



AIR QUALITY, MONITORING AND ALTERNATIVE TRANSPORT POSSIBILITIES IN KATHMANDU

*Presentation In Workshop On Air Quality & Sustainable
Transport Challenge In South Asian Cities*

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CONTENTS OF PRESENTATION

- 1. Air Quality Status in Kathmandu;**
- 2. Monitoring Mechanism Of air quality**
- 3. Advantages of Electric Transport;**
- 4. Relevance of Electric Transport;**
- 5. Problems and Mitigation Measures.**

POPULATION GROWTH TREND

Uncontrolled Growth of Population:

- Population 2001 : 1 Million
- Population 2010 : 2 Millions (Estimated)
- Population 2020 : 4 Millions (Estimated)

City unable to cope with the required services such as water supply, solid waste management, electricity and transport to this population.

GROWTH TREND OF VEHICLES

Uncontrolled Growth of Vehicle Population in Bagmati Zone :

▪ Vehicle in 1994	:	61,232
▪ Vehicle in 2000	:	145,926
▪ Vehicle in 2009	:	444,759
▪ Vehicle in 2011	:	555,718

Of the above it is estimated that 500,000 vehicles are operative; congestion 74% of these vehicles are motorcycles resulting in traffic congestions.



STATISTICS OF POL IMPORTS

Fiscal Year 2061/62	:	761,033 KL
Fiscal Year 2062/63	:	746,310 KL
Fiscal Year 2063/64	:	747,642 KL
Fiscal Year 2064/65	:	722,481 KL
Fiscal Year 2065/66	:	880,143 KL
Fiscal Year 2066/67	:	1,047,676 KL
Fiscal Year 2067/68	:	2,151,431 KL

Total paid by NOC to IOC for FY 6067/68 – NRs 122.3 billion.



ILL EFFECTS OF POL BASED TRANSPORT

1. Atmospheric Pollution;
2. Global Warming;
3. Huge Investment in Import of POL Products;
4. Higher Operation Cost.



VEHICLE & FUEL STANDARDS

1. VEHICLE STANDARD

- a. In Nepal standard adopted is of Euro 1
- b. In India the standard of vehicles as of 2010 is Euro III in general & Euro IV for 11 metropolitan cities

2. FUEL STANDARD

Petrol imported is of 88 and recently available of 91 octane. Adulteration of fuels is a major problem in Nepal



Emission testing

1. Post 1998 Petrol & Diesel vehicles undertaken by DoTM at Ekantakuna
2. Pre 1998 vehicle tested by Metropolitan Traffic Police
Emmission testing not known to be effective



AIR QUALITY MONITORING STATIONS IN KATHMANDU

- 7 Monitoring stations established under ESPS Program :
 1. Heavy Traffic areas – Putalisadak, Chahabil, Patan Gate
 2. Urban/Residential areas- Paknajol
 3. Urban Background – Bhaktapur, TU Gate
 4. Valley Background – Macchegaon

All stations were monitoring PM 10 content in the atmosphere.

After the Danish aid came to an end the stations became inoperative after 2008



A. Primary Pollution:

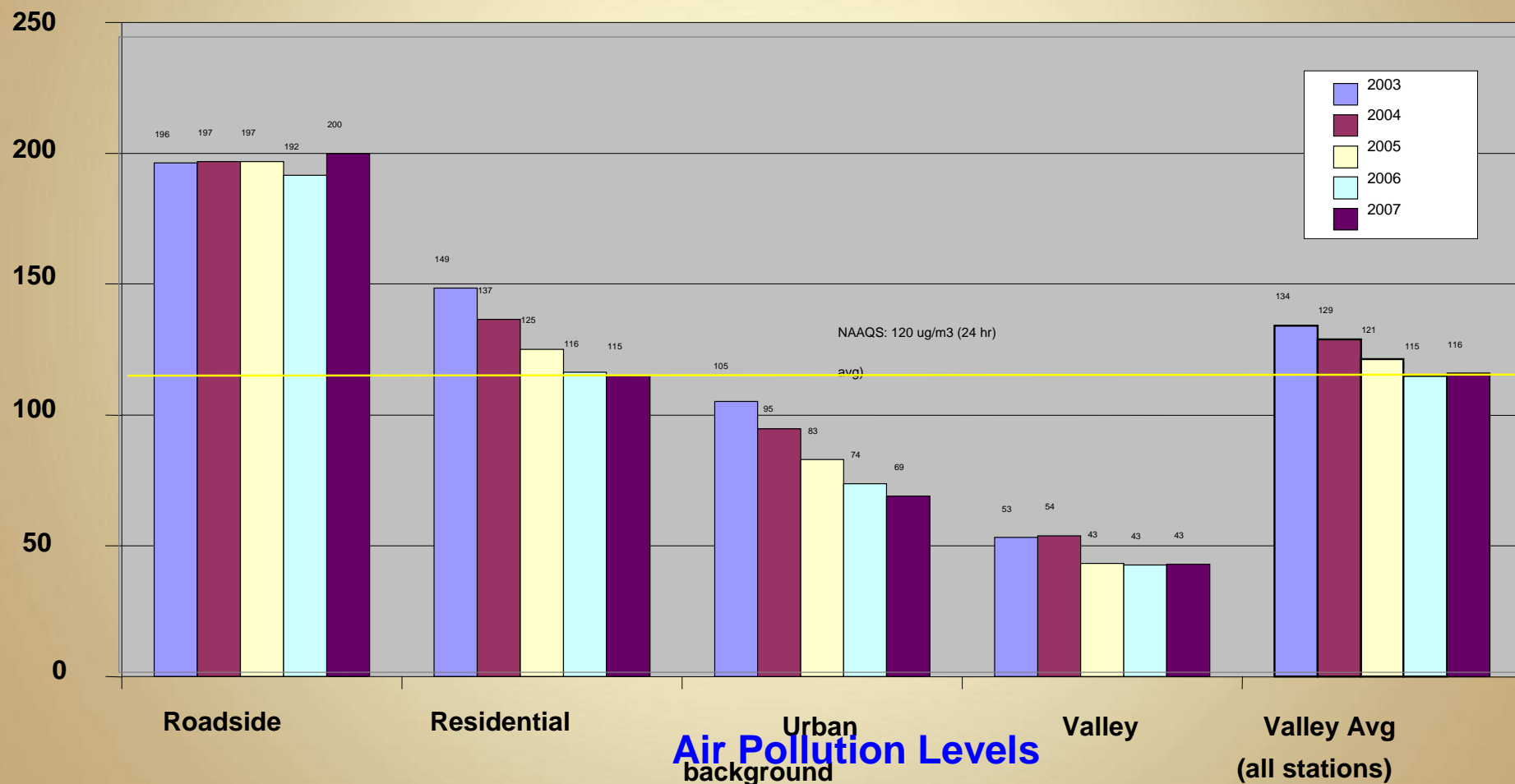
- **Particulate Matter (PM₁₀)** level 198 mg/m³ as against National Standard of 120 mg/m³ (results in respiratory and cardiovascular health problems);
- **SO₂** (causes respiratory problem);
- **CO** (reduces oxygen carrying capacity in blood);
- **NO₂** (results in cough, bronchitis and conjunctivitis);
- **Lg** (results in hematological and neurology problems).

B. Green House Gases (CO₂ CH₄ and N₂O):

- Contribute to Global Warming;
- Estimated CO₂ from existing vehicle population : 385,580 ton



AIR POLLUTION IN KATHMANDU





CONTRIBUTORS OF PM₁₀

The source of PM 10 pollution in Kathmandu air is as follows

- | | | |
|----|---------------------------------------|-------|
| a. | Vehicle Emmission | – 38% |
| b. | Brick Kilns | – 25% |
| c. | Suspended dust | – 18% |
| d. | Agriculture | – 11% |
| e. | Others (domestic, & other industries) | – 8% |



ELECTRIC TRANSPORTATION AS AN ALTERNATIVE

- i. *Low Operation and Maintenance Cost;*
- ii. *Positive Environmental Impact;*
 - *for every litre of fossil fuel replaced. EV's will prevent 3 – 10 gm of PM10 from being emitting,*
 - *reduction in polluting gases,*
 - *reduction of green house gases.*
- iii. *Each EV can reduce consumption of 2190 lit of fossil for per year:*
 - *reduction of economic burden of imported POL,*
 - *reduction of health risk,*
 - *increase of productivity of population.*



Cost of Operation / Maintenance:

A: Petrol Vehicle

▪ Petrol Cost for small car	:	Rs. 10.00 /Km
▪ Lubricant	:	Rs. 0.40 /Km
▪ Maintenance	:	Rs. 0.70 /Km
▪ Tyre Replacement	Candara	<u>Rs. 0.30 /Km</u>
Total per Km	:	Rs. 11.40

B: Electric Vehicle

▪ Battery Replacement	:	Rs. 3.50 /km
▪ 18 kWh @ Rs. 7 /– per unit	:	Rs. 0.80 /km
▪ Maintenance	:	Rs. 0.30
▪ Tyre Replacement	:	<u>Rs. 0.30</u>
Total per Km	:	Rs. 4.90



HISTORICAL OVERVIEW OF ELECTRIC TRANSPORT Development

1. 1960

43 km long bicable good ropeway with 22.5 ton/m operate between Kathmandu and Hetauda. Close down after development of Prithivi Highway and poor management of National Trasport Corp Ltd. (NTL).

2. 1977

Completion of Tripureshwor – Suryavinayak Trolley Bus with Chinese Grant of Rs. 40 millions. Initially 22 trolley buses with addition of 10 micro buses in 1997. Ferriad up to 20,000 pax per day closed down in December 2001.

3. 1993

Development of Safa Tempo. Proto types take over by NEVI. Proliferation of system leading to 625 tempos 31 charging station.

4. 2008

GoN provides tax incentive for 4 wheeler EV's.



HISTORICAL OVERVIEW OF ELECTRIC TRANSPORT Development

GoN Incentives for EV Development:

- 1993 : Customs incentives for 3 wheeler;
- 2008 : Custom and excise incentives for 4 wheeler.
Waiver of annual registration taxes on EVs.



HISTORICAL OVERVIEW OF ELECTRIC TRANSPORT Development

Agencies Which Supported EV Sector Development:

1. USAID by developing the SAFA Tempo prototype in 1993 and assisted in its proliferation;
2. DANIDA through ESPS Component No. 5 Air Quality Management;
3. Local NGO's: Clean Energy Nepal (CEN), Matin Chautari, Clean Air Network Nepal (CAAN), Nepal Forum of Environmental Journalist (NEFEJ).



Current Situation of Electric Transport Sector:

1. Trolley bus system closed due to mismanagement;
2. SAFA Tempo Industry fully developed with 4 manufacturers, 31 charging stations and over 600 Safa Tempos in Operation;
3. 4 wheeler EV's have found entry into Nepal.



Trolley bus





Hybrid Bus





Safa Tempo





Electric Coach





Electric Car





Broader Prospects of Development Transport in Nepal

- 1. Develop underground metro system in Kathmandu**
- 2. Develop network of railways throughout the Country;**
- 3. Develop trolley bus systems throughout the Country;**
- 4. Replace polluting diesel buses with hybrid buses/electric buses**
- 3. Provide exclusive routes for use of 3 and 4 wheeler EV's for operation on tertiary routes within Kathmandu city**



Broader Prospects of Development Transport in Nepal

Possible Sectors for Train Transport Development:

- 1. East West Highway;**
- 2. Kathmandu Outer Ring Road;**
- 3. Fast Track Road**
- 4. Kathmandu – Pokhara;**
- 5. Pokhara – Lumbini;**
- 6. Kathmandu – Kodari.**



Broader Prospects of Development Transport in Nepal

Possible Sector of Trolley Bus Transport Development:

- 1. Rehabilitation of Kathmandu – Bhaktapur Trolley bus;**
- 2. Kathmandu Ring Road;**
- 3. Primary Routes in Kathmandu Metropolitan City;**
- 4. Jogbani – Dharan;**
- 5. Sunauli – Butwal**
- 6. Nepalgunj - Kohalpur**



Existing Problems of Electric Transport Sector

- 1. Lack of Umbrella Organization Looking into Interest of the Electric Transport Sector;**
- 2. Existing Electric Transport Vehicles such as Safa Tempos face Unequal Challenges against ICEV Mini Bus and LPG Vehicles operating with subsidized fuels;**
- 3. Lack of Agency to Monitor Battery Quality and its Disposal;**
- 4. Exodus of Trained Drivers and Technician;**
- 5. Power Shortage.**



PROBLEMS AND MITIGATIONS

Recommended Action for Development of Electric Transport Sector

1. GoN should provide additional subsidies in the import of Electric Vehicles and Components;
2. GoN to discourage use of polluting ICEVs by increasing import duties and other taxes on such vehicles;
2. Creation of EV Promotion Centre with GoN/Donor Assistance to:
 - a. implement R&D in EV sector;
 - b. training of manpower for sector;
 - c. setting up of battery bank;
 - d. monitoring of battery waste disposal;
 - e. setting up of EV maintenance centre;
 - f. undertake advocacy of EV sector;



PROBLEMS AND MITIGATIONS

MEASURES FOR BATTERY HANDLING

1. Incorporate Battery Handling Company;
2. Preliminary Treatment of Batteries Acid in Nepal;
3. Export of Battery Lead to India or Bangladesh.



PROBLEMS AND MITIGATIONS

Power Shortage Solution (Short Term)

1. Provide Double Feeder Connection to all Trolley Bus Stations and EV Charging Station;
2. Encourage EV Charging Stations to Use Off-peak Energy.



Thank You