

Strategies for Reducing Vehicle Emission
Impacts in Mega Cities:
Conclusions from the IUAPPA Transport
Seminar Series

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2009 OSS Sub-regional Workshop

Better Air Quality in North Africa

IUAPPA Seminar Series

Aims:

- to increase knowledge and understanding of the issues relating to urban transport and pollution
- to explore innovative solutions

Methods:

- brings together scientists, administrators, policy makers from major cities around the world to
- exchange experience and
- explore new developments and opportunities

Transport Seminar Series

- **2008 Nelspruit:** Special Session at NACA/IUAPPA Conference
- **2007 Brisbane:** Special Session at the IUAPPA World Congress
- **2005 Tokyo:** 3rd International Seminar: Reducing the Impact of Transport on Air Quality and Environment in Cities
- **2004 Istanbul:** Joint Meeting with Embarq Programme: the Role of Emission Inventories in Reducing Urban Air Pollution
- **2003 Mexico City:** 2nd International Seminar: Managing the Impact of Transport on Air and Environment in Cities. Further details and presentations [here..](#)
- **2002 Sao Paulo:** 1st International Seminar on Urban Air Quality Management

Background/Context

- Air Quality in Major World Cities observed to be poor
- Transport, public and private is major factor in air pollution
- Transport systems also major factor in greenhouse gas emissions
- Many world cities growing rapidly
- Yet congestion is already severe
- Urgent need for solutions to improve air quality and reduce climate impacts

Urban Space, Characterised by:

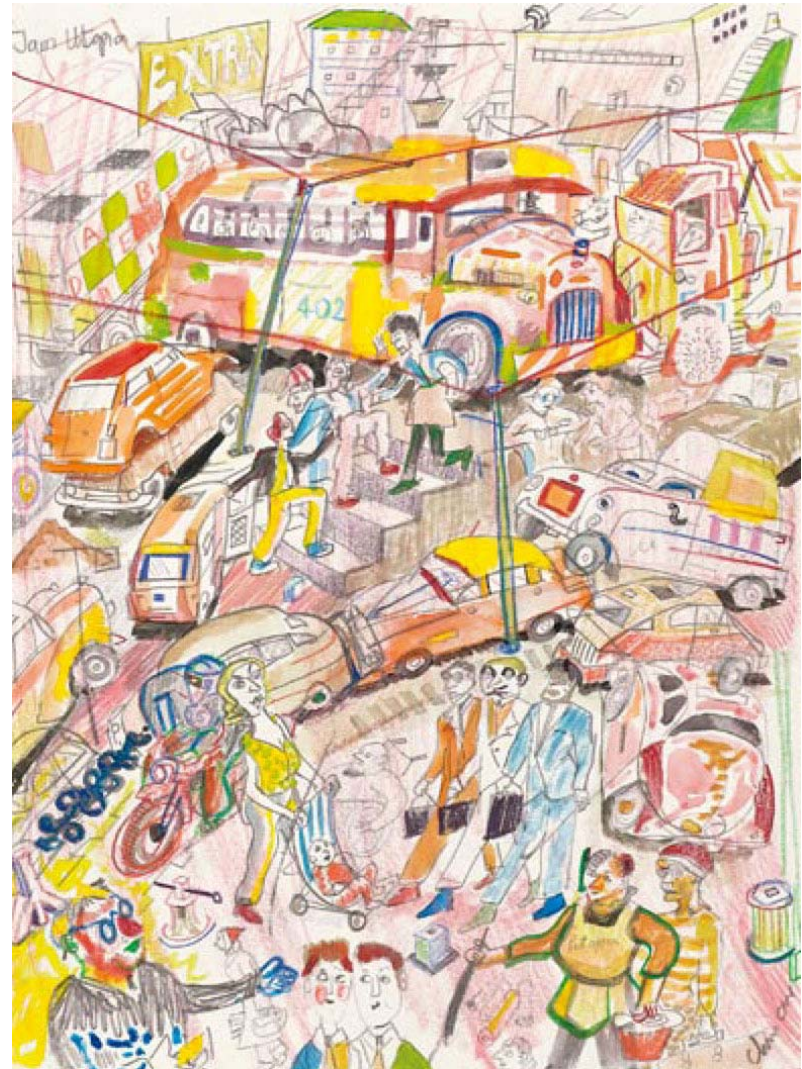
What is seen/felt

- Noise
- Congestion
- Conflicts between road users
- Proximity of vehicles and pedestrians
- Conflict between road users and pedestrians (for space)
- Construction works

What is unseen

- Air pollution
- Greenhouse gas emissions
- Stress

Transport/Vehicles a major factor



Chris Orr, Jam Utopia, from The Multitude Diaries

Hong Kong



Istanbul: Turkey



Growth 8.2 million to 11.7 million 2000 to 2007

Characterisation of Pollution Burdens

- *** Serious problem, WHO guidelines exceeded by more than a factor of two.
- ** Moderate to heavy pollution, WHO guidelines exceeded by up to a factor of two (Short term guidelines exceeded on a regular basis at certain locations)
- Low pollution, WHO guidelines are normally met (short term guidelines may be exceeded occasionally)
- No data available or insufficient data for assessment.

Air Pollution in Megacities (2000)

Megacity	Country	Pop 2000 (million)	Ranking (population)	SO ₂	SPM	Lead	CO	NO ₂	O ₃
Beijing	China	11.47	16	***	***	*	-	*	**
Bombay	India	15.43	6	*	***	*	*	*	-
Buenos Aires	Argentina	13.05	9	-	**	*	-	-	-
Cairo	Egypt	11.77	13	-	***	***	**	-	-
Jakarta	Indonesia	13.23	8	*	***	**	**	*	**
London	UK	10.79	18	*	*	*	**	*	*
Mexico City	Mexico	24.44	1	***	***	**	***	**	***
New York	USA	16.10	4	*	*	*	**	*	**
São Paulo	Brazil	23.60	2	*	**	*	**	**	***
Seoul	S. Korea	12.97	11	***	***	*	*	*	*
Tokyo	Japan	21.32	3	*	*	-	*	*	***

Annual Health Impacts Associated with Exposure to PM2.5 and Ozone Levels Above State Standards in California

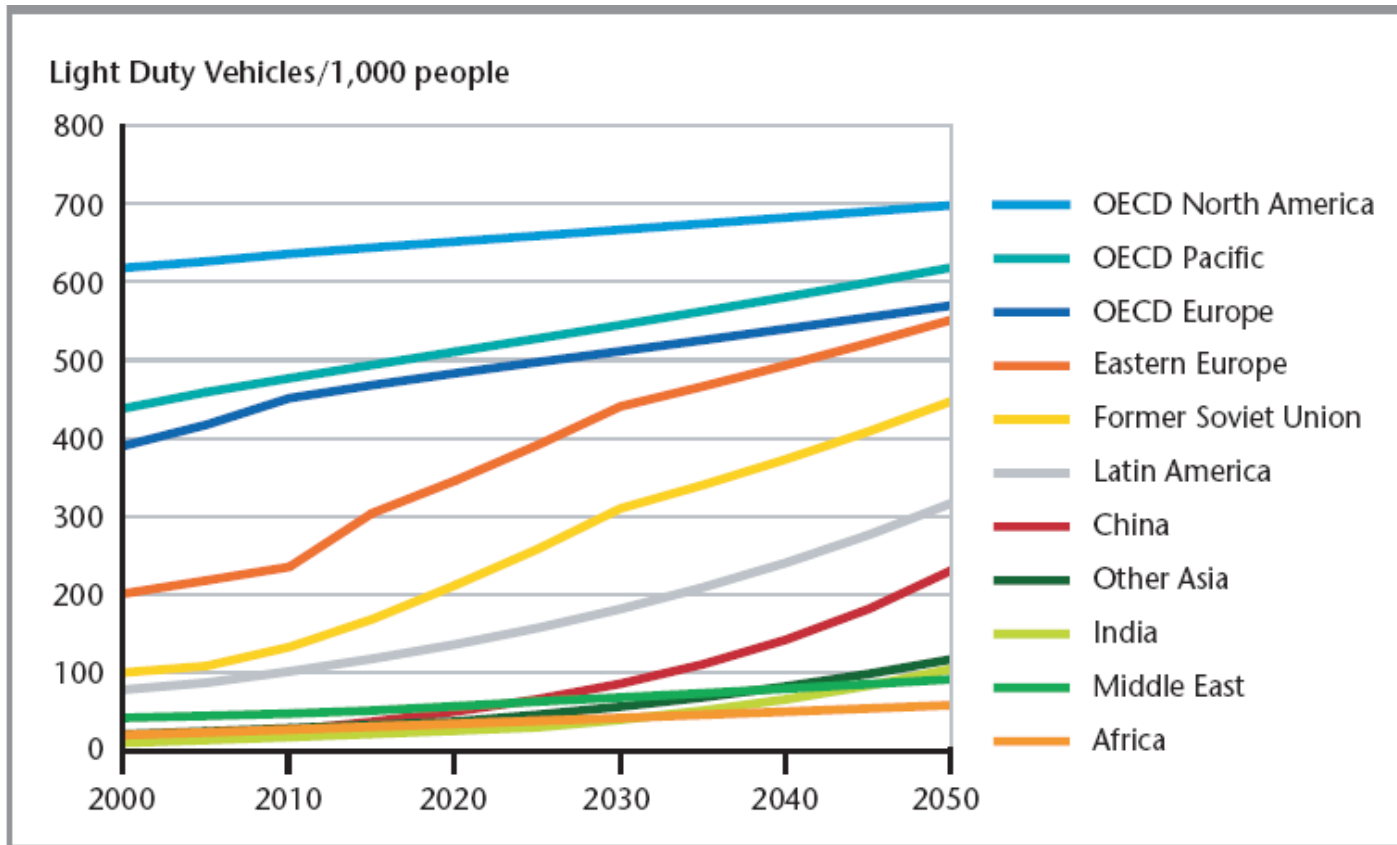
Endpoint	Exposure	# of Cases 95% C. I. (Low)	# of Cases (Mean)	# of Cases 95% C. I. (High)
Premature Mortality	PM2.5	2,800	8,200	14,000
	Ozone	310	630	950
	<i>Total</i>	<i>3,100</i>	<i>8,800</i>	<i>15,000</i>
	Total Value	\$22,000,000,000	\$70,000,000,000	\$130,000,000,000
Hospital admissions (Respiratory)	PM2.5	630	1,900	3,200
	Ozone	2,400	4,200	5,800
	<i>Total</i>	<i>3,000</i>	<i>6,100</i>	<i>9,000</i>
	Total Value	\$100,000,000	\$210,000,000	\$310,000,000
Hospital admissions (Cardiovascular)	PM2.5	1,300	1,500	1,800
	<i>Total</i>	<i>1,300</i>	<i>1,500</i>	<i>1,800</i>
	Total Value	\$52,000,000	\$64,000,000	\$75,000,000

*This table shows ARB estimates of the health effects (on an annual basis) from 1999/2000 monitored PM2.5 levels not attaining the State annual PM2.5 standard of 12 µg/m³ and 2001/02/03 monitored ozone levels not meeting the State 8-hour ozone standard of 0.070 ppm. PM2.5-related deaths are based on Pope et al. (2002).

Traffic in Dehli



Growth in Vehicle Ownership



Source: Sustainable Mobility Project calculations.

The Space for Solution

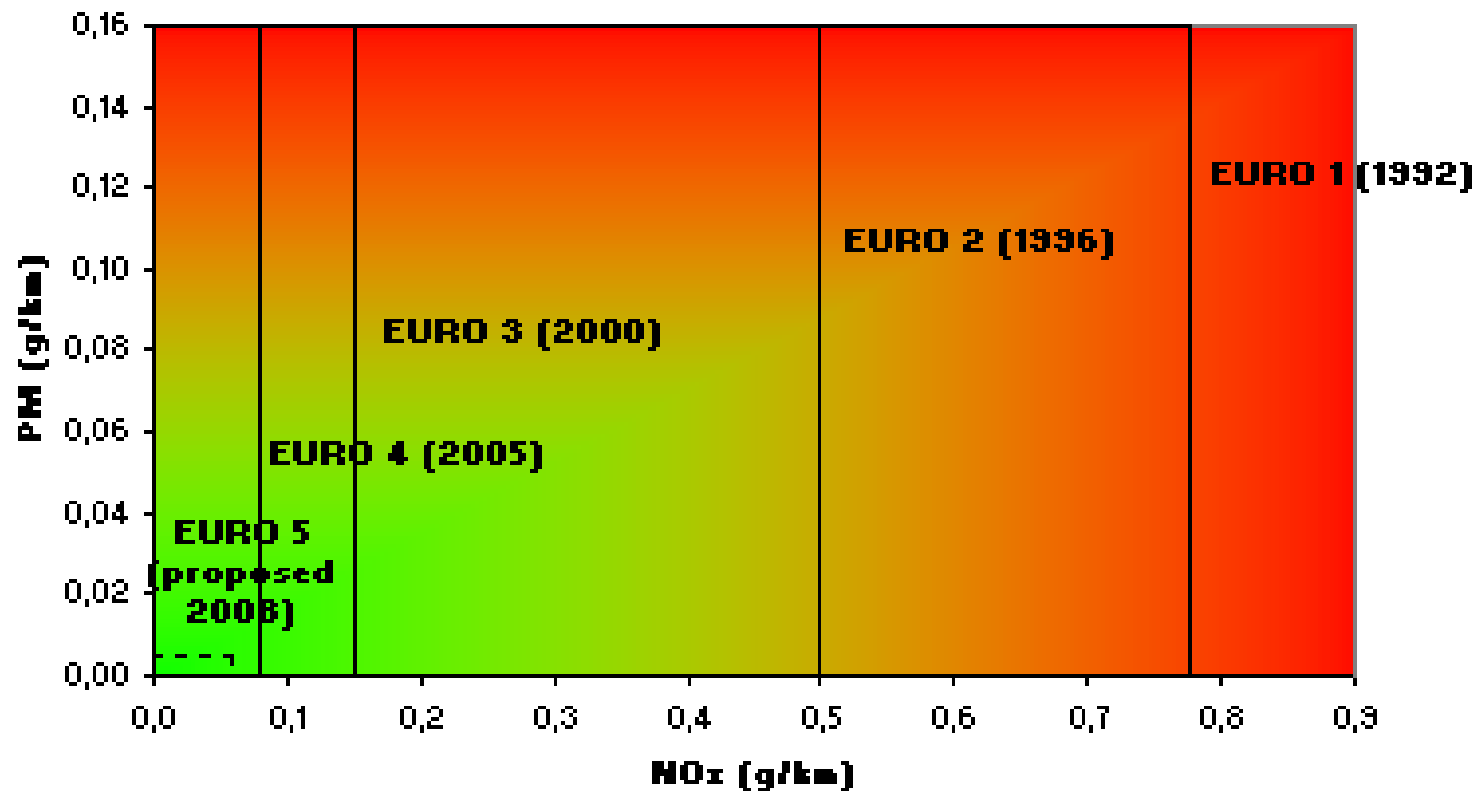
- Action on individual vehicles: HGV, PSV, LDV, passenger cars, 2 wheelers
- Cleaner fuels
- Managing demand
- Transport and Physical Planning

Action on Individual Vehicles

- Current Fleets
 - Keep in order: inspection & maintenance, roadside testing, owner support
 - Refuel: diesel to gas, biofuels
 - Retrofit: diesel filters, SCR
- New vehicles
 - New emission standards
 - Maintaining standards in service
 - New technologies: hybrid, electric, fuel cell

EU Vehicle Emission Standards: Passenger Cars

NOx and PM emission standards for petrol cars

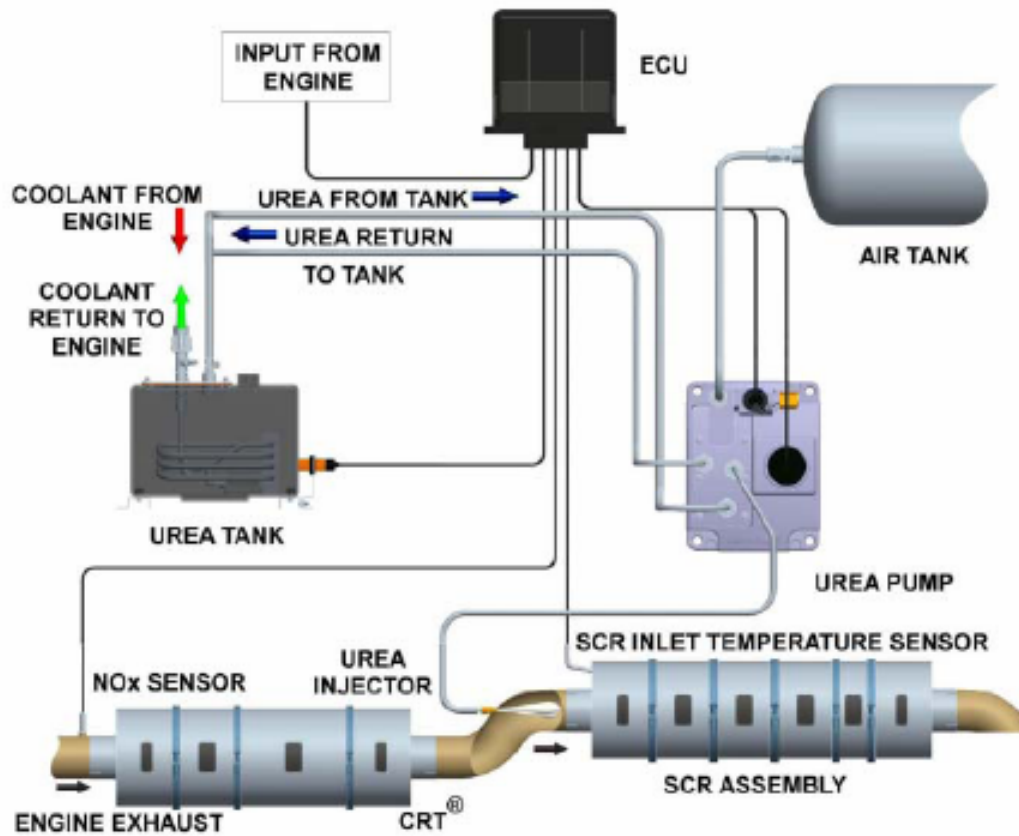


Cleaner Vehicles

- Many options: low impacts on air quality, climate and quieter
- The issue is entry into service
- Now many local initiatives



SCRT System Diagram



Construction

- Construction machinery now a major factor in quality of urban life: PM, noise, odour



- Retrofit DMP a viable solution
- Now time to put it into effect
- Impacts on construction costs low
- Low S fuels required but increasingly widely available

Cleaner Fuels

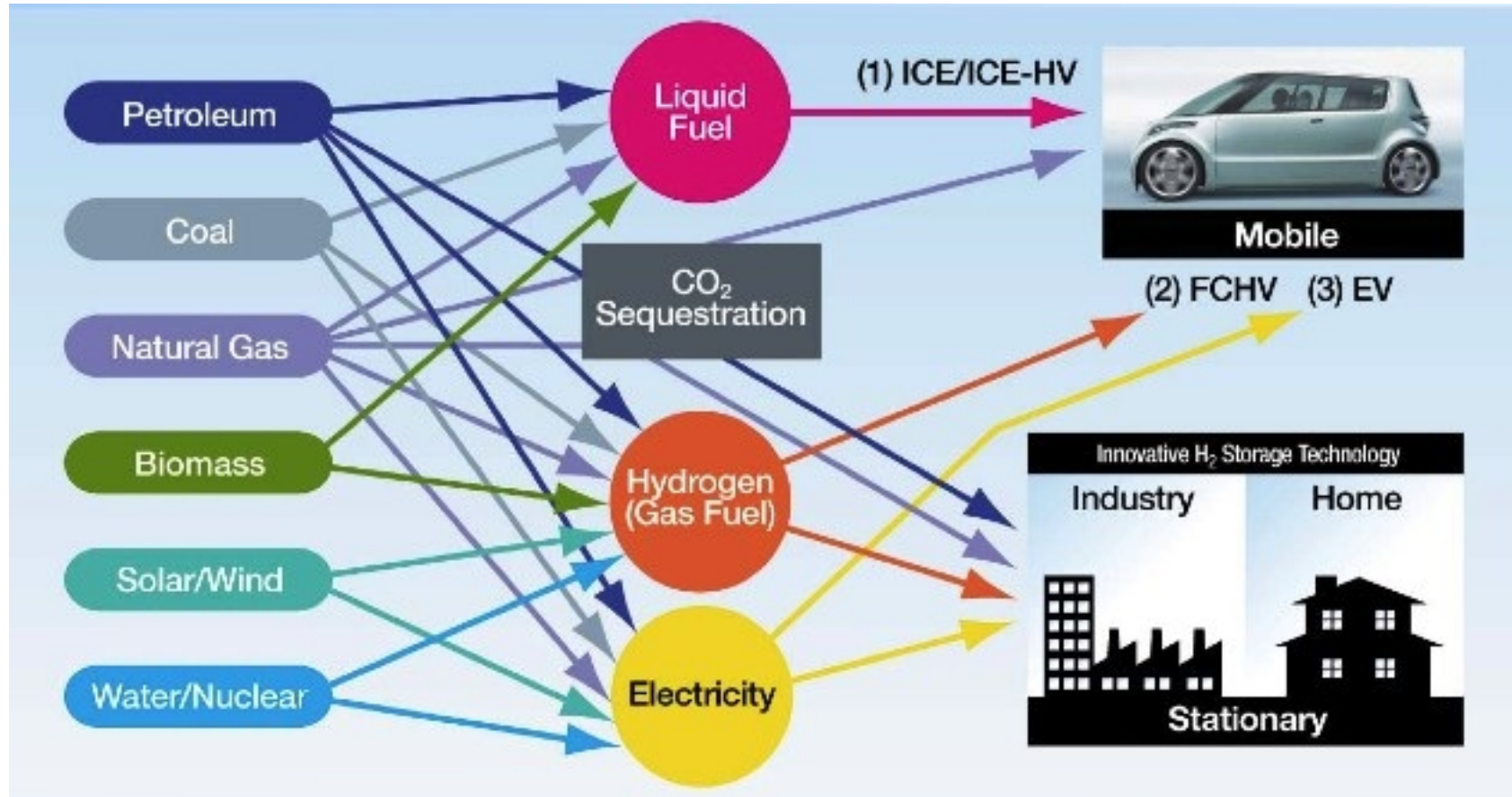
- Cleaner current fuels: lead-free, low S, RVP control
- Substitute fuels: biofuel
- LPG/CNG/LNG; Biomethane
- Electricity
- Hydrogen

Dual Fuel Truck:



Hardstaff Engineering

21st Century Energy Concepts



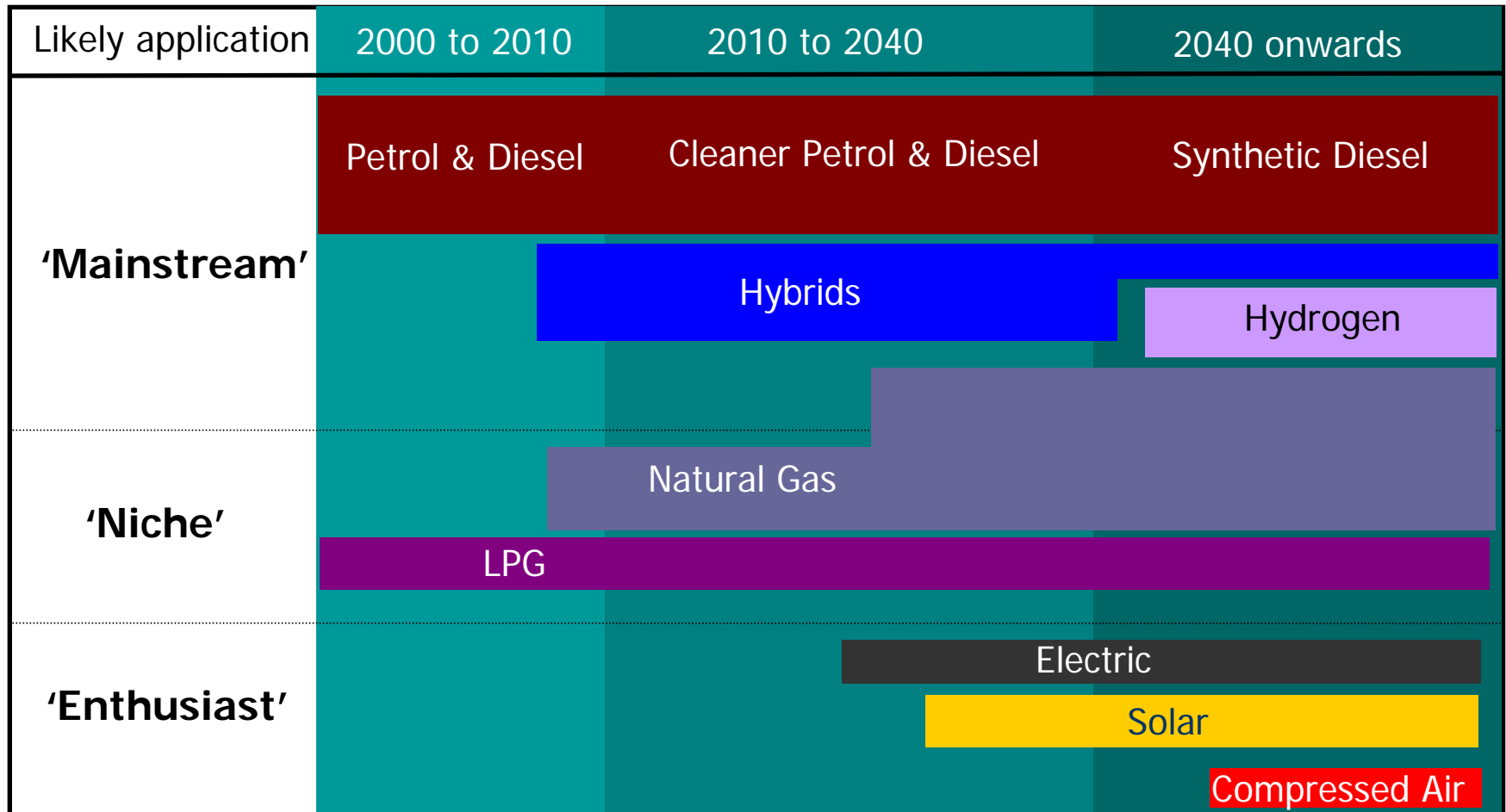
*Permission of Toyota

Implementing Low Emission Vehicles

- UK Cenex: government initiative; aim to improve uptake of low emission vehicles
- Focus on low carbon and public fleets, but takes holistic approach, Low C and AQ
- Current trials: biomethane and Smart ED



Future national fuel market will likely comprise a variety of fuels for specific applications.



Managing Demand and Planning

- Improved public transport: enhanced route planning; rapid bus transit; light tram
- Access management: congestion charging; low emission zones; alternate day access; multiple occupancy lanes
- Economic measures: road pricing; emission taxing; clean vehicle incentives
- Planning for public transport: locating retail/business in planned transport hubs

Bus Rapid Transit: Quito Ecuador



Conclusions

- Problems fairly well known/characterised
- Innovative solutions emerging in
 - Vehicles and fuels
 - Public transport and planning systems
- Remaining challenges:
 - Implementation
 - Benefiting from synergy between AQ and CC agenda
 - Funding
- IUAPPA Seminar series will continue to provide space for dialogue and the search for innovative solutions