

Modernizing and Greening Taxi Fleets in Latin American Cities

International Experiences Presented at the
United Nations Expert Group Meeting on Sustainable Urban Transport
in Rio de Janeiro, Brazil, 18-19 May 2011

Objectives: To enhance wider information and experience sharing on innovative initiatives and good practices on modernizing & greening taxi fleets in Latin American cities;

To facilitate the dissemination of innovative technologies and stimulate local consultations on options of regulatory reforms and improvements.

Participants: 63 attendees from 14 countries participated in the Forum.



Taxi Queue in Pereira, Colombia [Photo Courtesy of Mr Alvaro Rodriguez-Valencia (Bogota)]

Co-organizers:

The Transport Engineering Programme of the COPPE Institute of the Federal University of Rio de Janeiro
United Nations Department of Economic and Social Affairs

In collaboration with:

Korea Energy Economics Institute (KEEI)

With the support of:

Korea Energy Management Corporation (KEMCO)

Introduction

As an important part of urban public transport, the taxi distinguishes itself by offering door-to-door or point-to-point transport services, typically operating around the clock. These characters make it a paratransit system simultaneously complementing and competing with other forms of transport. Taxis can also contribute to national economy by creating job opportunities and tax revenues to local authorities.

However, by driving most of the time in the inner-city areas, taxis also contribute to urban air pollution caused by inefficient fuel use and traffic congestion. Estimates show that in many cities, taxis drive on average more than 50,000 miles (80,000 kilometers) per year in inner-city areas. Though taxis only account for around 2 per cent of the total motor vehicle population, taxis are responsible for approximately 20 per cent of local noise or air pollution and GHG emissions.

Most cities regulate commercial taxi services and systems through licensing systems: (a) restricted access/limitations on numbers of taxi licenses; (b) standardized vehicle specifications and standardized taxi fare systems; (c) requirement on safety and security for both passengers and drivers. In many developing countries, urban taxi markets are often either over-regulated or under-regulated. Frequent use of old or second-hand or highly polluting motor vehicles, high competition of taxi drivers for customers, inadequate or unfair distribution of revenues and risks between taxi owners and drivers, safety and security concerns and unmet transport demand are all factors that can negatively affect the sustainable development of taxi services and system.

Regulatory policies on taxis need to consider all economic, social and environmental dimensions. A sound taxi service system needs to provide affordable mobility for passengers, be available where and when needed, be safe, avoid unnecessary pollution, offer sufficient incomes for owners and drivers, and involve all stakeholders concerned in the policy making process.

This booklet aims to (a) inform a wider audience of policy options and good practices and the conclusions and recommendations reached at the EGM, and (b) enhance understanding of policy options to address the challenges of regulation, modernization and management of urban taxi fleets in growing cities of developing countries. The booklet progresses following the EGM proceedings:

- ✧ Policy options and best practices in regulating urban taxi systems;
- ✧ Urban transport systems and the role of taxis;
- ✧ Vehicle technologies and fuel choices for mitigating urban air pollution and GHG emissions from taxis;
- ✧ Taxi of tomorrow: Developments, innovations and trends;
- ✧ Conclusions and recommendations.

Different Types of Taxis



**Access a taxi
by
Street hail
Cab stand
Dispatch**

**CLICK THE
NAME TO
SEE THE
COMPLETE
PRESENTATION;**

**Also for
ORGANIZATIONS
OR OTHER
EXPLANATIONS.**



**Opening Statements by Professor Luiz Pinguelli Rosa and Ms. Kathleen Abdalla;
Introduction to Program of Expert Group Meeting by Mr. Ralph Wahnschafft.**

Policy options & best practices in regulating urban taxi systems

[Prof. Ronaldo Balassiano](#) from the COPPE Institute of the Federal University of Rio de Janeiro, and [Prof. Antonio Nelson Rodrigues da Silva](#) from the Department of Transport of the University of Sao Paulo, provide a comprehensive and systematic analytical overview of existing global taxi schemes and their respective policies and regulations. The general characteristics of taxi systems in developed countries and developing countries are compared. He also analyses and sums several key issues and entry policies, and four market types based on entry controls and qualifications of taxi schemes, as shown below:

Key issues	Developed countries	Developing countries
Regulation;	Substitute for private vehicles;	Supplement public transport systems;
Entry conditions;		
Number of licenses;	Use for convenience reasons or do not want own a car;	Upper lower income users;
Services provided;		
Quality of the service;	Nonshared basis;	Shared taxis;
Environmental impacts;	Limited supply.	Often unregulated;
Safety;		Low cost single passenger services.

[Mr. Sangjin Han](#), Head of Center for Transport and Climate Change of the Korea Transport Institute, shares Korea's experiences in enhancing sustainability of taxi services in terms of policies, initiatives and future development trends. In the presentation, he introduces the status of taxi operations in Seoul, elaborates on users' complaints, operators' concerns and threats to taxi businesses. Suggested measures to achieve sustainability of taxis include:

- ✧ **Market creation by tailored service:** market segregation by distance, market aggregation by areas and taxi license quota and free entry to taxi market;
- ✧ **Transforming into environmentally-friendly taxi:** from LPG taxis to hybrid or e-taxis, from large cars to compact cars and new types of taxis;
- ✧ **Safer taxis to use:** black box to monitor safety and to reduce accidents;
- ✧ **Convenient for passengers:** fast location by smart phone users and integrated call centre.
- ✧ **New taxis for carbon credit:** carbon market credit by CDM and NAMA, EF taxis and emission monitoring system;



Hybrid-only green cab companies



CNG refueling stations



Smartphones enabling efficient dispatch

[Mr. Charles Rathbone](#), Assistant Manager of Luxor CAB Company of California and host of on-line organization [TAXI-LIBRARY](#), shares private sectors' initiatives on "greening" taxi services in California. In the presentation, he demonstrates how:

Greening process could involve many stakeholders concerned. In Los Angeles (CA), taxi operators and environmental groups participated in crafting regulations. LA police is also involved in controlling illegal cabs to avoid over-supply;

- ✧ Compressed Natural Gas (CNG) vehicles were introduced to Disneyland and airports through private company partnerships. Private investment helped in constructing refueling infrastructure;
- ✧ Private-public partnerships can accelerate the adoption of electric vehicles (EV) in taxi industry;
- ✧ Technology advancement improves the dispatch efficiency.

SEE ALSO



A systematic "Fact Sheet" of taxis in terms of flexibility, comfort, safety and "green" potentials, by [Mr. Oleg Kamberski](#), Head of Passenger Transport & Taxi, International Road Transport Union (IRU), Belgium.

Urban transport systems and the role of taxis

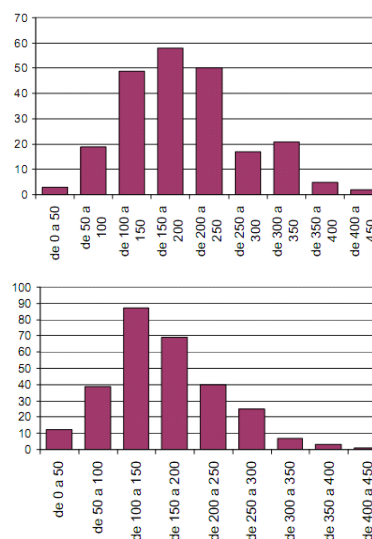
Economic development generates demand for mobility, and urban mobility dynamizes regional or local development. Latin America is the developing world's most urbanized continent with an average of 79 per cent population living in urban areas.

[Professor Jorge Galarraga](#), from National University of Cordoba of Argentina, concluded an empirical study of Cordoba, Argentina, and shares perspectives for improving taxi services. Two types of para-transit services are available in the City of Cordoba with a population of 1.35 million: taxis and "remises" (a type of taxi with different fare and that must be called by phone).

An empirical study was carried out to make a systematic comparison between these two modes to determine the suitable offer based on the needs of users and the city. The parameters include the size of registered taxi fleets, fares, distance travelled, waiting time, user preferences, productivities, load factors, fuel consumption per passenger kilometer, safety and convenience. Private cars and public transit are also compared with taxis and remises.

		
	Taxis	Remises
Numbers	4,000	3,500
Fares	Remises are 3 per cent more expensive than taxis;	
Load factor	0.57%	0.46%
Waiting time	Three time frames: <10 m, 10-20 m, >20 m; Three situations: working day, nights/holidays, rain;	
User preferences	In terms of fare, waiting time and safety and convenience	

Distance Travelled (km)



In the charts right above, the upper one reflects the daily driving distance distribution for the taxis and the lower one for remises. Taxis are used more often for medium-long distance trips. User preferences also show that taxis are preferred in terms of fare if compared to "remises".

[Mr. Alvaro Rodriquez-Valencia](#), from the Department of Civil and Environmental Engineering of the Universidad de Los Andes in Bogota of Colombia, carried out empirical studies on sustainability of taxi operations in Bogota. A survey of more than 400 drivers drawing personal data, vehicle and operation data was conducted in Bogota to analyze the important role taxis play in sustainable urban transport.

In his presentation, taxi operation is also compared with [TransMilenio](#) in terms of fleets number, total daily distance and passengers, and incomes. A summary of statistics covering different dimensions of current taxi services in Bogota can be found at the last page of his presentation.

"Informal" taxi services

With an ever densifying population and expanding urban area, taxis and alternative-transport services can provide mobility for everyone, including groups with special needs like the poor, the elderly, disabled, women and children. They also generate employment opportunities and tax revenues to local government. However, lack of regulation and necessary investment for vehicle replacement can result in more air and noise pollution, GHG emissions and inefficient use of urban spaces.

Mr. Frederic Saliez, from the regional office of UNHABITAT for Latin America and the Caribbean, elaborates on taxis and alternative-transport services in developing countries. He analyses the features of the various transport services like taxis, mototaxis and bicycletaxis.



How to make informal taxi service providers responsible for an accident that causes damage to third parties (users and non-users)? How to deal with a service that is granted a permit or an informal service rendered without municipal approval or endorsement?

Informality is predominant in 70 per cent of the cities where the motorcycle taxi services exist. In most cases, there is no regulation, or the existing regulation is inadequate or not implemented.

Motorcycle taxis represent a greater risk potential when compared with other motorized transport means.

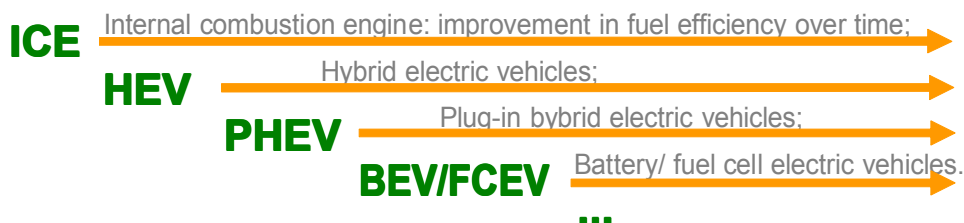
Professor João Alencar Oliveira Junior, Transport Engineering and Infrastructure Analyst from Brasilia, illustrates the liability (civil responsibility) in the case of traffic accidents of motorcycle taxi service in Brazil. He elaborates on the rationale for regulating informal services to establish the liability in mototaxi accidents. The genesis, legal background and statistics pertaining to motorcycle services in Brazil can also be found in his presentation.

His analyses on liability as applied to public transport services for passengers on motorcycles in Brazil provides good references for other Latin American countries.

There is no "one-size-fits-all" solution in regulating taxi systems as each municipality needs to approach the issue based on their own specifications and changing demands.

Vehicle technologies and fuel choices for mitigating urban air pollution and GHG emissions from taxis

As vehicle and battery and energy storage technologies evolve, fuel options widely expand from gasoline and diesel to natural gas, electricity, hydrogen and biofuel. They are considered to be "greener" fuels by their comparatively high efficiency and low carbon emissions.



A growing number of municipalities are upgrading their transport systems to introduce vehicles powered by these fuels in the public transport sector. Due to the fact that the taxi system is an important paratransit and accounts for approximately 20 per cent of the air pollution, the modernization and "greening" of taxi systems, especially in developing countries, can contribute significantly in mitigating urban air pollution and GHG emissions.

Compressed natural gas (CNG) application in taxis

Compared with gasoline or diesel, CNG is a cleaner and safe fuel alternative. In many Latin American cities, taxi operators are now using compressed natural gas (CNG) to fuel their vehicles. Natural gas is compressed at a pressure of 200-248 bar and then stored in cylinders on-board the vehicle.

Due to its ample availability and low comparative cost of gas, CNG vehicles are widely used in Argentina, accounting for 15 per cent of total vehicle population in 2010. In Buenos Aires, 68 per cent of taxis are CNG fueled in 2011.

[Mr. Martin E. Glücke-smann](#), President of Camara del Radio Taxi de Argentina of Buenos Aires of Argentina, provides an overview of CNG application in Argentina. In the presentation, he analyses the advantages and disadvantages of using CNG in taxis and suggests several key measures to promote CNG application and policies to further reduce the environmental impact of taxis.

Plug-in hybrid and battery electric vehicles used as taxis

The use of electric vehicles in taxis has proven to provide a significant reduction of carbon emissions. EVs can be economical and more profitable in taxi operation. Many innovative projects of applying plug-in electric vehicles (PHEVs) and battery electric vehicles (BEVs) in taxi operation are ongoing in several cities, in particular in China.

[Mr. Michael Kwei](#), from Shenzhen Bus Group of China, shares Pengcheng Company's initiative in applying EVs as taxis (fully battery powered) designed by [BYD](#) in the City of Shenzhen. Comprehensive and systematic information is provided in terms of BYD's "e6"-EV model and its technical specifications, the charging station network, the charging system, battery monitoring and management, purchasing cost and monthly operating cost. An overview is shown as below:

Charging time	1.5~4.5 h	Charging station network	47 by June 2011; 12,750 by 2015.
Range	200 km		
Electricity consumption	29 kw/100 km		
Average daily mileage	350 km		

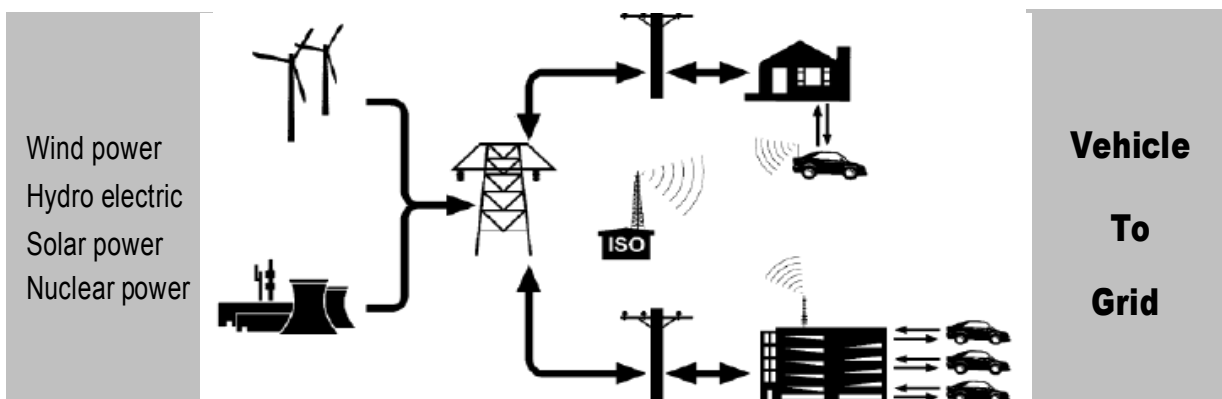


BYD "e6" taxis

Mr. Sangjin Han, Head of Center for Transport and Climate Change of Korea Transport Institute (KOTI), demonstrates Seoul's full scale green vision for 2020, including applying LPi hybrid taxis (using liquified petroleum gas and electricity). Further plans for "greening" taxis in the Republic of Korea can also be found in the presentation.

Electricity use to fuel taxi fleets

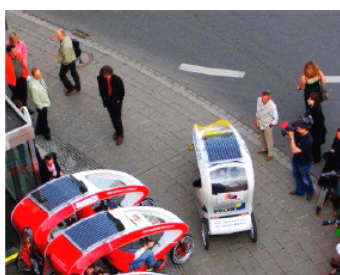
Some countries use electricity to fuel cars to improve efficiency and reduce pollution. Electric vehicles can be charged from the grid which typically relies on various domestic sources. The use of night-time off-peak power can be very economical for charging EV batteries. In some countries, electricity costs only 20-30 per cent of that of petroleum.



Electric vehicle technology can contribute to the “greening” of taxi systems, provided that batteries are charged with electricity from renewable sources of energy, or with electricity saved from energy efficiency projects.

Solar power

Mr. Michael Vogtmann, Managing Director of Solar Initiative Nuernberg (Germany), elaborates on introducing bicycle taxi services in some European cities. In the presentation, he introduces the operation of e-velos, e-rollers, e-bike taxis and other e-cars, the loading station systems and regional energy supply strategy. Innovations on the use of solar panel and green energy loading are further elaborated.



First solar velotaxi fleet in world with specially produced half transparent solar panels.
Night depot for 5 velotaxis.



Wind power

Prof. Alexandre Szklo, Prof. Bruno Soares Borba and Prof. Roberto Schaeffer, from the Energy Planning Programme of COPPE of the Federal University of Rio de Janeiro of Brazil, talk about the case of wind generation in North-Eastern Brazil. Wind power potential are analysed systematically. Furthermore, there are considerable opportunities in Brazil for expanding the use of electricity from renewable sources for fueling EVs.

SEE ALSO A "green" solution for São Paulo city transport by Mr. Stanley Tang, from BYD's Latin America Division.

Taxi of Tomorrow: Developments, innovations and trends

Mobility is an essential element in modern life and a key enabler for activities at different levels, in various forms. The quality of urban transport can determine the economic productivity and quality of life. Many technologies pertaining to transport evolve and can bring about a "greener", more sustainable mobility. This can also contribute significantly to building socially inclusive and environmentally sustainable urban systems:

- ✧ A system where people can equally use urban space and access to all public transport with special needs of all groups attended and satisfied;
- ✧ An atmosphere where people prefer public spaces and public transport is conveniently accessible and economically affordable, as well as safe and efficient.

Taxis, upgraded by the new information technology, can motivate and contribute significantly to this process.

What will taxi of tomorrow look like?



How are they different?

Mr. Rodrigo Torres Bustillos, transport consultant and former director general of Transport and Mobility of Quito Municipality of Ecuador, gives a comprehensive display of how the technologies and its applications will shape taxi peration in the future.

For vehicles

For users:

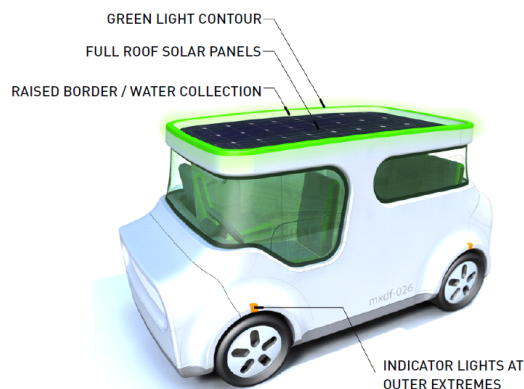


He analyses features of information-based taxi operation and services in the future by distinguishing executive taxi services from common taxi operation. The resulted benefits of regulators, customers and operators, as well as the integrated and intelligent system involving urban transport and microregional and rural transport systems are also discussed.

SEE ALSO

The Mobility Master Plan for the metropolitan district in Quito, presented by Mr. Roberto Noboa, director of Public Transport of Quito City of Ecuador. The organizational options for taxi operators or owners are also discussed in his presentation.

Mr. Alberto Villarreal, designer and creative director from Mexico city, gives a full introduction of an innovative design entitled "MX-Libris" initially developed in 2008. MX-Libris is a multiple fueled vehicle that is "green", efficient, intelligent and user-friendly.



What for taxi drivers?

Mr. Ramesh Prabhu, Chief Executive Officer of Three Wheels United (TWU) India Services Private Limited in Bangalore of India, shares TWU's experiences in improving the quality of life of auto rickshaw drivers and reducing environmental degradation caused by auto rickshaws.

Several measures have been taken by TWU, including strengthening financial support and providing technology kits, building up dedicated maintenance fund and community forum. A "triple bottom line" approach to performance measurement is adopted to prioritize social and environmental return as well as financial return on investment.

Problems:

Limited earning potential;
No access to finance from Banks;
Exploited by private money lenders;
No social security;
Low self esteem;
Noise & air pollution...

Financial Services	Additional revenues for drivers	Technology Kits (early 2012)
<ul style="list-style-type: none"> Financing Replacement of two stroke engines by four stroke engines Providing bank savings and recurring deposits accounts to drivers Life and Health Insurance 	<ul style="list-style-type: none"> Advertisements in auto rickshaws SMS based application to generate rides for the drivers; customer calling drivers for pick-up 	<ul style="list-style-type: none"> More fuel efficient and emission reducing kits Higher income for the driver and positive impact on environment

Women taxi services for women passengers

Taxi industry is conventionally a male dominated field. Taxi driving may involve heavy work load, long working time, high pressure, risks in terms of traffic accidents and crime. However, today there is an increasing number of taxi projects for women drivers entering into this industry, especially in developing countries. Besides many problems women taxi drivers share with their male colleagues, they face more challenges and risks while doing their job.

In some places, licenses for female taxi service are separately issued. Special subsidies and welfare programmes and dedicated women taxi driver associations exist to provide support to women drivers. "All women taxi services" are now available in many cities, which are provided exclusively by women drivers for women passengers.



In a growing number of cities in industrialized countries, municipalities have started to provide subsidized taxi vouchers or taxi services in particular for women and teenage girls to be used during period when no other public transport is available.

In Latin America, pilot projects of women taxis for women passengers have also been introduced into several cities.

SEE ALSO

Ms. Kwisun Huh gives a detailed discussion on these issues in her technical background paper.

After discussion, the experts and participants who attended the Expert Group Meeting in Rio de Janeiro adopted a set of Conclusions and Recommendations. To summarize:

Urban transport systems and the role of taxis

Taxis provide mobility in urban areas and can play an important role in public transport.

Taxis provide point-to-point, door-to-door or shared passenger transport services, with fares typically determined by taximeters measuring the distance and the time the car has traveled.

Taxi drivers provide transport services using company- or privately-owned or rented motor vehicles. In many cities taxi industries provide important employment opportunities.

In many developing countries taxi services are also frequently provided using small buses or vans, motorcycles, pedicabs or animal drawn carriages.

Taxis and other types of urban public transport services can be complementary and/or competing in servicing the urban mobility needs.

In order to function effectively taxi systems and their operational modalities need to be integrated in urban development and urban mobility planning.

Taxis can provide important mobility services for the elderly, for persons with disabilities and other social groups with special mobility needs.

Sustainable development issues and concerns

Economic, social and environmental considerations should always be considered in an integrated manner when reviewing public policies on taxi industry regulation.

Taxi systems can differ significantly from place to place. Hence, there is no standard one-size-fits-all solution to the prevailing local development concerns.

Taxis typically drive up to ten times or more the distance per day if compared with personal cars. Therefore, taxis also have much higher fuel consumption and disproportionately contribute to local air pollution.

Local authorities have an important role to play in regulating taxi companies, vehicles, operators and services.

In some developing countries there are large numbers of licensed and unlicensed taxis operating in the urban “cruising market”, often driving empty in search of passengers. Non-economic and inefficient use of motor fuels and driver time must be reduced and minimized to the extent possible.

Excessive supply of taxi services and inefficient regulation can lead to high competition among drivers, negatively affecting driver income, service quality and safety.

In many developing countries many old and obsolete motor vehicles are still used as taxis, driving many kilometers per day in urban areas, contributing to local air pollution.

Taxi industry regulation and related good practices

In most countries taxi industries are subject to regulatory regimes involving a combination of national, state and local level licensing, taxation and certification schemes.

The development and review of taxi industry regulations should be based on the active participation of concerned stakeholders, including taxi companies, taxi drivers and their associations and customer and consumer organization representatives. Taxi industry regulations, once agreed, should be appropriately enforced.

In many cities the taxi service industry makes a significant contribution to public sector revenues through local or state taxes and other fees. Established taxi fares should cover all direct operational costs of taxi operation and ensure adequate taxi driver income.

Safety and security concerns

Safety and security are important concerns for all: taxi drivers, taxi passengers and the general public. Driver training and monitoring of driver behavior offers important opportunities for improving traffic safety. Safety concerns of women and children need to be adequately addressed.

Vehicle technologies and fuel choices

In a growing number of Latin American cities taxi operators use compressed natural gas to fuel their vehicles. If compared with gasoline motor vehicles, efficient use of CNG can reduce fuel costs, as well as air pollution and GHG emissions per kilometer traveled.

In spite of higher initial purchasing costs many types of hybrid-electric vehicles have proven their reliability for use as taxis. Hybrid-electric vehicles require less fuel and can be more economical and more profitable in taxi operations.

Several cities have initiated innovative projects using plug-in hybrid electric vehicles (PHEVs) and fully battery-powered electric vehicles in taxi operations. Electric vehicle technology can contribute to the “greening” of taxi systems, provided that batteries are charged with electricity from renewable sources of energy, or with electricity saved from energy efficiency projects.

Access to affordable financing for the modernization and improvement of taxi vehicles is important, in particular in developing countries.

Development perspectives, innovations, trend projections and policy options

New information technologies and global positioning systems should be more widely disseminated and used by developing country taxi operators.

Licensing of taxi vehicles and fleets should include requirements of accident and personal injury insurance. Informal transport service providers should also be included in such schemes.

New information technologies can make important contributions to address taxi driver and taxi passenger security and safety concerns.

Perspectives for national and international cooperation

Taxi industry associations can play an important role in self-regulation of the taxi service industry.

Documentation of good practices and greater sharing and exchange of experiences at national, regional and international levels can facilitate the dissemination of innovative technologies and stimulate local consultations on options of regulatory reforms and improvements.

For more information on the Forum in Rio de Janeiro, please refer to:

http://www.un.org/esa/dsd/susdevtopics/sdt_tran_egm201105.shtml

Other Seminars, Workshops & Meetings on transport can also be obtained from:

http://www.un.org/esa/dsd/susdevtopics/sdt_transeminars.shtml

Disclaimer:

The views and opinions expressed in this brochure are those presented by participating experts and representatives and do not necessarily reflect those of the co-organizers and/or the supporters of the UN EGM.

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Group Photo of Experts and Participants attending the EGM in Rio de Janeiro

Announcement



RIO+20
United Nations
Conference on
Sustainable
Development

Objectives: To secure renewed political commitment for sustainable development; To assess the progress to date and the remaining gaps in the implementation of the outcomes of the major summits on sustainable development; And to address new and emerging challenge, with two themes: (a) a green economy in the context of sustainable development and poverty eradication; and (b) the institutional framework for sustainable development.

3rd Preparatory Committee Meeting for UN Conference on Sustainable Development

Rio de Janeiro, Brazil 28-30 May 2012

United Nations Conference on Sustainable Development (Rio +20)

Rio de Janeiro, Brazil 04-06 June 2012

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