

## Reducing Pollution from 2-3 Wheelers - Synthesis of Hanoi Workshop

RETA 5937 - Reducing Vehicle  
Emissions -

Concluding Workshop

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## Definition of the problem

- † Fifty to 90% of vehicle fleets in Asian countries comprise 2-3 wheelers - a majority powered by 2-stroke engines
- † Major 2-stroke engine pollutants are Particulate Matter (PM) and Hydrocarbons (HC) causing serious air quality and health problems
- † Asian countries need to take the lead in developing and implementing strategies to clean up 2 - 3 wheelers
- † There is also a need to institute local studies to
  - † reaffirm the relationship between 2-3 wheeler pollutants and health effects
  - † characterize 2-3 wheeler PM emissions
  - † determine actual 'emission factors' for 2-3 wheeler emissions

## Emission Standards for 2-3 Wheelers

- † All countries in the region need to adopt emission standards for new and in-use vehicles
- † ECE standards, adopted by some countries, may not be adequate - they may consider leapfrogging to Indian or Taipei,China standards
- † Countries with serious PM problem need to develop new standards for PM - based on sound science and a reliable measurement system
- † Emission standards must be evolved in a transparent manner involving all stake holders
- † Costs can be minimized by harmonizing standards and taking up joint technology development

## Emission Standards - in-use vehicles

- † In-use standards ensure proper vehicle maintenance
- † Typical in-use standards regulate CO under idle -some countries regulate idle HC and/or smoke (opacity)
- † Tight in-use standards can be used to force older, higher polluting vehicles to be retired or moved away from 'hot-spots'
- † Test procedure for in-use standards should be capable of accurately defining 'gross polluters'
- † Countries that adopt PM standards for new vehicles, should also adopt in-use PM standards using reliable test methods
- † Build adequate capacity to enforce in-use standards

## Fuel conversion programmes

- † Important alternate fuel options are CNG, Ethanol, Hydrogen, electricity, and LPG
- † Two-wheelers not seen as attractive candidates for alternate fuels except electric motorcycles
- † Three-wheelers successfully converted to CNG (India) and LPG (Thailand). Best option for PM and HC emission control is 4-stroke engine running on CNG or LPG
- † Coordinated effort between government and the energy sector required to evolve a comprehensive alternate fuel programme that encompasses
  - † Life cycle analysis (well-to-wheel)
  - † provision of fuelling infrastructure
  - † quality and approval systems for safety of the modified vehicles

## Two-Stroke versus Four-Stroke Engines - current position

- † Historically, two-stroke engines are known to emit higher levels of PM and HC, but lower levels of NOx.
- † Due to high ambient PM levels in the Asian cities, there is a great interest in replacing them or cleaning them up
- † Tight emission standards for 2-stroke and 4-stroke engines in some countries have led to increasing use of catalytic converters
- † Emission warranties of up to 30,000 km have been offered to address catalyst durability concerns
- † To be fully effective and legally enforceable, warranties require specific conditions regarding fuels, lubricants and maintenance, effective monitoring & recall systems

## Two-Stroke versus Four-Stroke Engines - possible options

- † Advanced technologies such as fuel injection systems, with isolation of fuel and lubrication systems, have a potential to reduce emissions of HC, CO & PM and improve fuel economy -actual experience in Asia limited
- † As an alternative to tight emission standards, many countries are considering an outright ban/restriction on sale of 2-stroke engines. Though this relieves the government of the responsibility of ensuring durability of catalytic converters, it is disruptive of industries
- † 'Carrot & Stick' approach of Taipei, China - set tighter standards for 2-stroke engines and provide incentives to owners to replace their 2-stroke vehicles with cleaner electric vehicles or switch to public transport

## Fuels and Lubricants

### † Fuel:

- † Lead free petrol a must for using catalytic converters
- † Low sulphur content necessary to improve durability
- † Low benzene content reduces exhaust toxicity
- † Oxygenates blended in fuel reduce CO emissions

### † Lubricating oil:

- † Smoke and PM emissions increase with increasing lubricating oil consumption
- † Supply of pre-mixed petrol-oil blends at filling stations can help to control excessive oil consumption
- † High performance 2T oils can reduce oil consumption
- † 'Low smoke' (JASO FC) oils reduce smoke emissions

## Integrated Strategies

### † REQUIREMENTS

- † Broad based approach as a part of an integrated & comprehensive strategy with a clear understanding of necessary emission reductions required from 2-3 wheelers to achieve healthy air quality
- † Strong political will, effective leadership, efficient coordination and clear allocation of responsibilities
- † Improved data collection for future emission load predictions for better targeting of policy interventions

### † STAKEHOLDERS

- † *National government agencies*
- † *Local government agencies*
- † *Industry (vehicle, fuel, catalyst, maintenance)*
- † *Intermediate groups for help in advocating and implementing pollution reduction campaigns*
- † *End users using the vehicle*
  - † *as personal transportation*
  - † *for earning a livelihood , for example, rickshaw drivers*

## Typical strategies

- † A combination of measures related to
  - † Emission standards for new and in-use vehicles
  - † Fuels & lubricants
  - † Alternative fuels
  - † Inspection & Maintenance
  - † Retrofit and/or scrappage schemes
  - † Alternative modes of travel
- † *"Sustainable financial and tax incentives to support strategies to protect the health of the citizens which is a public good".*
- † Asian cities may take their own initiatives

## Implementation & Ensuring Compliance

- † Carry out systematic, transparent and consistent enforcement of laws and regulations to ensure compliance
- † Ensure acceptance by end users through
  - † large scale innovative demonstration projects and awareness campaigns to galvanize stakeholders to change their behavior
  - † pragmatic programmes for phasing in clean technologies and phasing out polluting vehicles with support of stakeholders
- † Analyse demand for mobility to provide inputs for urban planning and to foster improvement/development of alternative public mass transportation systems
- † Conduct educational programmes for enforcement staff and judiciary

## Strengthening of capacity

- † Governments need strengthening of their capacity to play their role more effectively
  - † Clear definition of mandate of individual agencies
  - † Increase in number of staff, better training and knowledge base
  - † Equipment for measurement of in-use emissions, analysis of fuel and lubricant
  - † More funding for related departments and organizations
  - † Better information management systems - better monitoring of air quality and emission test results - leading to better prioritization of interventions in terms of expected impacts
  - † Additional and more detailed policy instruments to promote better compliance
  - † Better and more institutionalized coordination mechanisms
  - † Improve credibility of departments with the public at large

## Additional recommendations

- † The industry manufacturing 2 & 3 wheeled vehicles has shown a strong awareness to improve designs to reduce emissions. It will be of great help if medium-term plans are developed for new and in-use emission standards
- † Taking up an "Auto-oil" programme for 2 & 3 wheeled vehicles in Asia, on the lines of those carried out in other regions of the world for 4-wheeled vehicles
- † There is a need to strengthen the methodology of assessment of impact of various measures taken
- † Until and unless new 2 & 3 wheeled vehicles are sufficiently clean, importing countries should consider a ban on their imports