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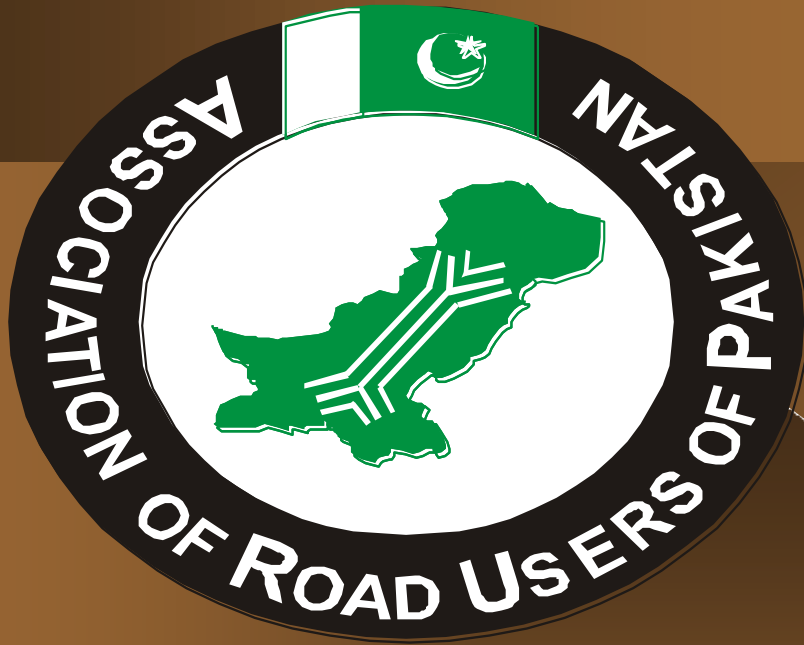
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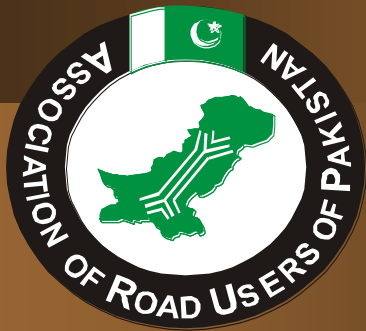
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Air Quality in Urban areas in Pakistan Vs Transport Planning: Issues and Management tools

By
Dr. Noman Fazal Qadir
of Global Environment Technologies

Summary of the Talk

◆ **Introduction**

◆ **Pakistan: Basic Information**

◆ **Urban Air Quality (UAQ) in OUR Cities**

◆ **Existing Measures for controlling UAQ**

◆ **Limitations / Constraints**

◆ **Conclusions & Suggestions**

INTRODUCTION

- **Transport & energy sectors - major air polluters.** Road sector causes more UAP than any other single human activity.

- **Improved technology.** has not outweighed the amount of pollution emitted by the share of old technology Vehicles on road.

- The ROAD Sector contributes $1/2\ NO_x$, $2/3$ of CO, & $1/2\ HC$ emissions.

- UAQ be improved by **integrating technical & management options & financial incentives** including better traffic flow & transport management / planning in the urban areas ,

- Change of technology including fuel substitution & conversion to less polluted fuels (e.g. low Sulphur / Lead fuels, CNG) &

- Using management tools for effective implementation of laws linking control on emissions & fuel adulteration, strengthening vehicle inspection system & transport priority planning.

Introduction

◆ **Air Pollution emerging environmental concern**

◆ **Rapid growth – infrastructure + associated transport sector**

◆ **Impacts including those on direct health**

◆ **Cost – benefit analysis of impacts Vs clean up activities**

◆ **Pollution control & prevention are not desirable luxuries but necessary parts of sustainability for survival of OUR ecosystem**

◆ **AQM – emerging field**

TOTAL ROADS : 258,000 KM
ROAD DENSITY : 0.32
NATIONAL HIGHWAYS : 9000 KM
(INCLUDING MOTORWAYS)

KHUNJERAB

CHINA

Tarbela Dam

KASHMIR

TORKHAM

Peshawar

Islamabad
Rawalpindi

DISPUTED
TERRITORY

Nowshera

Hassanabdal

Mangla Dam

Indus River

Kharian

Chenab Bridge

Jhelum River

Chenab River

D.I. Khan

Qila Saifullah

(N - 50)

Faisalabad   Lahore

Shorkot

Ravi River

CHAMAN

(N - 70)

Quetta

D.G. Khan

Okara

WAGAH

TAFTAN

Lakpass

M-5   Multan

Mian Channu

Nok Kundi

(N - 40)

Sutlej River

IRAN

(N - 25)

(N - 65)

M-8   N - 55

Bahawalpur

Sukkur

Rahim Yar Khan

Ratodero

Rohri

N - 5

Turbat

(N - 10)

Hala

GWADAR

Hyderabad

Hub   Kotri

KARACHI

ONLY 3.5 % OF ENTIRE ROAD
TAKES 80 % OF COMMERCIAL
ROAD TRAFFIC
CARRY 90% OF FREIGHT &
PASSENGER TRAFFIC
ONLY ONE COMPLETE NORTH-
SOUTH LINK N-5

MOTORWAYS SHOWN
ON THE NEXT SLIDE

MOTORWAYS (2736 KM)

COMPLETED

M-1 ISLAMABAD - BURHAN	37
M-2 LAHORE - ISLAMABAD	367
M-3 PINDI BHATTIAN-FAISALABAD	53

ONGOING

M-1 BURHAN - PESHAWAR	117
M-10 KARACHI NORTHERN BYPASS	57

CHINA

PESHAWAR
M-1
ISLAMABAD
N-5
M-2
M-3   PINDI BHATTIAN
FAISALABAD
M-4   LAHORE
N-5
Quetta
M-5
D.G.KHAN   MULTAN
M-6
N-5
KHUZDAR   SADIQABAD
IRAN
KAKKAR
M-8   RATODERO
TARBAT   AWARAN   MORO
M-7   HALA
GWADAR   M-9   HYDERAB
KARACHI   M-10

PLANNED

M-4: FAISALABAD-MULTAN	243
M-5: MULTAN-DG KHAN	84
M-6: DG KHAN - KAKKAR	467
M-7: KAKKAR - KARACHI	280
M-8: RATODERO – GWADAR	895
M-9: KARACHI-HYDERABAD	136

December 1, 2016

Pakistan : some statistics

Country / City	Population Million	Vehicular population	Importance for air quality
Pakistan	150 +	6.5 million	Road infrastructure, Transport, industry (brick kilns, thermal power plants & steel), municipal solid wastes, climate, Forest / green cover.
Karachi	14.5	Over 1.7 million	Largest industrial / transport / residential sector Little Forest / green cover.
Lahore	8.5	562,000 vehicles & ~ 3000 SME / industries	Large industrial / transport / residential sector, climate

Transport data

Class of Vehicle	Petrol / Diesel / CNG / LPG	1980	2000	Rise %
Delivery Vans	D / P	8503	109722	1190
Motor cycles	P	287622	2113078	634
Cars TAXIS CARS	P/D/CNG/LPG P/D/CNG/	148334	748,909	405
Trucks	D	34193	158645	364
Buses	D	25275	91910	264
Rickshaws	P	31950	93300	192
Total	Mix	682059	4293836	530

Fuel Consumption & Sectoral oil Consumption 2000-1: Total 19.35 Million Tons

Year	1990-1	1995-6	2000-1
Fuel x MTOE	7.8	15.8	19.35

Sector	% age
Transport	46.2
Power	36.8
Industry	10.9
Others	6.1

Air Pollution in Cities

◆ **Ambient Air Quality Parameters (hourly Maximum Concentrations)98-9**

Cities	CO ppm	O_3 ppb	SO_2 ppb	NO_x ppb
Lahore	8 - 9.2		50 - 80	300 - 450
Rawalpindi	1.2 – 6.2	27 - 62	4.5 - 27	25 - 250
Rawat Vill.	0.8	31	2	< 20

Air Pollution range (1 hr max) in Lahore, Islamabad and Rawalpindi region 1999-2000

City	CO ppm	NO_x ppm	SO_2 ppb	O_3 ppb	PM_{10} $\mu g/m^3$	$\mu g/m^3$ TSP
Standards	0.35 USEPA, WHO, EU	110 - NO_2 0.053 ppm 0.04-0.06	134 WHO 130 USEPA	90 WHO 120USEPA 60 : 1 hr	200 Jap. 150:24-hr avg USEPA	200 Japan
Lahore	0.1-9.4	2.7-499 NO 24–556 NO_2	2.8 - 211	0.4–110.6	68.4 - 1535	1975-3045
Rawalpindi	0.3- 6.7	3.5 - 263 NO 19–237NO_2	7.8 - 61	0.1–59.37	40- 1406.3	675 - 3724
Islamabad	0.1-3.6	10 - 355 NO 30–349 NO_2	4.3 – 60.2	0.1 – 52.5	80.7 – 937.8	2230-2385

Pollution Levels

◆ **SPM/PM in all the cities are higher than international standards:** **VERY HIGH** **(about 6 times higher than WHO guidelines)**

◆ **Heavy metals (Arsenic, Lead) in ambient air samples in Lah. & Isb. are higher than International Standards**

◆ **In Lahore, Rawalpindi and Karachi CO, NOx and SO2 levels are quite high.**

Efforts are required *to:-*

- ✉ **Collect** data for baseline ambient airborne pollution levels

- ✉ **Develop linkages** between pollutant concentration Vs source identification & their contribution / quantification,

- ✉ **Incorporate** atmospheric dispersion models

- ✉ **Initiate** pollution index levels dissipated with weather reports,

- ✉ **Implement** feasible mitigating measures to reduce these levels

- ✉ **Create Awareness** amongst **ALL** stakeholders especially transport sector

- ✉ **Reduce the emissions** of these pollutants through Adoption of national guidelines / standards

- ✉ **consistency in laws and strong enforcement.**

Sources of Air Pollution

1. **Vehicular emissions**; **important source** –

   its contribution **not been quantified** as yet.

Total emissions by transport sector is approx **324,473 tons**

NO_x (> 90 % by diesel as source of fuel & 9.5 % by Gasoline: 65 % share of total NO_x emissions by all sectors), 35,362 tons PM (93% by diesel driven veh. & 6.5 % by Gasoline: 2 wheelers, motor cars & tractors are dominant sources; 6 % share of total emissions), 120,871 tons SO_2 (99 % diesel driven vehicles: 16 % of total SO_2 emissions).

1. **SMEs in & around cities** : geographical concentration

2. **Industry & power sector** : Major users of diesel & furnace oil – thermal power plants, steel etc.

3. **Municipal Solid waste**

   Integrated Municipal Solid Waste Management not available.

POLICE, during an anti-pollution drive, checks a vehicle to gauge harmful smoke emission in Islamabad on Thursday (6 May 2004)
-- Dawn Friday 7 May 2004 --

Existing mitigation measures

1. **FERTS** tune up activities :
   1. 28000 gasoline veh. in 2 years from 15 tune up facilities – now 20+ centers
   2. 94% of veh. tuned are older than 8 years & 6% are younger than 1995 --
   3. 54% reduction of CO, 462 Tons of CO
   4. 15% efficiency in fuel consumption –

2. on completion will result in annual reductions in emissions of CO_2 (262,040 tons), SO_2 (1478 tons), lead (7 tons), Hydrocarbons (5659 tons), CO (67343 tons) and SPM (5342 tons) .

3. **VETS** - tested > 18000 (Petrol & Diesel) vehicles and reported reduction 28% in terms of opacity and 77% in CO ; PM_{10} emissions from diesel veh. 160 Tons/year and CO from petrol vehicles 913 tons/year .

4. **Fuel substitution & clean up** : reduction / elimination of Lead in Petrol, reduction of Sulphur in HSD & Fuel oil with a time frame : introduction of catalytic converters ; restriction on 2 stroke engine ; price balancing: shift towards gas driven processes

5. **Conversion to CNG** : more environment friendly for NOx emissions
   1. Over 500 CNG stations :
   2. 210,000 petrol driven veh. (22% of 4 wheeler petrol driven);
   3. Replacing 142,000 (13%) Tons / yr of petrol
   4. Reducing emissions from transport sector.

Fuel related air pollution abatement measures include

VEHICLE INSPECTION PROGRAMS,

 BETTER FUEL FORMULATION,

AVAILABILITY OF UNLEADED & LOW SULPHUR FUELS,

PROMOTION / USE OF ALTERNATE FUELS

Creating AWARENESS about responsibility of every Road User towards AIR Quality

SHIFT TO GAS :
> COST EFFECTIVE
> REQUIRE COST SHARING BY INDIVIDUALS
> NEED A TIME FRAME

Limitations and Constraints

◆**Faulty & inappropriate** tuned vehicles on the road

◆**not-- effective VIM**; ineffective introduction of legal, planning & institutional changes for annual VIM system,

◆**Use of inappropriate fuel mixtures**, petroleum adulteration & available fuel mixtures with high Lead & Sulphur contents,

◆**Lack of maintenance culture** or no preventive maintenance concept in government, public & private vehicle fleet,

◆**Prioritization of various options** for transport sector like Railways, pipelines, roads, flyovers, by passes & mass transport,

◆**No control / standards / tests** are available on fuel / engine performance enhancing techniques / systems,

◆In the absence of an effective **urban mass transport system** in all major cities, traffic problems increasing in heavily populated cities-- deteriorating AP concerns.

Traffic planning & flow management-- not linked to reduce UAQ as an imp component

ROAD RELATED PUBLICATIONS

- MOBILE WORLD
- TRAFFIC TIMES
- SHIFA NEWS
- CHEMICAL NEWS
- NATIONAL TRANSPORT NEWS
- NEWS PAPER SUPPLEMENTS
- PAKISTAN SPECIAL
  - BY NHA
  - BY NHMP
  - I T P
  - BY OTHERS

- **A R U P**
- ARSB – ENGLISH
- ARSB – URDU
- DRIVER HAND BOOK
- DRIVING TECHNIQUES
- LEAFLETS
- BOOKLETS

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Email: arupisbd@hotmail.com Ph: 0300-8544056

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Conclusion

1 **Vehicle Inspection Department** be strengthened to improve condition of tuned vehicles.

2 **Quality control** on quality & control on sale of adulterated fuels

3 Establishment and implementation of **Weigh Bridges** to check over-loading (SYSTEM NEEDS TO BE IMPROVED)

4 **Re-organized Policy / pricing structure** for conversion of dirtiest fuel (diesel) to clean fuel i.e. CNG instead of gasoline conversion to CNG, i.e. provision of incentives to diesel driven vehicles,

5 Setting up of **Vehicles testing & tuning centers** & creating ripple effect,

Fuel substitution strategy can be improved,

Fuel substitution policy needs environmental initiatives for effective results, i.e. inter-se prices of HSD-MS Ron 87-CNG be rationalized, tax / duty incentives on CNG kits & equipments, CNG operated buses / trucks be exempted, lucrative bus routes for CNG, lower slab of road tax for CNG vehicles etc,

Undertake road shoulder improvement (concrete pavements or vegetation cover, traffic management like speed reduction & cleaning of road by vacuuming) by municipalities & traffic engineering bureaus for control of suspended SPM / PM,

Introduction of subsidized urban mass transport system using clean fuel -- reduce traffic burden from city roads / hot spots & as a result improve UAQ.

Prioritize transport planning & flow management on busy roads

Suggestions

- ALL STAKEHOLDERS BE INVOLVED IN CONTINUING CONSULTATION PROCESS TO
  - CREATE AWARENESS ON AIR QUALITY
  - HEALTH, ECONOMIC AND SOCIAL IMPACTS OF UAQ
  - YOUR RESPONSIBILITY OF CARING FOR OTHERS AND CONSERVING ENVIRONMENT FOR FUTURE

- AVAILABILITY OF INFORMATION THROUGH PRINT, RADIO, TV AND WEB be Considered

THANK YOU