

OVERVIEW OF THE ASIAN FUEL MARKET

THE EUROPEAN FUELS CONFERENCE – 9 March 2011

Sunanda Banerjee
European Fuel Oxygenates Association - www.efoa.eu

Mission and Vision

- Working closely with fuel policymakers, regulators and stakeholders in the fuel industry, ACFA **promotes** and advances the **use of cleaner automotive fuels** based on principles of sound science, cost efficiency and sustainability of the environment.
- EFOA considers that **ethers have an important role to play** in creating a cleaner environment based on sustainable transport fuels. This is reflected in our mission: EFOA is dedicated to the promotion of ethers as fuel components towards a cleaner and sustainable future.

Asian Fuel Quality Issues

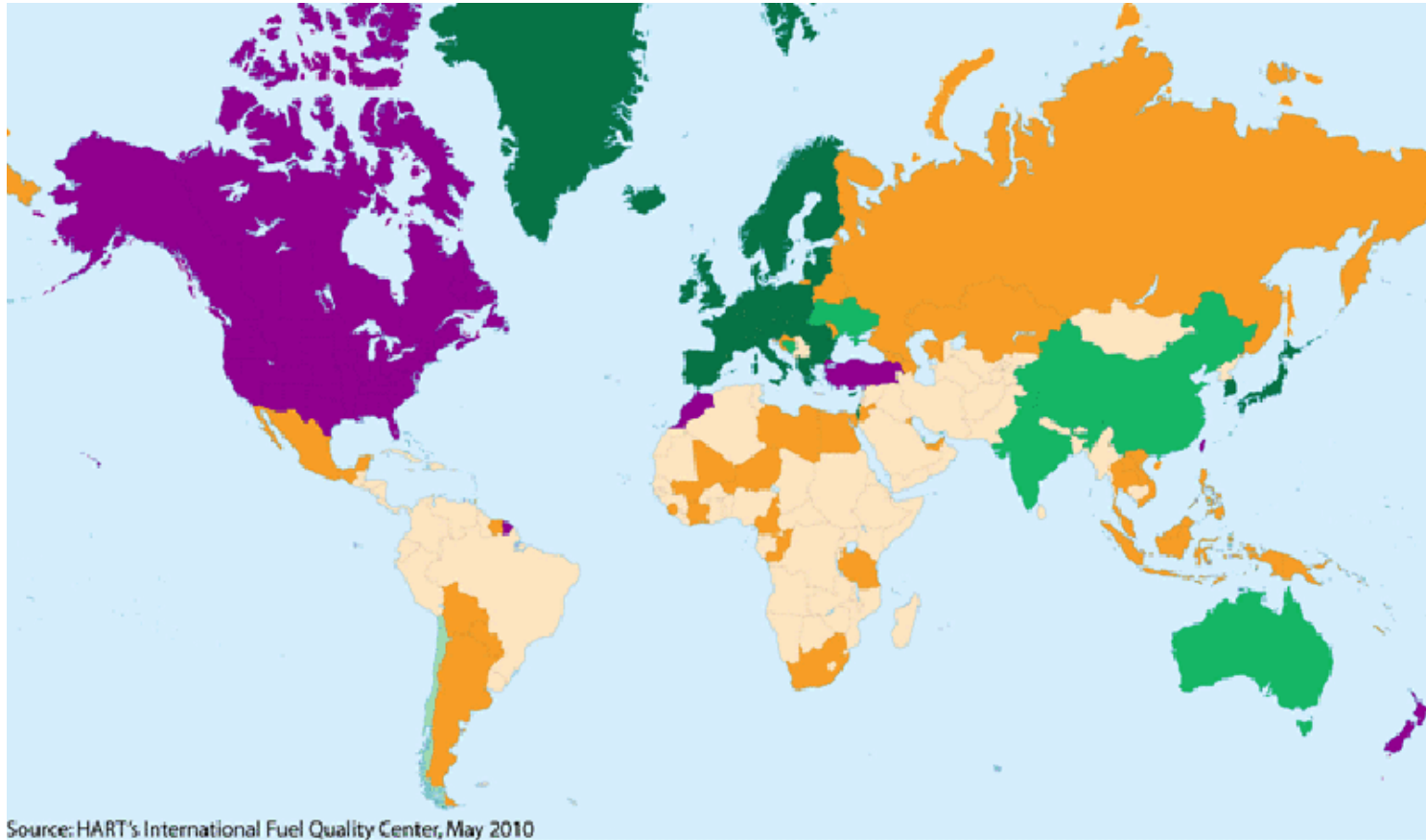
- Major Asian cities are among the most polluted in the world ;13 of the 15 most polluted cities in the world are from Asia.
- Continued growth in vehicle population.
- Significant improvements in fuel quality in the last decade.
- Lead phase-out almost complete.
- Fuel quality monitoring legislation lacking in many countries.
- Subsidised fuels in several countries.
- Fuel adulteration a major issue (market price distortion, taxation).
- Fuel quality is not harmonized among the countries.

Sulphur Content in Fuels (Asia Pacific)

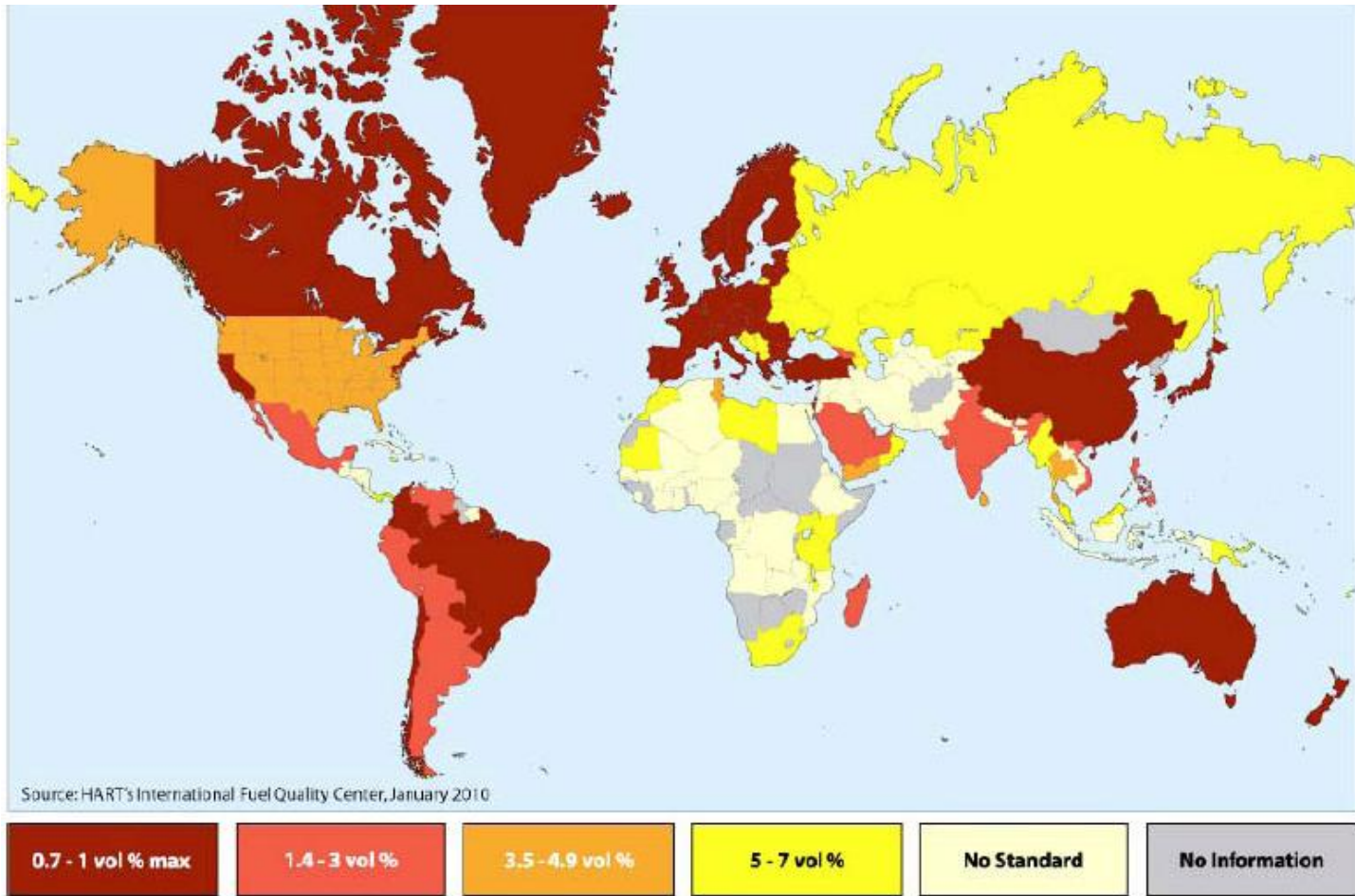
- Fuel quality standards not harmonized across region
- Generally aim to align fuel and emissions regulations with EU
- Vast differences in regional fuel sulphur
- Most countries in 50ppm to 500ppm fuel sulphur range

Sulphur level	* Only automotive diesel	** Only gasoline
Leaded		Burma (leaded gasoline still on the market)
1,000 ppm to 10,000 ppm		Bangladesh, Cambodia, Nepal, Pakistan
500 ppm to 5,000 ppm		Brunei, Indonesia*, Laos*, Malaysia, Sri Lanka
50 ppm to 500 ppm		China, India, Philippines, Thailand, Vietnam, Fiji, Papua New Guinea, Indonesia**, Laos**
50 ppm		Taiwan, Singapore*
10 ppm		Japan, Hong Kong, South Korea, Australia*, New Zealand*

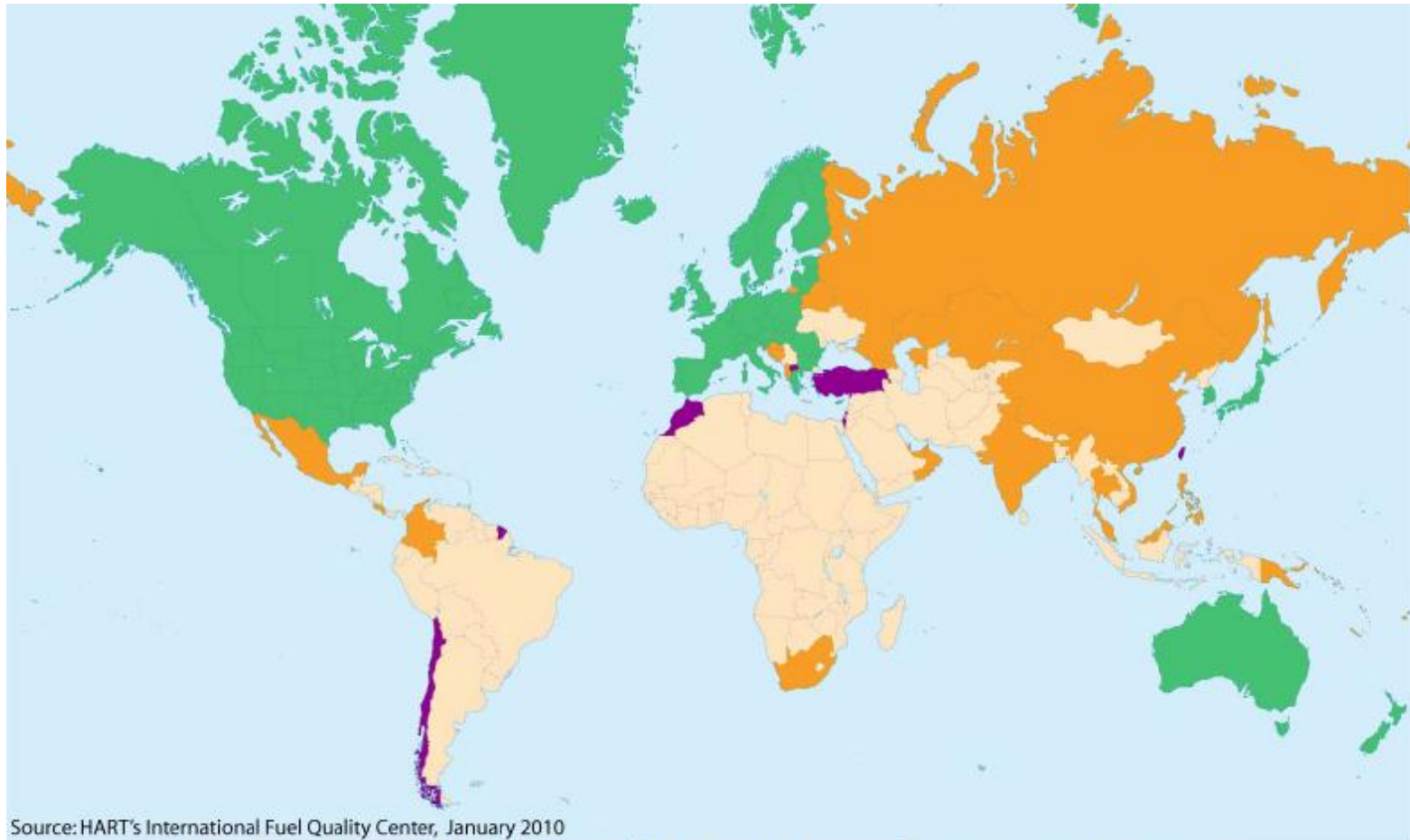
Global Gasoline Sulphur Limits



Global Gasoline Benzene Limits



Global Diesel Sulphur Limits



10 or 15 ppm

50 ppm

300 - 500 ppm

1,000 - 12,000 ppm

Emission Standards (New Light Duty Vehicles)

Country	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
European Union	E1	Euro 2				Euro 3				Euro 4				Euro 5				E6		
Bangladesh ^a											Euro 2									
Bangladesh ^b											Euro 1									
PRC ^a						Euro 1		Euro 2			Euro 3			Euro 4						
PRC ^c						Euro 1		Euro 2			Euro 3		Euro 4 Beijing only							
Hong Kong, China	Euro 1		Euro 2			Euro 3				Euro 4			Euro 5							
India ^d						Euro 1				Euro 2				Euro 3						
India ^e					E1	Euro 2				Euro 3				Euro 4						
Indonesia											Euro 2									
Republic of Korea											Euro 4			Euro 5						
Malaysia			Euro 1							Euro 2				Euro 4						
Nepal						Euro 1														
Pakistan	No conclusive information available																			
Philippines								Euro 1			Euro 2									
Singapore ^a	Euro 1					Euro 2														
Singapore ^b	Euro 1					Euro 2				Euro 4										
Sri Lanka								Euro 1			Euro 2									
Taipei, China					US Tier 1										US Tier 2 Bin 7 ^f					
Thailand	Euro 1					Euro 2			Euro 3							Euro 4				
Viet Nam											Euro 2									

Current Select Gasoline Standards (North Asia)

GASOLINE (selected specification)		Japan	Taiwan (01/2007)	Hong Kong (01/2005)	S. Korea (01/2009)	China (12/2009)
RON	-	89/96	92/95/98	95	91/94	90/93/97
Aromatics	vol%, max	-	36	35	24**	40****
Olefins	vol%, max	-	18	18	18	35
Benzene	vol%, max	1.0	1.0	1.0	0.7	1.0
Oxygen	wt%, max	1.3	2.7	2.7	2.3	2.7
Sulphur	ppm, max	10	50	50	10	150
RVP	kPa	65/93*	60	60	60/96***	72/88*

* Summer/winter

** Either aromatics 24 vol% max and olefins 16 vol%, or aromatics 21 vol% max and olefins 19 vol% max.

*** Jun-Aug 60kPa; Oct-Mar 96kPa

**** If total aromatics and olefins content is controlled, the maximum allowable aromatics limit is 41 vol%.

Current Select Gasoline Standards (Southeast Asia)

GASOLINE (selected specification)		Vietnam (01/2007)	Indonesia (2006)			Thailand (2009)	Philippines (2005)	Malaysia (2009)	Singapore
RON	-	90/92/95	88	91	95	91/95	81/93/95	95/97/99	92/95/98
Aromatics	vol%, max	40	no limit	50	40	35	35	no limit	report
Olefins	vol%, max	38	no limit	no limit	no limit	no limit	no limit	no limit	report
Benzene	vol%, max	2.5	no limit	5.0	5.0	3.5	2.0	5.0	report
Oxygen	wt%, max	2.7	2.7	2.7	2.7	11*	2.0	no limit	report
Sulphur	ppm, max	500	500	500	500	500	500	500	500
Lead	g/l, max	0.005	0.3	0.013	0.013	0.013	0.005	unleaded	0.013
RVP	kPa	43-75	69 (max)	45-60	45-60	62	85/62	65	report

* Oxygenates content vol% maximum 11

Fuel Specifications by 2012 (Asia Pacific)

EURO V equivalent

Australia, Hong Kong, Japan, New Zealand, South Korea, Taiwan

EURO IV equivalent

Singapore, Thailand

EURO III equivalent

China, India

EURO II equivalent

Brunei, Fiji, Indonesia, Laos, Malaysia, Philippines, Sri Lanka, Vietnam

PRE-EURO or EURO I equivalent

Bangladesh, Burma, Cambodia, Nepal, Pakistan

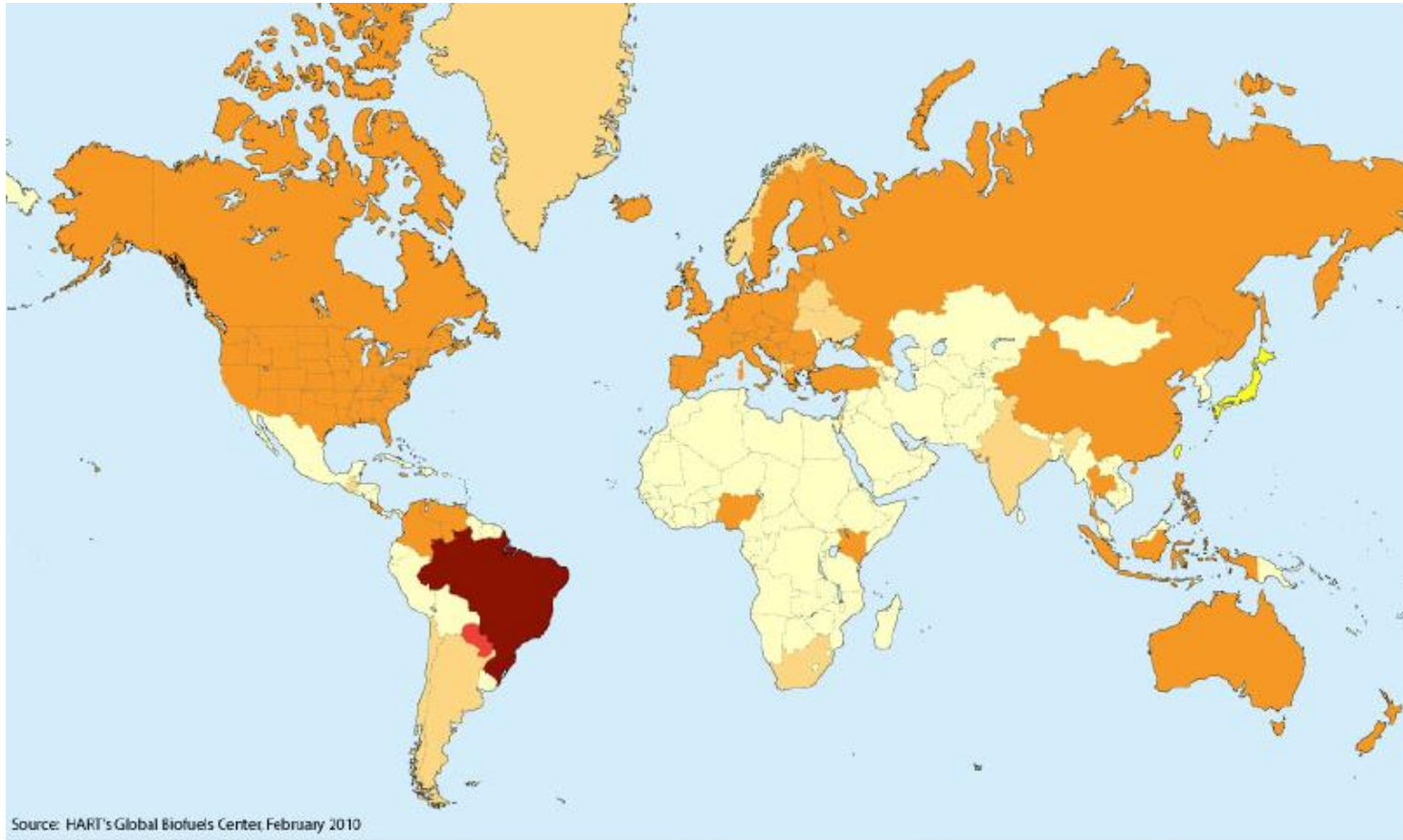


Source: IFQC, June 2010

Biofuels in Asia

- **Growing interest in biofuels in Asia following USA and EU**
 - Supporters: energy security, rural development and climate change reasons
 - Critics: competition with food, not cost effective in reducing emissions, implementation requires huge financial support, impact biodiversity negatively
- **Most biofuels programs comprise ethanol component in gasoline and biodiesel**
- **Biofuel policies, mandates and targets set in a number of Asian countries but need to overcome several obstacles in practice**

Global Ethanol Blending Limits



What are the drivers for Fuel market evolution

- **International**
 - Kyoto Protocol
 - CO, NO_x, VOC, PM
- **Environment and health**
- **Refining Industry and technology**
- **Vehicle park / engine technologies**
- **Age of vehicle fleet**
- **Gasoline and diesel**
- **After treatment technology**
- **Direct injection**
- **Hybrids**
- **Fuel cells**
- **Energy security**
- **Politics**
- **Local economic conditions: government interests, taxes, subsidies, fuel adulteration**
- **Fuel specifications: lead, sulphur, distillation, aromatics, octane, additives, oxygenates, lubricants**
- **Alternative fuels**



Is there a need for cleaner fuels?

- The air pollution problem in most Asian metropolitan areas is significant, in some places chronic
- Both fuels and motor vehicles are the major contributor to the air pollution problem
- Experience from the USA, EU, Japan shows that improving fuel quality and controlling vehicle emissions results in better air quality
- Modern vehicles need cleaner fuels to meet the stricter emissions standards and to operate as designed
- Euro 4 or better fuels are preferred

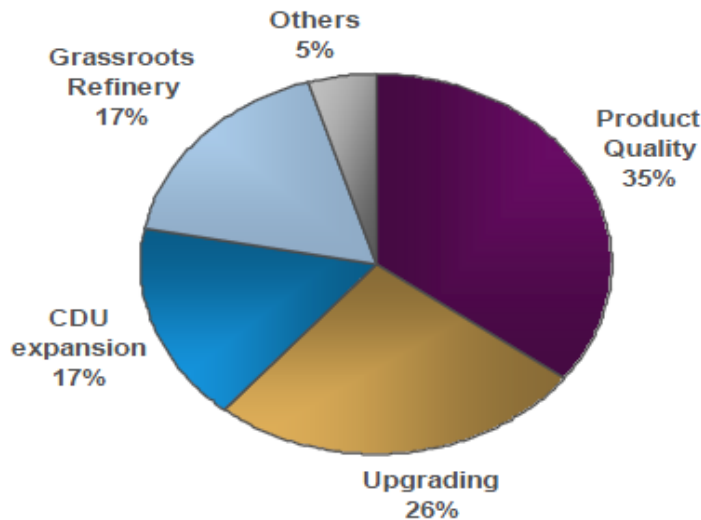


5-10 Years Fuel Quality Outlook in Asia

- Continued demand increase for vehicles and fuels
- Fuel standards closely related to vehicle emission standards
- Continued pressure to reduce urban air pollution
- **Continued lead phase-out**
- **Reduced benzene, aromatics and olefins in gasoline**
- **Progressive reduction in sulphur**
- Growing role of biofuels but not enough to replace conventional transport fuels
- On-road engines remain key focus in Asia
- Growing policy focus on reducing CO₂, greenhouse gas emissions and increasing vehicle efficiency

Clean Fuel Investments

- Between 2007-13, approx. ~368 refinery projects are announced in Asia Pacific alone
- Around 35% of announced projects are product quality related and mainly for Clean Fuel
- % Investment type categorized as



- ❖ By 2011 – Most countries are ambitious to achieve Cleaner diesel & gasoline
- ❖ Short term excess capacity build up affect refining margins
- ❖ Some projects may be delayed
- ❖ Environment pressures continue to drive investment

Source:

Comparison with Europe?

- In Europe legislations on fuels along with fuel quality standards, pollutant emissions limitations are being developed.
- The philosophy of this development is about having the **right vehicle for the right fuel**. One could not do with one without the other.
- These legislations could be a source of inspiration for Asia as
- These developments are closely being followed by Asia.

- **ACFA covers a huge region going from the Middle east right up to Australia**
 - **Fuel standards are far from being the same in all regions**
 - **Asia is moving towards improving fuel quality and controlling vehicle emissions for better air quality**
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- **Thank you for your attention!**