

ROAD AND TRANSPORTATION MASTERPLAN

PALESTINE

TA 2012013 PS 00 F10

IX Environmental and Social Impact Assessment

SEPTEMBER 30,2016



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1 Identification of Environmental and Social Effects

From a methodological point of view, given the comprehensive nature of NTMP, SEA directive and guidelines, together with available techniques in the reference manuals, are taken as references for identifying and assessing environmental and social effects eventually generated by the implementation of NTMP in Palestinian Territories.

The evaluation of environmental and social effects is carried out at two levels:

- First-Level Evaluation

It concerns all NTMP components, divided into *general objectives* (integrated multi-modal transport strategy) and *sectoral objectives*, related to all transport modes included in the Master Plan (sub-sector plans).

The assessment considers NTMP components at their highest level of implementation, reached in Phase 4.

The environmental and social systems are divided into components similar to what is done to the EIA (air, water, soil, landscape, etc.) in turn adapted with respect to relevant issues about local context and level of available knowledge. For each component, sustainability and environmental protection targets¹ (SEA objectives) are assigned. The interaction of environmental and social components and the Master plan's vision is described according to the ordinal rating scales, through the use of double-entry matrices.

- Second-Level of Evaluation

It examines the environmental and social effects of the main actions related to strengthening and reorganization of transport systems, with the exception of those with intangible nature (organizational-administrative).

The interaction of environmental-cum-social components and the Master plan's actions is revealed with overlay-map technique, consisting in overlapping infrastructure (roads and railways) blueprints and the areas affected by the location of specific infrastructure (airports and ports) with the natural valuable elements: i.e. agricultural land of high and medium value, areas with historic value, vulnerable areas, specific built-up areas etc. This procedure shows the degree of potential interaction, according to ordinal rating scale.

The following two base maps are used: 1) The National Plan for natural resources and historical landmarks protection (environmental natural component) and 2) Soil Use Map (built-up/man-made component).

The second-level of assessment entails the following activities:

- Refurbishment and upgrading of existing airports;
- Main roads for international connections;
- New Rail network;
- Main logistics areas.

A focus on social effects induced by the upgrading/reorganization of public transport are described in the last paragraph.

1.1 First-Level Assessment

As previously mentioned, the range of potential environmental effects under consideration was informed primarily by SEA Directive. Annex I of the SEA Directive requires that the assessment

¹ Assigned targets are internationally recognized and/or connected with the values and critical issues of the local context.



includes information on the “likely significant effects on the environment, including issues such as: biodiversity; population; human health; fauna; flora; soil; water; air; climatic factors; material assets; cultural heritage, including architectural and archaeological heritage; landscape; and the inter-relationship between the issues referred to”.

In the absence of detailed guidance on their content, a number of these environmental categories (e.g. population, human health and material assets) can be subject to varying interpretation and adapted to the local context.

Tab 1. List of Categories included in SEA Directive and Assessment

Categories in The SEA Directive	Categories Used In This Assessment
Biodiversity, Flora and Fauna	Biodiversity and Nature Conservation (which includes flora and fauna, and the functioning of ecosystems)
Population Human Health	Population (including socio-economic effects and accessibility) and human health
Soil	Including land use, important geological sites, geological risk areas, and the contamination of soils
Water	Especially groundwater resources, wells and springs
Air	Air Quality
Climatic factors	Climate Change (including greenhouse gas emissions, predicted effects of climate change such as flooding and the ability to adapt)
Material assets	Waste and energy
Cultural heritage, including architectural and archaeological heritage	Cultural Heritage (including architectural and archaeological heritage)
Landscape	Landscape

The assessment process seeks to predict the significant environmental effects of the plan or program, by comparing the goals of sustainability and the Master Plan's objectives (general and sectoral), identifying the coherence and the eventual contrast. The assessment can identify also the likely changes to the baseline conditions, resulting from the implementation of the proposed plan. Matrices and ordinal value scale are used in the assessment process.

The range of judgement/key or performance adopted is reported below:

- “+” positive
- “-“ negative
- “0” neutral (no link or significant relationship)
- “?” uncertain (forecasts or uncertain knowledge)
- “+/-“ major
- “+/-“ minor

Tab 2. NTMP Environmental Effects Assessment Matrix

SEA topics	SEA objectives	Integrated Multimodal Transport Strategy		
		Multi-modal transport system adapted to context's specificities and urban growth patterns	Improve domestic connectivity	Improve regional/ international connectivity
Biodiversity, Flora and Fauna	Reduce the degradation to ecosystem services	-	-	-
	Conserve the natural parks, reserve and the sites of particular importance for biodiversity	-	-	-
	Protection of forests	-	0	-
	Limit degree of habitat intrusion	?	?	?
	Reduce the risk of ecological	?	?	?



	destabilization (possibility of disease transmission, level of contamination, etc.)			
Population and human health	improve the people's accessibility to public transport and to public facilities	++	++	++
	reduction of polluting emissions and maintenance of concentration of pollutants below of limits which exclude damage to human health	+	+	+
	increase employment, enterprise capacity and income producing	+	+	+
	minimize the population exposed to noise levels above international standards	-	?	-
	improve the life quality into the cities and rural settlements	+	+	?
	Limit disturbance to agriculture	-	-	-
	Limit disturbance to human activities	-	-	-
	Limit disturbance to residents and workspace	-	-	-
	Limit impairment to aesthetics	?	?	?
	Reduce family expenses	?	?	?
Population and human health	Improve women status & independency	+	+	+
	Enhance social participation and society interaction	+	+	+
	Inclusion of marginalized people, elderly, children, poor, disabled, women -access to social services...	+	+	?
	Reduce the resettlement / displacement by better convenient accessibility	+	+	+
Soil	Conserve the High value agricultural lands and reduce the loss of productive soil	-	-	-
	Conserve the important geological sites	?	?	?
	Reduction of erosion and soil degradation	?	?	?
	Reduction of soil contamination risk	?	?	?
Water resources	minimize the impact on the groundwater resources and protect the most important wells	?	?	?
	Promote a sustainable use of water	0	0	0
	Reduction effects on the watershed areas	-	-	-
Air quality	improve the air quality with reference to international standards	++	+	+
	Reduce risk of CO uncontrolled emission	++	+	+
Climatic change	reduce greenhouse gas emissions (per capita)	+	+	+
	reduce vulnerability to the effects of climate change e.g. flooding, etc.	?	?	?
	Risk of storm effect in regarding to impervious layers			
Waste and energy	increase the use of renewable energy sources and energy efficiency	++	+	+
	reduce the production of waste	-	-	-



	promote recycling and energy recovery of waste	0	0	0
Cultural heritage	Conserve the important historical sites and the areas surrounding	?	+	?
Landscape	protect and enhance the landscape everywhere and particularly in designated areas	?	?	?
	conserve the Sightseeing areas	?	?	?
	value and protect diversity and local distinctiveness	?	?	?

1.2 Second-Level Assessment

In order to evaluate the environmental/social impacts of actions related to the implementation of infrastructure projects, an overlay-map is realized, to assess the potential degree of interference under ordinal rating scales (high impact, medium, low, insignificant). This approach aims at driving the next design phase, according to the general goal of environmental and social sustainability.

1.2.1 Road Transport Network Environmental/ Social Assessment

Road network is planned on the basis of immediate, current, and future needs, in response to expected increase in travel demand. Road network is deemed as key-element for activate local economies and improving multi-scale connectivity: 1) between cities, and; between cities and rural areas. Road network is assessed at its highest level of development, in Phase 4.

For more details, refer to: ¶/V.1 – Road Transport

Road Backbone Environmental/Social Assessment

Tab 3. Main Road Environmental/Social Assessment Matrix

	Natural Resources	Water Resources	Agricultural	Population	Cultural Heritage
Gaza Strip Eastern 1 st -Class Road	NOT SIGNIFICANT	NOT SIGNIFICANT	HIGH	HIGH	NOT SIGNIFICANT
Road N.90 *	HIGH	MODERATE	HIGH	LOW	LOW
Road N.60 **	LOW	HIGH	HIGH	HIGH	MODERATE
Road N.57 Damiyeh Bridge – Tulkarm ***	LOW	HIGH	HIGH	MODERATE	MODERATE
Road N.1 King Hussein Bridge	NOT SIGNIFICANT	LOW	LOW	LOW	NOT SIGNIFICANT
Road N. 35 From N.90 Through Hebron To Border With Israel ****	HIGH	MODERATE	LOW	MODERATE	NOT SIGNIFICANT

*The high impact on agriculture mainly concerns the corridor along the Jordan Valley.

** The high impact on agriculture mainly concerns the corridor between Jenin and East Jerusalem.

*** The impact on heritage cultural sites relates primarily to the corridor between Tell Al Bayda and the East Corridor.

**** The impact on the population mainly concerns the corridor north of Hebron and the impact on natural resources the stretch between Bayt Hanoun and the East Corridor.

Ring Roads Environmental/Social Assessment

The following matrix considers the new roads designed mainly to bypass congested links in West Bank (sub-urban orbital/ring roads to provide North-South alternatives to passing through congested urban areas).

Tab 4. Ring Road Environmental/Social Assessment Matrix

	Natural resources	Water resources	Agricultural	Population	Cultural heritage
Ramallah ring-road	LOW	HIGH	LOW	MODERATE	MODERATE
Qalqiliya ring-road	NOT SIGNIFICANT	HIGH	HIGH	MODERATE	NOT SIGNIFICANT
Tubas ring-road	MODERATE	MODERATE	HIGH	MODERATE	NOT SIGNIFICANT
Hebron ring-road	HIGH	MODERATE	MODERATE	MODERATE	NOT SIGNIFICANT
Jericho ring-road	NOT SIGNIFICANT	LOW	MODERATE	MODERATE	HIGH
Jenin ring-road	NOT SIGNIFICANT	MODERATE	HIGH	MODERATE	NOT SIGNIFICANT
Tulkarm ring-road	MODERATE	HIGH	HIGH	MODERATE	NOT SIGNIFICANT
Bethlehem	NOT SIGNIFICANT	MODERATE	LOW	MODERATE	MODERATE
Nablus ring-road	LOW	HIGH	HIGH	MODERATE	LOW
East Jerusalem ring-road	LOW	MODERATE	LOW	MODERATE	LOW

The impact of new ring-roadson population is partially compensated by the reduction of through-traffic in urban areas, with a reduction of exposed population to noise, air pollution, risk accidents.

1.2.2 Rail Transport Network Environmental/ Social Assessment

Rail network comprises multi-scale connectivity at: Micro-Scale: within West Bank and Gaza Strip; Meso-Scale: between West Bank and Gaza Strip, and; Macro-Scale: between PNA and MENA Region. For more details, refer to: ¶IV.2 – Rail Transport

The environmental/social assessment matrix follows:

Tab 5. Rail Network Environmental/Social Assessment Matrix

	Natural Resources	Water Resources	Agricultural	Population	Cultural Heritage
International Rail Corridor	MODERATE	MODERATE	HIGH	HIGH	MODERATE
International Rail Corridor - line for Jenin	MODERATE	HIGH	HIGH	MODERATE	HIGH
National Rail	MODERATE	HIGH	HIGH	HIGH	LOW



1.2.3 Air Transport Network Environmental/Social Assessment

NTMP envisages the development of a new airport in the West Bank, as the main gateway to West Bank and Gaza Strip (ICAO F), whereas a rehabilitated airport in the Gaza Strip will provide the connectivity with regional hubs, as well as a domestic shuttle route to/from the new airport in the West Bank (ICAO C). A buffer zone with a radius of 5 km is considered to assess the impacts on the population.

For more details, refer to: ¶IV.3 – Air Transport

Tab 6. Air Transport Infrastructure Environmental/ Social Assessment Matrix

	Natural Resources	Water Resources	Agricultural	Population	Cultural Heritage
New Int'l Airport Jericho North (option1)	LOW	LOW	LOW	MODERATE	NOT SIGNIFICANT
New Int'l Airport Jericho South (option 2)	HIGH	LOW	LOW	LOW	HIGH
GZA Int'l Airport	NOT SIGNIFICANT	LOW	LOW	HIGH	NOT SIGNIFICANT

1.2.4 Maritime Transport Network and Logistics Environmental/ Social Assessment

NTMP proposes the implementation of a new commercial port in Gaza Strip and two main freight and logistic platforms, one in West Bank (Damyeh) and one in Gaza Strip (Al Nouseirat/New Gaza Commercial Port). A buffer zone with a radius of 1 km is considered to assess the impacts on the population.

For more details, refer to: ¶IV.4 – Maritime Transport and ¶6 – Logistics, BCPs and West Bank – Gaza Strip Corridor.

Tab 7. Maritime Transport and Logistics Environmental/ Social Assessment Matrix

	Natural Resources	Water Resources	Agricultural	Population	Cultural Heritage
Freight and logistic platform (transit point) border with Jordan	HIGH	MODERATE	HIGH	LOW	LOW
Gaza Strip freight and logistic platform (transit point)	NOT SIGNIFICANT	LOW	HIGH	HIGH	NOT SIGNIFICANT
Gaza Strip New commercial port	HIGH	HIGH	MODERATE	HIGH	NOT SIGNIFICANT



2 Motor Vehicle Policy

2.1 Air Pollution

Air pollution effects on human health and the environment are well known, confirmed by scientific studies and by major institutions such as the World Health Organization², which highlights adverse effects even at concentrations below the standards adopted, for instance, by the European Union. In this regard, the international report from the Agency for Research on Cancer, classifying air pollution as a human carcinogen factor, is to be considered along with the recent WHO guidelines on air quality. Moreover, it is noteworthy that OECD (Organization for Cooperation and Economic Development) has already declared that air pollution is likely to become, by 2050, the first environmental cause of mortality worldwide, surpassing the unhealthy waters and lack of hygiene services.

The relevant legislation in the European Community for the protection of air quality is the Directive "framework" n. 2008/50 / EC of the European Parliament and of the Council of 21 May 2008³ and other directives on emission sources or on individual pollutants.⁴

European legislation suggests the adoption of standards on vehicle emissions identified with the "Euro- "caption followed by a number. This standard classification defines the maximum emissions of the motorized vehicle, measured in g/kWh for heavy commercial vehicles and, in g/km for other vehicles. Since these standards have come into force, European market has been more and more characterized by the presence of energy efficient and less polluting vehicles, design and produced according to new technologies. The overall result was a significant reduction in vehicle emissions in Europe over the last 40 to 45 years.

Concurrently, more international resources were identified in the spread of diesel vehicles, a major cause of non-compliance with air quality limits.

In the Communication "A Clean Air for Europe Program"⁵ it is noted that these intended reductions by successive generations of "Euro" norms and standards on fuel quality, have been achieved with the exception of NOx emissions from diesel light commercial vehicle engines. Additionally, according to some scientific studies, emissions from diesel are quantitatively and qualitatively more dangerous to human health than the combustion of gasoline or natural gas. Therefore, the technological renovation of diesel vehicle fleet is not sufficient to achieve substantial environmental benefits, and many countries are taking measures to the progressive replacement of diesel vehicles, at least in urban areas, with other vehicle, using environment-friendly fuels (low-emission NOx, PM10, CO2, VOCs).⁶

Figure 1. Ratio of NOx emissions measured on the NEDC and more representative CADC cycles for different vehicle Euro categories and engine technologies⁷

²http://www.who.int/phe/health_topics/outdoorair/outdoorair_aqg/en/

³http://europa.eu/legislation_summaries/environment/air_pollution/ev0002_it.htm

⁴<http://ec.europa.eu/environment/air/legis.htm>

⁵http://ec.europa.eu/environment/air/clean_air_policy.htm

⁶ For other measures see the publication: Explaining road transport emissions - A non-technical guide, EEA, 2016.

⁷ source: Explaining road transport emissions - A non-technical guide, EEA, 2016

Ratio CADC/NEDC	Euro 0	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6
PETROL 	1.07	1.38	1.88	1.62	1.96	1.50	n.a.
DIESEL 	1.22	1.13	1.64	1.88	3.16	3.52	4.80

2.2 Green House Gas Emissions

Regulation (EC) No 443/2009 of the European Parliament and of the Council of 23 April 2009 defines the performance standards for greenhouse gas emissions for new cars within EU integrated approach to reduce CO₂ emissions of light vehicle. The Regulation identifies a target for new sold cars CO₂ emissions in 130g CO₂/km. The obligations for manufacturers was applied with progressive rates from 2012 (at least 65% of the fleet) up to 100% from 2015. It also introduced a quality objective of 95g CO₂/km to be reached by 2020.⁸ It is suggested to:

- Introduce appropriate standards for CO₂ emissions for all motor vehicles, if necessary supplemented by the energy efficiency requirements to take into account all propulsion systems (referring to EU standards);
- Label vehicles with regard to CO₂ emissions and fuel consumption.

Usually, the decarbonisation of transport sector requires not just technological solutions, but also policies that stimulate significant behavioural changes, including the correct pricing of transport externalities and planning approaches that stimulate the use of sustainable modes of transport.⁹

2.3 Noise Pollution

Road traffic noise, both within and outside urban areas, is still the most important source of environmental noise in the EU and in many other countries. Around 125 million people were potentially exposed to noise levels exceeding 55 dB Lden in 2012 in EU. The latter has approved a specific regulation that aims to improve environmental protection and public safety and to ensure a better quality of life and health for people in the EU by reducing major sources of noise caused by motor vehicles. It does so by setting out the administrative and technical requirements for the EU approval of all new vehicles of certain categories¹⁰ with regard to their sound level and for the approval of the replacement of silencing systems and related components;¹¹ Manufacturers should ensure that vehicles, are designed, constructed and assembled so as to enable the silencing systems, when in normal use, to comply with this

⁸Refer also to the following reports: "Monitoring the CO₂ emissions from new passenger cars in the EU: summary of data for 2013" and "New cars' CO₂ emissions well below Europe's 2015 target" edited by European Environment Agency.

⁹cf. Evaluating 15 years of transport and environmental policy integration — TERM 2015: Transport indicators tracking progress towards environmental targets in Europe, edited by EEA

¹⁰ Referred to in Article 2 of and Annex II to Directive 2007/46/EC

¹¹Regulation N. 540/2014 on the sound level of motor vehicles and of replacement silencing systems, and amending Directive 2007/46/EC and repealing Directive 70/157/EEC



Regulation. EU has approved other regulations that regard different noise sources (aircraft noise, railway noise, etc.), that can be a reference.¹²

Over past decades, a number of approaches were developed to mitigate noise pollution. Noise emissions can be reduced at source (i.e. via measures relating to vehicles, tires, road surfaces and traffic management) or by reducing the exposure of people to means of anti-propagation or insulation measures (i.e. by increasing the distance between source and recipient, through better insulation of buildings and constructing noise barriers). Following that, most EU regulations focus on mitigating at source.

Road Transport

Measures at source level are often considered the most cost-effective and examples include:

- Establishing limits for the noise of vehicle engines and exhausts;
- Promoting quieter tires;
- Developing low-noise road surfaces, such as thin-layer, double-layer, porous and poro-elastic pavements.

If the desired degree of noise reduction cannot be achieved through source measures, other measures that reduce noise at the receiver's end can be necessary.

These include installation of road- or rail-side noise barriers and insulation of dwellings. On average, noise barriers reduce noise levels by 3–6 dB(A), depending on their design and height. Roadside noise barriers are most suitable for motorways and other bypass roads where there is no need for pedestrians to cross. On busy urban streets, which are crossed by pedestrians along their entire length, noise barriers cannot be placed directly on the kerb, for this reason solutions for extra-urban contexts are often provided.

Road noise can also be reduced by improved traffic control and planning, to influence the traffic speed and/ or flow. Indeed, limiting traffic speed reduces its noise, especially between 50 and 80 km/hour.

Traffic management measures typically involve only limited investments and have a direct effect, because of their limited implementation time.

Rail Transport

The most cost-effective measure to reduce railway noise is tackling noise at source, in this case through the retrofitting of freight wagons, usually noisy and operating at night, with composite brake blocks. In 2015, a new regulation establishing incentives to encourage rapid retrofitting, agreed on the technical specification for interoperability relating to the subsystem 'rolling stock' aiming to reduce the noise emitted by existing vehicles.

Air Transport

Aircraft noise has its own specific features, and it is not comparable to the principles and problems of addressing noise from road and rail traffic. Although substantial efforts were done to get new technologies for quieter engines, partly addressed by international regulation, the main current challenge is facing the increasing noise levels, resulting from the growing air transport traffic. Therefore, many mitigation measures focus on optimizing flight operations and improving spatial planning of airports and their expansion.

Operational noise abatement procedures are used at all airports in different forms: noise preferential routes (where aircraft fly over the least populated areas), thrust management (the

¹²See also the Directive 2002/49/EC relating to the assessment and management of environmental noise.



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more thrust, the more noise is generated but the steeper the aircraft may climb) or specific measures on the ground (specific taxi runs or runways).

3 Public Transport Social Benefit Assessment

NTMP proposal for public transport sector includes multi-modal supply, consisting in shared transport services both road and rail-based. *For more details, refer to: ¶IV.6 – Public Transport.* New road-based public transport network shall meet mobility needs determined by Palestinian social and economic structure, including:

- High incidence of youth population that has limited possibilities of the use of private motorized means of travel;
- Growing motorization rate;
- Rules of social behavior that affect female gender (Societal norms contribute to a degree of gender inequality).

An evaluation of the most important social effects of public transport is carried out and presented below:

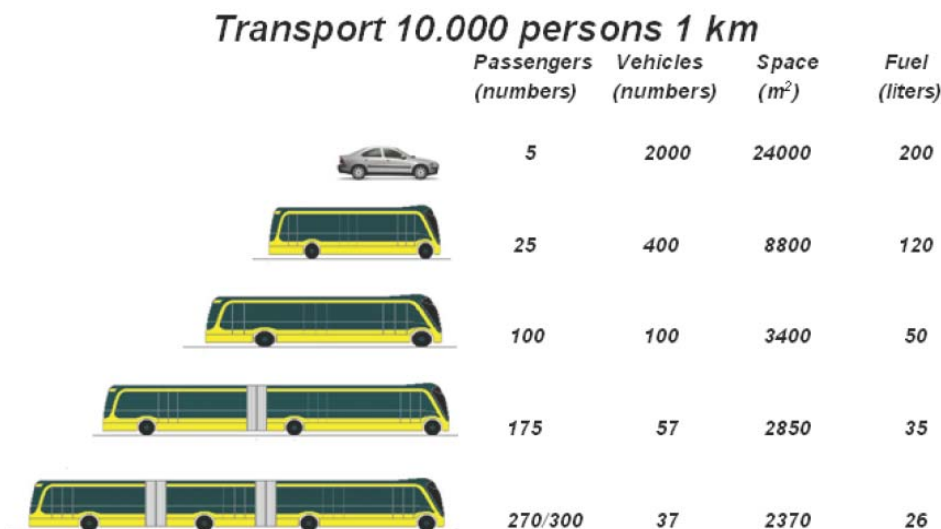
Safety

Implementation of shared public transport allows reduction in accidents. For example, at the European level, 53% of traffic accidents involve a car or taxi, while accidents with bus or coach are almost irrelevant (0.1% on average is involved).

Traffic Congestion Reduction

The graph below illustrates the relationships between private car and coaches for road-based public transport, along with the increased efficiency in fuel consumption.

Figure 2. Demand/Capacity: Private Cars vs Public Transport Buses



Social Inclusion/ Exclusion

Public transport plays a crucial role in exacerbating or mitigating the social exclusion of vulnerable and disadvantaged groups, affecting their access to basic services, as well as employment and social relationships. The negative effects of the transport system on the environment, safety and public health are also likely to affect disadvantaged groups disproportionately.



Tailored Supply

The disadvantaged vulnerable groups present different needs (access to education, work, healthcare, etc.), and are affected in different ways by existing transport barriers. Public transport policies/actions must therefore be specifically tailored to user needs and criticalities.

Accessibility, Safety and Comfort

Accessibility, safety and comfort can be gained through:

- The design of transportation facilities, considering the specific needs of vulnerable groups;
- The safety of public transport,
- The provision of service and pricing structures;
- Innovative solutions for the transport services, activating and coordinating different operators at different levels, to provide integrated and flexible transport services, able to reach different destinations and allow the most vulnerable users to organize both short trips and travel on medium and long distances, also from rural areas and small villages;
- Technological devices to support networking and coordination and improve the efficiency of rail and its flexibility in responding to needs and different mobility patterns at a quite low cost.

Transport Integration

Wider integration of public transport with other modes of transport (for all three service typologies: short, medium and long) and a design of lines and stops consistent with the structure of land use, i.e. location of residential areas, urban services, etc., (especially for short-range routes) can help to promote accessibility by reducing the risk of spatial exclusion.

Facilities Standards and Conditions

Other social sustainability measures of public transport by road (fostering greater social acceptability, promoting widespread use even for the weakest sections of the population), require that the means, the stops and the employee information, have the following features:

- Appropriate size for users of various ages and abilities;
- Protected from climate conditions;
- Safe and comfortable;
- Visible from the immediate surroundings and from the community;
- Without any obstacles for pedestrians and cyclists;
- With current information on the route;
- With enough seating space for all types of users within the development;
- With at least the minimum required urban furniture to allow access to the stop.

Public Awareness

Proper advertising campaigns can increase awareness in the users and make public transport more "friendly". Such a campaign could be accomplished by:

- Creating a brand with recurring advertising, posted on the sides of public transportation vehicles and meeting places of the main users (women and youth)
- Distribution of leaflets about working hours and new initiatives at post offices, supermarkets, schools, cinema ...

Information and Communication Technologies



The use of ICT could lead to greater reliability towards public transport as well as make up for the lack of infrastructure in the most remote areas of the region. Real-time information can be implemented, such as:

- Timetables and routes of public transport;
- Location of accidents in real time with traffic detours;
- User's feedback on public transport lines etc.

These measures would also allow the creation of synergies between users, revealing transportation options of which some users are unaware, despite being in the area where they live. In addition to that, the information sent by users could be very useful for the service providers to reshape the offer.

Peripheral Areas

For more peripheral areas (with lower population density areas, with the presence of small rural villages) heavy investments in information campaigns as well as specific solutions are required; i.e. on-call services, shuttles to the main stops.