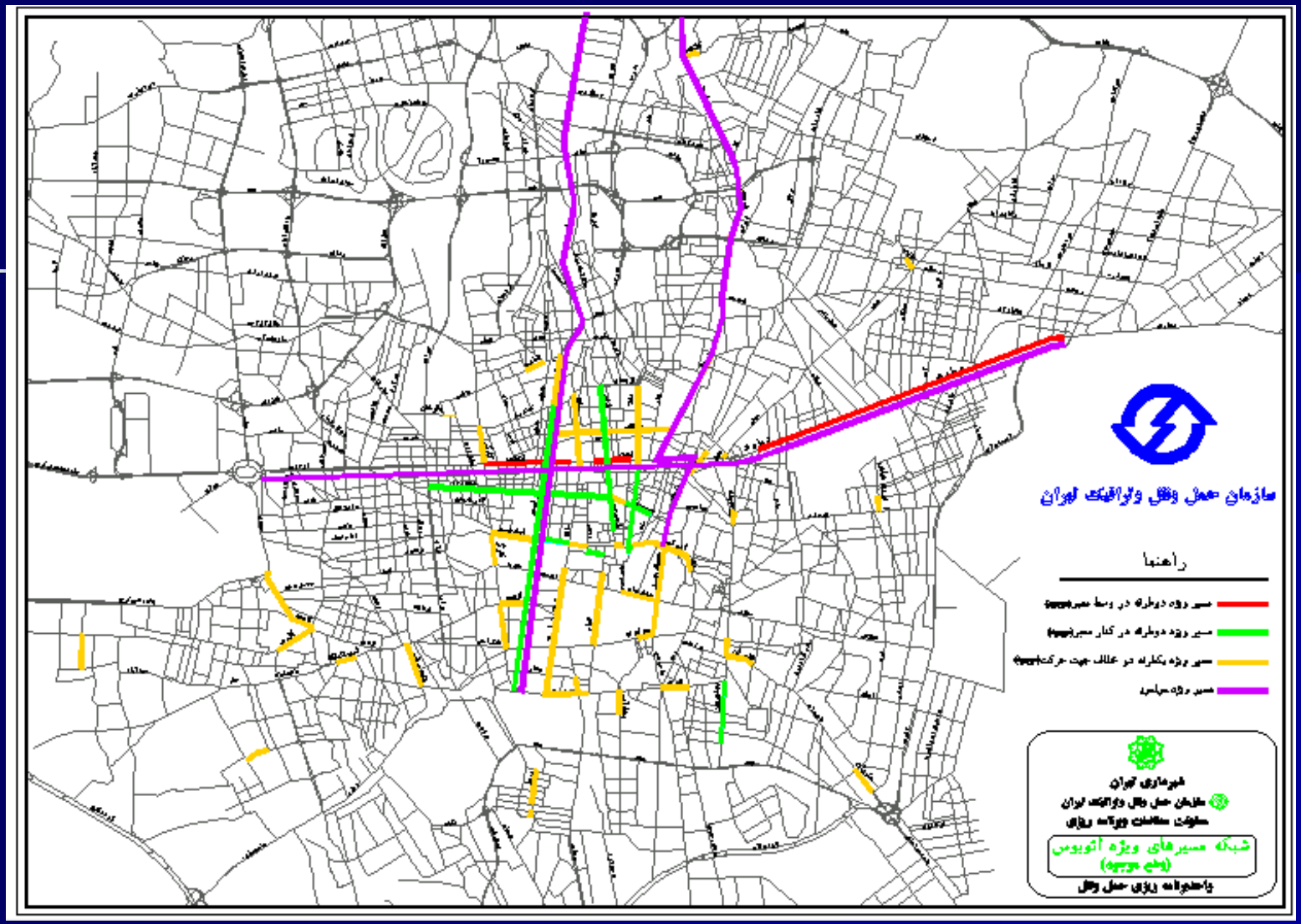
Further outline schemes have been prepared for 200 kms more bus lanes. These include 20 km continuous lanes on the NS and EW axes shown in Figure below. However, the police have objected to some schemes on the grounds of the likely impact on non-bus traffic.



Map of recommended dedicated bus lanes in Tehran

•The main constraint on the effectiveness of Tehran's bus priority network is that it is fragmented. This limits the speed and reliability advantage to buses and makes enforcement difficult.

•Recently, all bus routes were investigated to establish the potential for dedicated lanes. 25 streets were selected for establishing two-way dedicated lanes and 14streets for one-way lanes. The primary criteria for selecting the routes were the volume of demand for buses and the level of congestion.



Proposed Municipality bus lanes in Tehran

Replacement of Electric Trolley buses with BRT system

The 12.6 km central median trolley and bus lane in Damavand (East Tehran) (illustrated in Figure above and shown in red) which was partly run by Electric trolley buses was replaced by a BRT line very recently.

Fuel Rationing

- In Aug2007 , 8.8 million fuel cards were issued. 4.2 million cards also issued for motorcycles.

- A huge task, all pump stations were equipped with card readers and linked to main computer site.
- Each private vehicle was allocated hundred liters per month.
- Taxis, goods and emergency vehicles received higher quota.

- After fuel rationing in Aug2007, mean daily consumption of petrol in the country has decreased to 59.4 million liters. In comparison, Daily consumption of previous year was 75.9 million liters. If the scheme was not implemented, the demand would have risen to 82.5 million liters. Therefore, fuel rationing has resulted in a saving of 20 million liters per day.

- Currently daily Petrol production in Iran is about 42 million liters. The rest is imported.

- Gasoline import started in 2005.

State Energy Subsidy

Share of Energy subsidy from total state subsidy;

- In 2nd FYDP(95-99), this figure ranged from 85% to 92%,
- In 3rd FYDP(00-04), it always stayed beyond 90%,
- In first year of 4th FYDP(05-09), this figure increased to 95%,
- In 2004, the total energy subsidy amounted to $20.7bn,
- In 2005, this figure increased to $29.5bn,
- Compare the above subsidy sums with total development budget which was around $11bn.

State Fuel Subsidy

- State fuel subsidy in 2005 was equivalent to $26.2bn of which 27.9% was the subsidy for petrol ($7.3bn), and 44.7% for gasoline which amounted to $11.7bn,
- Based on forecasts, if the petrol rationing scheme was not introduced, the subsidy for petrol in 2007, would have amounted to $16.6bn and in 2008 to $24.1bn.

Fuel consumption trend

Petrol and Gasoline consumption trend in Iran
Mar1998 to Mar2006 (million liters per day)

year	98	99	00	01	02	03	04	05	06	Annual average Growth (percent)
Petrol Consumption	37.7	39.1	42.7	45.9	50.5	56.3	60.7	67	76	9.0
Gasoline Consumption	63.8	63.1	66.7	69.1	70.8	72	74.5	79.4	84.8	Mar04 to Mar06 7%

Monthly petrol consumption trend
2001 to 2007, Tehran (1000lit)

	2001	2002	2003	2004	2005	2006	2007
April	198462	215543	236705	254262	270644	280583	289925
May	235538	266600	273859	295568	315104	324362	331958
June	229679	250945	273612	291225	309446	317009	316881
July	245024	263934	291630	303889	329650	333742	272414
August	274040	267251	289121	299268	329372	330621	271159
September	240839	263934	287212	298260	325690	327572	263940
October	233640	256830	280849	293158	302470	305126	261018
November	241230	254910	273834	281477	305691	317135	261821
December	233550	254700	277473	302816	305412	326233	277067
January	237210	260370	264623	256421	305693	315244	
February	244560	264870	284386	295284	304556	310069	
March	250879	268917	283070	307623	210838	206449	
Total	2864651	3088804	3316374	3479251	3614566	3694145	2546183
Annual growth (%)		+7.8	+7.4	+4.9	+3.9	+2.2	
Average annual growth 2002 - 2004	+6.0			O/E	O/E	O/E	F.R+ O/E

Monthly petrol consumption trend (high demand period) July to December, 2001 to 2007 in Tehran (1000lit)

	2001	2002	2003	2004	2005	2006	2007
July	245024	263934	291630	303889	329650	33742	272414
August	274040	267251	289121	299268	329372	330621	281159
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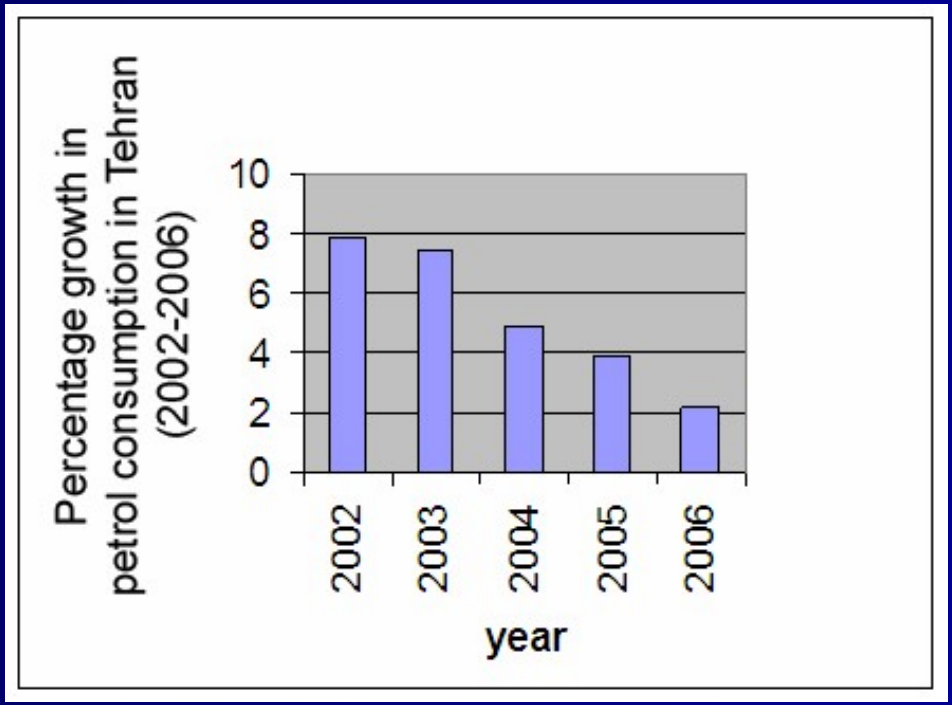
November	241230	254910	273834	281477	305691	317135	261821
December	233550	254700	277473	302816	305412	326233	277067
Total	1468323	1561559	1700119	1778868	1898285	1940429	1607419
Annual growth (%)		+6.3	+8.9	+4.6	+6.7	+2.2	-17.16
Average annual growth 2001 - 2005	+6.63			O/E			F.R

Based on statistics by National Iranian Oil Production and Distribution Company (NIOPDC), petrol consumption in Tehran has increased on average of 6% per year between 2001 to 2005. Introduction of number plate scheme decreased the growth down to 2.2% between the year 2005 to 2006 and by implementation of fuel rationing, consumption in Tehran decreased by 17.16% from 2006 to 2007.



- . Last month the ration increased from 100 Liters to 120 Liters ?!!
- The scheme offers no incentives for those who do not use ,or part use, their ration.
- The scheme implementation reduced the congestion levels significantly,
- Cautious consumption, but then card swapping, black market,..

Summary and Conclusions;

"Experiences gained in Iran"

- **Congestion Charging**, introduced nearly three decades ago, there are plans to expand the area, a progressive policy then, and still valued by the transport authorities, still standing.

- **Staggered Working Hours,** spreads the peak hour, creates more capacity during the peak period, with time releases suppressed demand and congestion levels return to previous levels, causes hardship to families, could raise the need for vehicle ownership, scheme abandoned.

- **Odd/Even Number Plate Scheme,** shifts congestion to peripherals, increases traffic violations, causes hardship and restricts freedom of choice on travel day (s), stretches already limited police resources, Not favored by the public and police.

- **Dedicated Bus Lanes,** Focuses on people and not cars only, relatively easy to install, low cost of implementation, socially fair, if criteria for selection of DBL (s) are carefully studied and properly consulted, the scheme is likely to yield high benefits, if fragmented it will constraint effectiveness, best to plan continuity in the DBL network.

- **Fuel Rationing, a** socially right solution, given the circumstances in Iran, limits subsidies targeted towards relatively well of sectors of the community, a new tool to manage demand and to achieve lower congestion, reduces pollution and traffic accidents, considering the issues of global warming and climate change, rising global demand for petrol, insufficient global production capacity, high oil prices, this scheme can be highly effective in capping demand by causing forced modal shift to PT.

By learning from the Iranian experience, and resolving short-comings in the strategy adopted and the way scheme was executed, it is believed the scheme will be considered by other countries on the long run, it is also believed that investments in PT alone, will be unlikely to resolve traffic congestion in large urban centers, given the comfort offered by private cars.

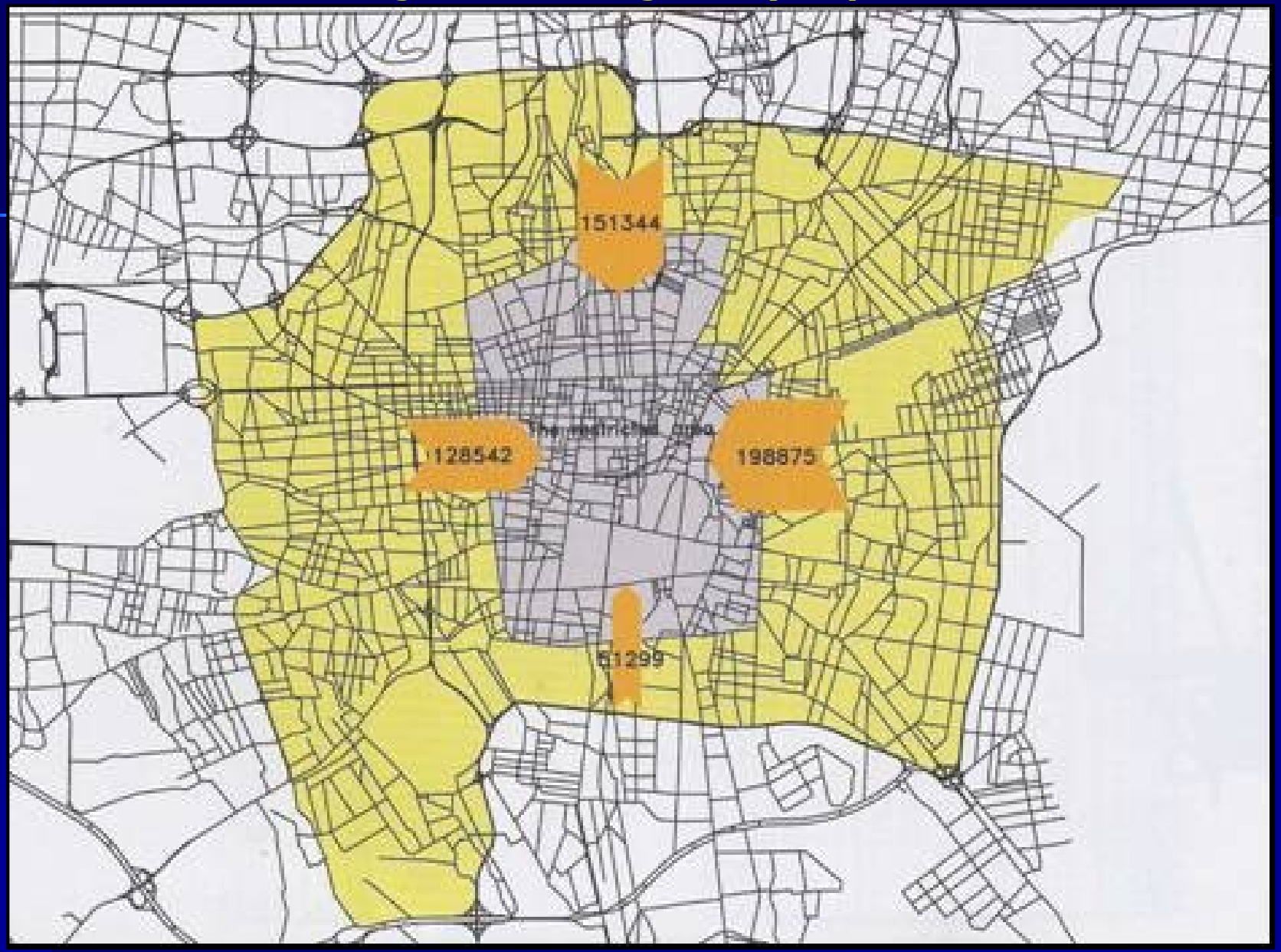
Fuel rationing is a policy in the right direction, although it may be considered controversial and simplistic solution to resolve complex urban transport, fuel rationing is a radical and effective TDM tool if complemented by PT investment and improvements.

The End

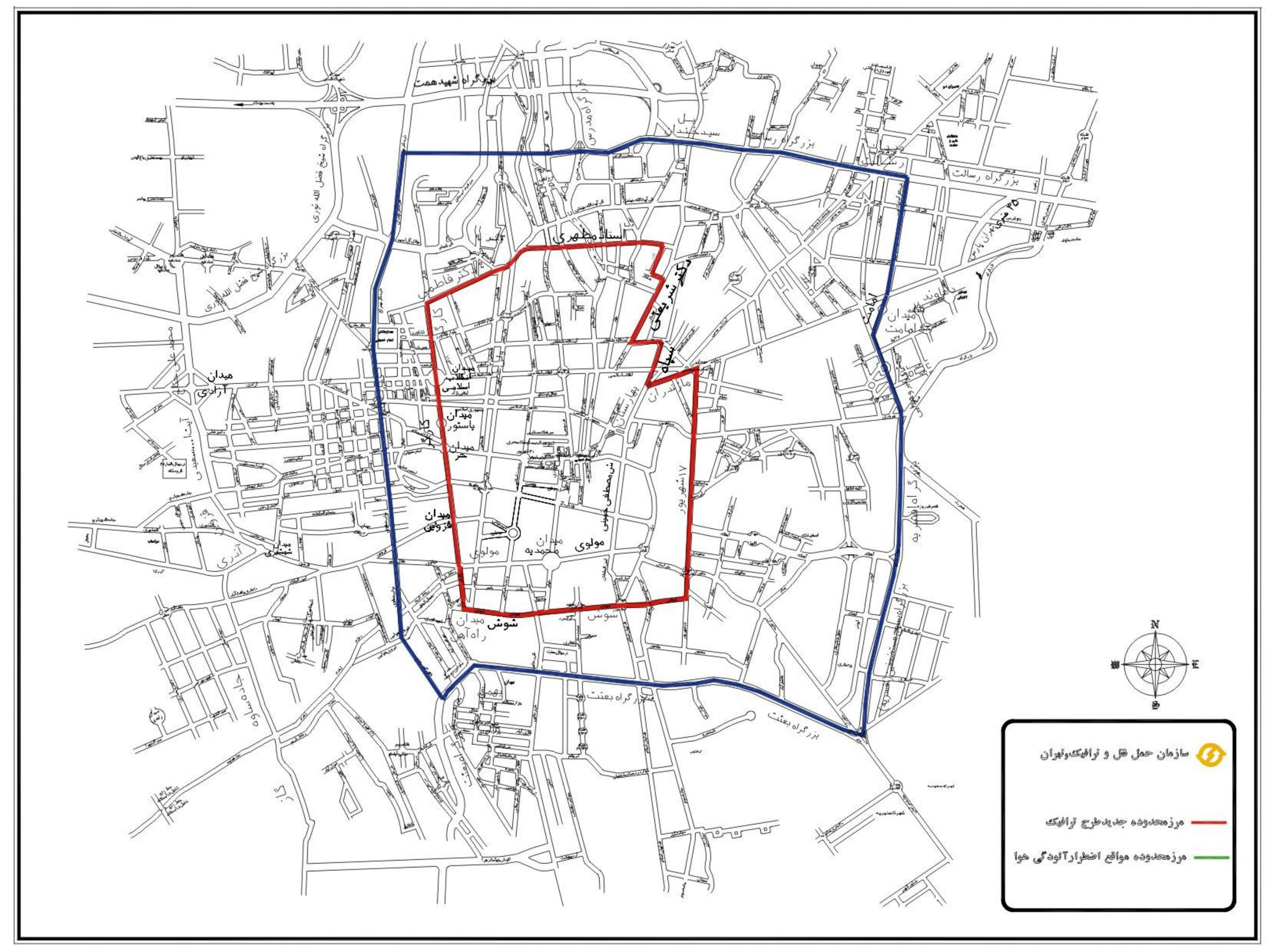
Number of vehicles registered between April to September 1999 – 2007 in Iran

April to September	Vehicle	Percentage of variation in comparison with last year	Percentage of variation in comparison with the year 1999
1999	130071		
2000	154012	+18.4	+18.4
2001	225843	+46.6	+73.6
2002	330305	+46.2	+153.9
2003	775703	+134.8	+496.4
2004	1324424	+70.7	+918.2
2005	1102516	-16.8	+747.6
2006	1063457	-3.5	+717.6
2007	1185270	+11.5	+811.2

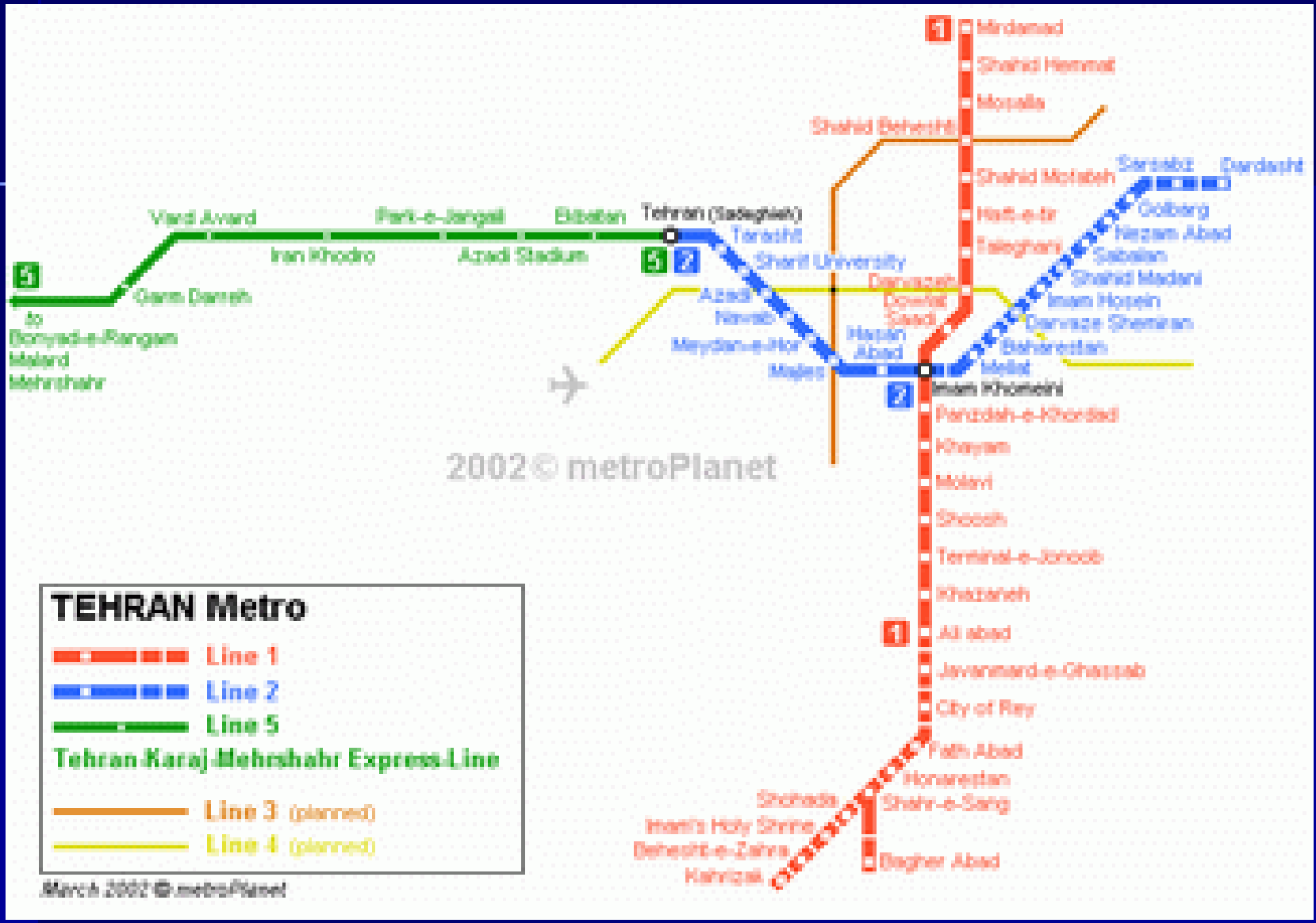
Tehran: Existing RTZ, Average Daily Trips into Zone, 2004



Tehran: Odd/even Number plate zone (blue)



Tehran Metro lines



The limitations of what traffic management can achieve in a city like Tehran

- In developed countries, traffic management is well developed and techniques have evolved over many years in the context of moderate traffic growth. Furthermore, the pre-conditions for successful traffic management techniques are well-established.

- In Tehran, however, and in fast developing cities there is sometime unrealistic expectations of what traffic management can achieve. While traffic management techniques are wide ranging, they cannot solve some of the fundamental problems associated with poor development control and land use planning, under-developed transport planning, rapid growth in vehicle ownership and use, large traffic volumes, and poor enforcement and road user behavior,

•Traffic management measures can mitigate some of the symptoms of these deficiencies, but given the variable nature of travel demand, any benefits are swamped by newly generated or diverted trips from other parts of the road network .

•Low fuel prices also mean throughout the day vehicles search for quickest routes to get to their destination , regardless of distance traveled or travel cost, which is very low. This imposed additional VKM , unlike developed countries where travel cost is an issue, exacerbates the congestion levels.

•IT is therefore, important to realize the limitations of traffic management policies and tools in a city like Tehran.

Need for more radical TDM to complement PT improvements

- At some point, Tehran has to adopt more radical TDM measures because it is not possible to build a way out of congestion. Fundamental to this should be the introduction of fuel limitation and levies, higher parking charges and restrictions on vehicle ownership, not just on use.