SOLUTIONS Training Kit
Cluster 1: Public Transport

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About SOLUTIONS

SOLUTIONS aims to foster knowledge exchange and boost the uptake of innovative sustainable urban mobility solutions through the further exploitation of existing knowledge. The main focus of the SOLUTIONS project is on the exchange between cities from Europe, Latin America and the Mediterranean.

The project looks at the following thematic areas:

- public transport
- transport infrastructure
- city logistics
- integrated planning / sustainable urban mobility plans
- network and mobility management
- clean vehicles

Introduction to Cluster 1: Public Transport

Public Transport: A crucial factor for achieving healthy and liveable cities and metropolitan areas
Issues: traffic congestion, traffic pollution, carbon emissions and energy consumption
Main focus: learn how to improve the public transport capacity and efficiency in an environment friendly pattern through policy making, technical improvement, integrated planning, etc.

-> Requires detailed discussion about ITS, BRT, subsidies, funding, pricing mechanisms, corresponding infrastructures & energy policy

SOLUTIONS for	Type of impact
BRT system construction and operating with high level service	Improve (Shift)
Trolley bus systems	Shift (Improve)
Metro systems	Shift (Improve)
Use and operate clean vehicles such as CNG, LPG, LNG in public transport system	Improve
Use new technology vehicles such as electric and Hybrid vehicles in public transport system	Shift (Improve)
ITS for public transport	Improve
Integrated planning of public transport network	Improve
Financing public transport	Improve
Integrated fare system	Improve
Eco-driving for professional drivers	Improve
Bus priority	Improve
Bike sharing and public bicycles	Shift (avoid)

Solution 1.1: BRT system construction and operation with high level service

Dedicated bus lane

Solution 1.1: BRT system construction and operation with high level service

Objectives and implementation

- Provide high level public transport service
- Increase public safety enhance logistics function
- Supported through dispatching information systems
- Best implemented along main roads of cities and metropolises
- Will reduce congestion, increase passenger volume and reduce public transport carbon emissions.

Solution 1.1: BRT system construction and operation with high level service

Drivers

- Increased carrying capacity compared to conventional public transport,
- Environmental appeal of the system
- Independence from terrain limitation
- cost effectiveness

Barriers

- Funding and investment for BRT
- Limited road space
- Public opposition against reducing road space in favour of public transport

Solution 1.1: BRT system construction and operation with high level service

Examples

- BRT system in Curitiba, Brazil
- TransMilenio BRT system in Bogota, Colombia
- Hubei–Yichang Sustainable Urban Transport Project, China;
- Guangzhou BRT

Solution 1.2: Trolley bus systems

Trolley bus in Gdynia, Poland

Solution 1.2: Trolley bus systems

Objectives and implementation

- Public transport mode using electric propulsion
- Can be operated with renewable energy
- Reduces fossil energy use by maintaining (or even increasing) carrying capacity
- Support cities in achieving their climate goals
- Best implemented in the built up area of a city

Solution 1.2: Trolley bus systems

Drivers

- No local air pollution and less noise emissions
- Positive impact on local emissions
- Effective means to implement electromobility in cities

Obstacles

- Construction and maintenance of the power grid
- In many countries, trolley busses are perceived as old-fashioned
- Many projects, such as the TROLLEY project have demonstrated that such barriers can be successfully overcome

Solution 1.2: Trolley bus systems

Examples

- Zurich, Swizerland
- Beijing, China
- Taiyuan Trolleybus project in China
- Hybrid trolley buses (several kilometres autonomy without wires) in Gdynia, Poland

Solution 1.3: Metro systems

Solution 1.3: Metro systems

Objectives and implementation

- Rapid public transport mode on rails without the need to change the structure of road networks and built up areas
- Almost independent from the topography of cities
- Best implemented in areas with the need of mass capacity in PT
- Metro systems attract passengers from other transport modes (private cars)

Solution 1.3: Metro systems

Drivers

- Potential for mass passenger capacity
- Perceived as fast and reliable
- Electric propulsion decreases local emissions
- Shift of passengers from private cars reduces congestions and emissions from cars

Obstacles

- Huge investment
- High cost for maintenance and operation decreases the acceptance of metro construction by the public

Solution 1.3: Metro systems

Examples

Examples are manifold. Major systems are…

- London underground
- Berlin underground
- MRT in Singapore
- Beijing underground
- Dalian metro system, etc.

Solution 1.4: Use and operate clean vehicles such as CNG, LPG, LNG in public transport systems

CNG bus, Delhi, India (Markus Spring)

Solution 1.4: Use and operate clean vehicles such as CNG, LPG, LNG in public transport systems

Objectives and implementation

- Reduces air pollution and carbon emissions from public transport
- Compressed natural gas (CNG), liquefied natural gas (LNG) together with liquefied petroleum gas (LPG) have higher fuel efficiency and much lower emission of pollutants than diesel
- CNG, LPG and LNG vehicles can be operated in cities of all sizes
- Potential for considerable impact on air quality
- Reduces heavy reliance on traditional fossil fuels

Solution 1.4: Use and operate clean vehicles such as CNG, LPG, LNG in public transport systems

Drivers

- Cities can achieve climate protection objectives faster
- Reduction of operating costs

Obstacles

- Gas is still a fossil fuel with CO2 emissions
- Limited range of gas propelled vehicles (Broader use of LNG could resolve this)
- Although there are sufficient experiences in CNG and LPG, global exchange on the use of LNG in public transport is needed

Solution 1.4: Use and operate clean vehicles such as CNG, LPG, LNG in public transport systems

Examples

- CNG buses in Delhi (India), Berlin (Germany), Lille (France), Hongkong (PRC)
- LNG public buses in Guiyang (PRC)
- Xian public buses (PRC)

Solution 1.5: Electric and hybrid vehicles in public transport systems

Figure 3: Hybrid bus, Germany

Solution 1.5: Electric and hybrid vehicles in public transport systems

Objectives and implementation

- A good opportunity to test and implement electromobility
- Electric vehicles help to reduce local air pollution and noise
- Hybrid vehicles have greater flexibility due to the extended range offered by a conventional aggregate
- Aims at attracting more passengers to clean public transport
- Scope: city and metropolitan wide
- Works best along dedicated corridors

Solution 1.5: Electric and hybrid vehicles in public transport systems

Drivers

- Decrease the reliance on the fossil fuel
- Use of local energy sources

Obstacles

- Considerably higher cost (batteries)
- Limited range of the vehicles
- Climate conditions affect the reliability of the technology (e.g. reduced range in low temperatures)
- Higher operating costs, hence higher ticket prices?

Solution 1.5: Electric and hybrid vehicles in public transport systems

Examples

- China: Shenzhen electric buses, Beijing electric buses; Hybrid(gas) buses in Guiyang
- Europe: Aachen, Bremen

Solution 1.6: ITS for public transport

Solution 1.6: ITS for public transport

Objectives and implementation

- Helps passengers to receive real-time information on arrival and departure times of vehicles
- Provides further information services to travellers
- Allows for monitoring of vehicles and traffic situations to respond to disruptive situations
- Can be applied at subway and bus stations
- Can be applied on board of vehicles using GPS and GPRS

Solution 1.6: ITS for public transport

Drivers

- Raises the attractiveness of public transport: shift from other transport modes
- Ensures the safety of public transport operation
- Makes management effective and convenient

Obstacles

- Initial high investment
- Data acquisition and integration
- Maintenance and operation of technical equipment

Solution 1.6: ITS for public transport

Examples

- Most major cities in Europe and other developed countries
- Some cities of emerging economies are building the intelligent dispatch systems for public transport, but no good examples exist in China

Solution 1.7: Integrated planning of a public transport network

Solution 1.7: Integrated planning of a public transport network

Objectives and implementation

- Align the public transport network and operation with the overall urban planning layout
- Often a subset of sustainable urban mobility planning
- Keep travel distances between urban functions short, efficient and manageable by walking, cycling and public transport
- Cross-sector cooperation inside the administration is important
- Best applied in cities (or areas of cities) with insufficient public transport capacities

Solution 1.7: Integrated planning of a public transport network

Drivers

- Demand for public transport, sustainable urban development and development within limited space

Obstacles

- Fragmented competences,
- Differing interest of land use
- Resistance from society/inhabitants

Solution 1.7: Integrated planning of a public transport network

Examples

- Stockholm, Sweden
- Curitiba, Brazil
- Hefei BRT project
- Yinchuan BRT project

Solution 1.8: Financing public transport

Solution 1.8: Financing public transport

Objectives and implementation

- Make sure that public transport has sufficient investment capital to keep high quality service and to keep up with increasing demand
- Balance between high quality service and affordable pricing

Solution 1.8: Financing public transport

Drivers

- Participatory decision making
- Good transport planning practices

Obstacles

- Insufficient capital source (or willingness of decision makers to assign sufficient budget)
- unnecessary subsidies for public transport companies (and hence lack of competition)

Solution 1.8: Financing public transport

Examples

- Transport Tax, Paris, France
- Ticket system for PT in German cities and Japanese cities
- Beijing, China
- Ticket system PT in Dalian city, China

Solution 1.9: Integrated fare system

Solution 1.9: Integrated fare system

Objectives and implementation

- One of the basic conditions to provide convenient access to a public transport system in a city
- Allows transfers within or between different transport modes with a single ticket that is valid for the complete journey
- Public bicycles or carsharing could be included

Solution 1.9: Integrated fare system

Drivers

- Encourage people to use public transport by simplifying switching between transport modes and by increasing the efficiency of the services

Obstacles

- Need for cooperation of different authorities and operators
- Investments for corresponding equipment are needed

Solution 1.9: Integrated fare system

Examples

- London (Oystercard)
- Beijing, China
- Smart card for Japanese cities
- Bremen, Germany

Solution 1.10: Eco-driving for professional drivers

Solution 1.10: Eco-driving for professional drivers

Objectives and implementation

- Eco-driving has the potential of saving up to 20% of fuel
- Improve eco-driving skills of bus drivers to improve energy use efficiency and reduce emissions
- Applied to professional drivers of buses, subways and light rail systems

Solution 1.10: Eco-driving for professional drivers

Drivers

- Reduction of fuel cost
- Reduced wear and tear of the vehicles

Obstacles

- Continuous training efforts of drivers to maintain the level of eco-driving within public transport fleets

Solution 1.10: Eco-driving for professional drivers

Examples

- Demonstrated in various European transport projects, such as ACTUATE and BENEFIT
- Some companies in some cities in China have applied eco-driving of professional drivers.

Solution 1.11: Bike sharing and public bicycles

Foshan, China

Solution 1.11: Bike sharing and public bicycles

Objectives and implementation

- Fixed rental bicycle systems will solve the 'last mile' problem in urban transport systems
- Provide truly door-to-door travel connections
- Provides means of transport for population in high-dense residential areas
- Best combined with public transport hubs

Solution 1.11: Bike sharing and public bicycles

Drivers

- Safe cycling infrastructure
- Good access to installations

Obstacles

- Potential vandalism
- Obstruction of the operation
- Maintenance of the corresponding equipment

Solution 1.11: Bike sharing and public bicycles

Examples

- Amsterdam, The Netherlands
- Paris, France
- Berlin, Germany
- Hangzhou bike-sharing system, Changzhou bike-sharing system, China

Thank you!

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