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Sustainable Transport Evaluation

Developing Practical Tools for Evaluation in the Context of the CSD Process

Prepared by
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* *The Partnership on Sustainable, Low Carbon Transport is a voluntary, multi-stakeholder partnership of over 50 organizations registered with the Commission on Sustainable Development and committed to working together to promote and facilitate sustainable, low carbon transport in developing countries.*

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About GIZ

The Deutsche Gesellschaft für Internationale Zusammenarbeit - German Development Cooperation - (GIZ) is hosting the Sustainable Urban Transport Project (SUTP). Its main objective is to assist developing world cities achieve their sustainable transport goals, through the dissemination of information about international experience, policy advice, training and capacity building and targeted work on sustainable transport projects within cities

For further information visit www.sutp.org.

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Abstract

Sustainable development balances environmental, social and economic objectives. Sustainable transport planning refers to transport policy analysis and planning practices that support sustainable development. This is important because transport policy and planning decisions can have diverse, long-term impacts. A critical component of sustainable transport planning is the development of a comprehensive evaluation program that evaluates transport system performance based on an appropriate set of environmental, social and economic indicators. This study reviewed existing indicator sets to determine which are most appropriate for sustainable transport planning and policy purposes on an international level. The analysis concluded that there is currently no sustainable transport evaluation process that is suitable and mature enough for processes such as the UN Commission for Sustainable Development (CSD). Although some jurisdictions are starting to establish sustainable transport performance evaluation programs, there are currently no widely-accepted standards, and many countries do not yet collect the basic data needed, particularly in developing regions.

Building on a well established definition of sustainable transportation, this document outlines options for relevant indicators and evaluation schemes. Based on this analysis, we recommend the following actions to develop international guidelines and standards for sustainable transport indicators and evaluation tools:

- Establish a working group tasked with developing a recommended set of sustainable transport evaluation methods, performance indicators, and data standards during CSD 18/19, with a view on endorsement at the Rio Plus 20 Conference in 2012.
- Identify and evaluate existing transport-related data suitable for sustainable transport planning, available from international organizations (e.g. UNFCCC, IEA, IRF, UNDP, ITF, Worldbank etc.). Identify problems with these data sets, including the types of data collected, the geographic areas where they are collected, and the quality and availability of the resulting data. Develop an action plan to quickly begin addressing these problems.
- Following the selection of an evaluation scheme, CSD should task a suitable international body with implementing or coordinating the scheme. This should be an independent professional organization or development agency that has broad stakeholder support and reliable financing.

This program will provide many significant benefits. By establishing international guidelines and standards for transport-related data, indicators and evaluation practices it will avoid duplications and help create data sets suitable for tracking and comparing performance towards chosen sustainability goals. This will help individual jurisdictions identify problems and evaluate potential solutions. It will help researchers around the world better understand the ultimate impacts of transport policy and planning decisions. Furthermore, the scheme could be used for aligning transport-related projects of international donors according to such goals.

1. Introduction

Established in the aftermath of the 1992 Conference on Environment and Development in Rio de Janeiro, the UN Commission for Sustainable Development (CSD) is coordinating and implementing the Agenda 21, which calls for reorienting policy towards sustainability. Following the World Summit on Sustainable Development (WSSD) in Johannesburg in the year 2002, the work of the CSD is structured in thematic two-year cycles, during which three to six specific topics are treated. Each cycle is divided in one year for the evaluation of progress and one year for the formulation of policy recommendations. The transport sector is one of the focus topics of the CSD process during 2010/2011 (CSD 18/19).

The evaluation year 2010 (CSD 18) has shown that there is no accepted single definition of sustainable transport and especially its measurement in terms of indicators. Hence, the paper aims at giving an overview on available approaches and providing ideas how the evaluation of sustainable transport could be organized at international level. Rather than outlining indicators, the paper focuses on ways how to embed indicators into decision-making. Thereby the paper is a contribution to the Partnership for Sustainable Low Carbon Transport (SLoCaT). The partnership of more than 50 organizations worldwide is actively following the CSD Process on Transport in 2010/11 (for details see www.slocat.net and CSD18 background papers 'Policy options for Transport' and 'The Improvement of Developing Country Transport Data Collection, Analysis and Dissemination' at http://www.un.org/esa/dsd/resources/res_docucsd_19.shtml).

The paper is financed by the German Federal Ministry for Environment and Nuclear Safety (BMU). The Ministry is co-ordinating the sub group on transport of the Working Party on International Environment Issues (WPIEI) within the European Union which is the coordinating body for CSD conferences. In this context, the Ministry has asked GIZ to conduct a review of existing concepts and provide an input for further discussion.

This document is structured along the following **key questions**:

- *What is sustainable transportation?*

  Chapter 2 introduces a multidimensional definition based on earlier, widely recognized work.

- *Why do we need indicators to measure sustainability?*

  Chapter 3 gives a quick introduction to some of the most important challenges in the transport sector. It outlines the relevance of indicators to identify unsustainable trends in transportation and the possible benefits of an evaluation scheme.

- *What are suitable indicators and evaluation methods?*

  Chapter 4 focuses on basic requirements for suitable indicators and the different methodological options for moving beyond a set of descriptive data towards a proper evaluation scheme.

- *What are strengths and weaknesses of existing concepts for measuring sustainability in the transport sector?*

  Chapter 5 provides a review of selected existing concepts dealing with the measurement of sustainability in the transport sector. Both basic indicator sets as well as performance measurement schemes are included. The concepts are then

analysed with regard to issues such as scope, applicability and the dimensions of sustainability covered.

- *How to implement an international evaluation scheme?*

  Chapter 6 concludes and deals with possible next steps and the role of international stakeholders for establishing, implementing and financing a global evaluation scheme for sustainable transport. It also outlines the possible role of such a scheme to align projects of international development co-operation with national development goals for sustainable transportation.

2. Sustainability in the transport sector

A necessary first step before embarking on further analysis is to define what sustainable development in the transport sector actually means. A wide range of different concepts has been proposed. While the seminal work on sustainable development of the WCED (1987, 43) emphasized the inter-generational dimension ("[...] meet[ing] the needs of the present without compromising the ability of future generations to meet their own needs"), most concepts for sustainable transport currently focus on intra-generational aspects of equity and welfare. The long-term perspective is nevertheless present in many approaches, e.g. when dealing with the contribution of the transport sector to climate change. Essentially, measuring sustainable transport is about measuring enhancements in the sustainability of transport.

Considering the various negative effects of transportation, a definition of sustainable transport with special reference to developing countries should include social, environmental and economic dimensions. In addition, as a fourth dimension, reflecting the experiences in implementing the Agenda 21 on a local level (UBA 2005), the process towards a sustainable transport system should be participative and involve not only key stakeholders, but also the general public.

Box 1: Definition of sustainable transport

A more sustainable transportation system is one that:

- Allows the basic access and development needs of people to be met safely and promotes equity within and between successive generations. (**Social dimension**)
- Is affordable within the limits imposed by internalization of external costs, operates fairly and efficiently, and fosters a balanced regional development. (**Economic dimension**)
- Limits emissions of air pollution and GHGs as well as waste and minimises the impact on the use of land and the generation of noise. (**Environmental dimension**)
- Is designed in a participatory process, which involves relevant stakeholders in all parts of the society (**Degree of participation**).

Source: Adapted from CST 2005

In conclusion, low-carbon, **sustainable transport** reduces short and long term negative impacts on the local and global environments, has economically viable infrastructure and operation, and provides safe and secure access for both persons and goods.

Source: Dalkmann and Huizenga 2010

Based on a concept developed by the Toronto-based Centre for Sustainable Transportation, which has been adopted by the European Conference of Transport Ministers (ECMT) and numerous other relevant international organizations (CST 2005), we define sustainable transport as follows (Box 1).

3. The need for sustainability indicators

Sustainability in transport is a widely acknowledged necessity due to negative environmental, social and economic impacts of movements of passengers and goods. Key challenges correspondent to the need for a sustainable transport system and are outlined in Box 2. Tackling one of the problems often yields significant co-benefits, as many of them tend to reinforce each other. In order to identify the impact of transportation on the various issues and provide a basis for policymaking and awareness raising, indicators are needed. As defined in the European COST 356 project (COST 356, 2010, 28), *"an indicator is a variable, based on measurements, representing as accurately as possible and necessary a phenomenon of interest"*, i.e. sustainable transport. One may thereby further distinguish between indicators measuring progress in establishing a more sustainable process (outcome), and indicators that measure results (outputs) of actions by governments to contribute to that.

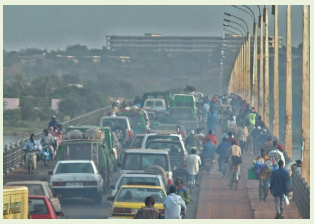
Box 2: Key challenges in the transport sector

Air pollution

Transport activities generate a wide range of emissions that influence air quality on a local level. They have various detrimental effects on human health and the environment. This includes, among others, Nitrogen Oxides, volatile organic compounds (VOC), Particulate Matter (PM) and Lead.

Climate change

Transportation plays a significant role in global GHG emissions, with most of its share originating from burning of fossil fuels. The largest contributor by far is freight and passenger road transport. Overall, transportation is responsible for 13% of global GHG emissions and 23% of energy-related CO2 emissions. Industrialized countries are currently the main contributors for overall GHG emissions, but 80% of projected increase until 2030 is related to road transport in developing countries, mainly the countries with emerging economies like e.g. China.



Congestion

Unsustainable transport systems trigger significant negative effects for national economies and the society. Congestion causes a significant amount of time lost which could have been used for other purpose, and increases operating costs e.g. for vehicle owners and freight operators.

Energy intensity and natural resource consumption

Current projections for global freight and passenger transport growth under a business as usual scenario show that much of the increase in transport activities will be in the most energy intensive modes like aviation, private motorized transport and road freight. This runs counter to the principles of sustainable production and consumption, which, amongst others, call for a significant increase in energy efficiency to limit the need for natural

resources.

Energy security

Current transportation relies heavily on fossil fuels. Volatile world market prices, the generally rising costs of crude oil and the limited number of supplier countries pose significant threats for energy security especially in the developing world.

Equity of access

Both in urban and rural areas, people depend on affordable transportation for access to employment and markets, schools and health care. A transport system increasingly centred on motorized individual transport reduces such access for low income groups. This seriously reduces equity, and impairs efforts for poverty reduction in developing countries.

Habitat fragmentation and land consumption

Transport infrastructure is a major cause for the partition of ecosystems and/or habitats of plant and animal populations into smaller, more isolated units. Disturbance and killing of animals is a common concern, but in the long run even essential ecosystem processes can be influenced as populations of individual species become separated. In addition, the land consumption of transport infrastructure is an increasing problem especially in urban areas. The huge area taken up by roads and rails already reduces valuable urban space otherwise available for living, recreation and businesses.

Noise

Traffic noise has severe impacts on health and quality of life not only in cities, but anywhere near major transport infrastructure. Exact figures on the extent to which the population is affected by traffic noise are currently very limited even in Europe.

Road safety

Road traffic accidents are likely to become the 3rd important cause of deaths and injuries by 2030. Victims include a large number of pedestrians and cyclists, especially in developing cities. On the other side, many developed countries have succeeded in significantly reducing the number of people injured and killed in road traffic. In addition, accidents incur a dominant share of overall external costs of transportation on the society, such as the costs related to medical care for the victims.

Source: Extended overview based on GTZ 2009 and Van Bohemen 1998. Pictures: (c) GIZ

Although indicator schemes exist for various cities, countries and regions (see also section 4) international processes like CSD cannot refer back to a comparable evaluation scheme on a global level. In addition, most of the developing world lacks the necessary data for indicators and/or has not yet defined sustainability goals in transport.

The evaluation of the sustainability of a national transport system provides benefits for countries participating in a scheme. The following six categories summarize advantages of evaluation schemes on a national level. They are ordered from very general to rather specific and more conflicting benefits:

1. **Identification of challenges:** As outlined in Box 2, transportation has numerous potential impacts on sustainability. Specific impacts are of varying importance in individual countries. Whereas the contribution of the transport sector to GHG emissions and environmental destruction is a key challenge in many developed countries and emerging economies, less developed countries may worry more about the accessibility of transportation for the poor or the high number of road traffic fatalities. A consistent and comparable evaluation of different indicators enables both official stakeholders and the public to identify the major challenges towards achieving sustainability in the transport sector.
2. **Transparency and information:** A common definition of sustainable transport facilitates benchmarking but also multilateral negotiations e.g. on climate, environment or energy issues. Measurement, Reporting and Verification (MRV) has gained increasing importance e.g. in financing schemes such as the Global Environmental Facility (GEF) and funds of multilateral development banks. A reliable panel database of relevant indicators enables recipient countries to prove progress towards defined targets to donor parties. On a more local level, an internationally driven effort to provide necessary data will help those who are dealing with the more immediate (negative) effects of transportation. For example, transport planners and engineers require good information on transport facilities and activities, and public health officials rely on sound data on traffic casualties or pollution exposure.
3. **Knowledge transfer:** Evaluation schemes identify parties with high performance (e.g. low number of road fatalities, low carbon intensity, ...). Countries can therefore learn from others, especially from countries with a similar stage of development, what are good practices and what can be done to improve sustainability.
4. **Policy target setting:** Countries that choose to establish a sustainable development strategy for transportation may use a set of indicators for sustainable transport and define objectives which they can strive to reach. They can refer such targets in national transport and development policies. Once targets are set, the indicators can serve monitoring process towards sustainability. Countries can control whether political measures contribute to progress towards sustainability goals. If necessary, they can readjust their concepts.
5. **Gaining competitive advantages:** Countries (especially emerging economies) can present themselves in comparison to others to prove their attractiveness as a location for economic activities and as a safe and convenient place to live. This issue is even more important for evaluation schemes on an urban level, as cities worldwide are already facing increasing competition e.g. as location for business headquarters, exhibitions and numerous other activities. Singapore is a good example for such an active marketing of the well-performing transport system.
6. **Linking international standards with local action:** Broad international guidelines for evaluating sustainability in the transport sector may inspire local initiative. Setting derived and/or additional individual indicators at the local level can help to improve

local governance and networking by initiating dialogue between multiple stakeholders.

With regard to the CSD process where countries with rather diverse conditions are involved, a ranking along indicators would probably only motivate forerunners to take part and is less attractive to those who are less developed. Hence, the aim of any evaluation scheme under the CSD would not be to explicitly compare performance (see point 5) but:

a. to see whether the past developments and trends on global scale are positive and directed towards a sustainable development; and
b. to learn from others in order to strive for policies and measures that are able to trigger a more sustainable development.
c. to discuss more specific policy targets under the CSD that may inspire governments and negotiators for using the CSD as a platform for discussing the future of transport systems.

3. Sustainability indicators and evaluation schemes

A set of indicators is able to describe a current situation. If data are collected repeatedly, it can even illustrate trends. However, they are not able to determine the sustainability of a transport system. As Gudmundsson (2003, 209) points out: “With no benchmark, how would we know if systems are sustainable or not?” Such benchmarks are related to the framework the sustainability indicators are used in, e.g. policy targets, labels or audits (see section 4.2).

An example would be the average particulate matter (PM) concentration in cities above 500.000 inhabitants. However, this value alone does not provide much information on whether the level of local air pollution can be considered a problem or not. Then, the PM concentration needs to be compared against a benchmark, e.g. – in this case a global policy target – the recommended maximum value according to WHO guidelines. This reveals whether the current situation is unsustainable with regard to the impact on human health.

While benchmarks are highly desirable, they may not be available or even definable for every aspect. Still, indicators can be important for comparison reasons.

3.1. What are suitable indicators of sustainability?

Indicators must be accurate but easy to measure, acceptable but not influenced by interests, measurable, timely and understandable. Annex I lists typical characteristics a good performance measure (or indicator) should possess. Some of them are based on technical or scientific conditions, others are related to the intended use as a tool e.g. for policy-making and information. In practice, most indicators lack at least a few of the requirements. This also shows the challenge to define appropriate indicators for describing complex processes like sustainable development in the transport sector.

With regard to a possible global scheme to assess sustainability in transport, it is worth pointing out few key issues.

1. Indicators should cover all dimensions of sustainability (social, environmental, economic and governance). At the same time, they must be limited in number in order to keep necessary international efforts on large-scale surveys and measurement on a realistic level. This poses serious challenges regarding the credibility of any set of indicators, which must be “scientifically valid, accurate and precise” (Gudmundsson 2010). Furthermore, it is desirable to achieve a certain compatibility with other global indicator schemes (WHO, CSD main indicator set) and to complement such sets with additional transport-specific indicators.
2. In order to avoid problems with acceptance of indicators, they must be selected in a participatory process involving experts and policymakers from participating countries. Especially in the context of CSD, no party can be forced to provide necessary data. The willingness to take part in the effort to measure sustainability in the transport sector is likely to decrease significantly without a thorough consultation process.
3. It is important that indicators correspond to underlying sustainability goals derived from the chosen definition of sustainability in transportation. Otherwise they do not contribute to assess progress towards sustainability and to serve policy purposes.
4. Although quantitative indicators are easier to compare across a large sample of countries, there is a need for additional qualitative information and interpretation. This refers especially to the institutional environment. Sustainability is a forward-looking concept, and today’s policy determines the future shape of the transport system. The existence of governmental institutions dealing with sustainability topics and the incorporation of the latter e.g. into transport planning is therefore an important indicator for sustainability itself, which can probably be captured only through qualitative research and stakeholder interviews.

Efforts to derive a suitable set of indicators for sustainable transportation have been numerous during the past years (for details, see section 5). Table 2 shows what a set of suitable indicators in the CSD context could look like. It is certainly beyond the scope of this document to present a definitive choice. Rather, our aim is to emphasize some issues that need attention when choosing suitable indicators, as already outlined above. In addition to the different dimensions of sustainability, a distinction between different levels of indicators is used to categorize them. Performance indicators are those which measure the degree to which actors like governments contribute to a more sustainable transport systems through relevant policies. An example is the introduction of an adequate minimum taxation for fossil fuels, which is expected to trigger desirable behavioural changes (reducing number and length of trips, switching to alternative modes, etc.). Outcome indicators measure the more immediate result of better policies, which in turn lead to effects and impact regarding air quality, road safety, climate change, etc. The final category, effect or impact indicators, measure the long term results of better policies.

Table 1: An initial suggestion: Ten key indicators for more sustainable transport

Note: The below list of indicators should be considered as an example to start a discussion and not as a comprehensive suggestion.

Dimension/Indicator	**Underlying sustainability goal**	**Indicator type**	**Current availability of data**
Environment			
Land consumption by transport infrastructure (as % of total surface)	Avoid sprawl and destruction of the environment by transport infrastructure	Effect / impact	Low
Transport GHG emissions per capita	Reduce transport contribution to climate change	Effect / impact	Medium
Percentage of population affected by local air pollutants (e.g. PM10 concentration, Non-Methane Hydrocarbons [NMHC] emissions, ...)	Reduce detrimental effects on human health and the environment	Effect / impact	Medium
Equity/Social			
Road fatalities	Reduce the number of people killed or injured in road traffic accidents	Effect / impact	High
Modal share of PT/NMT	Foster transport modes that are both accessible for a large part of the population and environmentally sound	Outcome	Medium
Share of transport cost from total household expenditure	Provide affordable transportation for all members of the society	Outcome	Medium
Economy			
Minimum taxation on fuel	Consider the external costs caused by transportation based on fossil fuels (especially road traffic)	Performance	High
Transport investments by mode	Prefer transport modes that are accessible and environmentally sound	Performance	High
PKM/TKM per unit GDP	Decouple economic growth from transport demand	Effect / impact	Medium
Governance			
Participatory transport planning	Involve the public in the decision process for transport policies and projects	Performance	Low

Source: Own compilation, many ideas are based on Slocat/Litman 2010

An important issue is the availability of data. Accessibility to valid data is a key requirement to set up indicators and the data in itself is a valid objective for governance towards a sustainable development. Only if objective and unbiased information is available, informed decisions can be taken. Good data on transport helps transport planners to better do their job and more accurately describe what is needed. Only in a second step, the data can be used for evaluating sustainability. However, international processes like the CSD can help to put the data issue on the national agenda and also consider free access and use of data for all organisations and groups.

3.2. Frameworks for indicators

To date, few true benchmarks or target values for sustainability have been developed. An example is the maximum value of 2 tons for average CO2 emissions per person in 2050 as recommended by the IPCC in 2007. Staying below this value is assumed to avoid serious consequences of climate change for future generations, something lying at the very core of the classic sustainability concept. Another example, referring to atmospheric pollutants (SO2, NOx, VOC and NH3), is the NEC Directive of the European Union. It aims at “moving towards the long-term objectives of not exceeding critical levels and loads and of effective protection of all people against recognised health risks from air pollution by establishing national emission ceilings, taking the years 2010 and 2020 as benchmarks” (EU 2010, see http://rod.eionet.europa.eu/instruments/522). National ceilings are differentiated, and member states are required to draft corresponding action programmes and to report regularly on progress. The target values and the reduction scheme used by the EU may be suitable also for a global application.

Such more or less well defined targets based on sound scientific knowledge are difficult to achieve for other dimensions and indicators: Which modal share can be considered sustainable, and does it make sense to set a common target for such diverse countries like Singapore and Canada? But even in such cases, indicators may still be able “to send signals about (un)sustainability, rather than to provide final evidence” (Gudmundsson 2003, 209). A good example is the goal of EU member states to reduce the number of road fatalities by 50% until 2010 (based on the 2001 number of fatalities). Even though it is not possible to define a ‘sustainable’ level of road deaths, it is nevertheless feasible to set an ambitious target value leading towards a relatively more sustainable outcome. As a conclusion, any CSD-based set of transport related indicators needs to be embedded in an official decision on targets or development “directions” for the various indicators.

In addition to such policy targets, there are various ways (frameworks) indicators are used to assess sustainability. Even if these are not directly applicable on global level, the concepts outlined in Box 3 give a good overview how countries could benefit from a definition of indicators on global level to apply schemes within the countries, e.g. for cities. This might be especially interesting for (a) urban transport systems and comparisons of cities and (b) mobility management of companies or other (public) organizations.

Box 3: Frameworks for sustainability indicators

- **Ranking**: A basic, but nevertheless efficient method to illustrate the range of values for any quantitative indicator. An example is the Human Development Index (HDI) country ranking, which has gained high popularity even in the general media. Rankings are also used by some concepts for sustainable transport (see Chapter 6). Without a reference value, an individual rank does usually not provide consistent information about whether the situation the respective indicator is describing can be considered sustainable or not.
- **Benchmarking**: A benchmarking scheme may be described as a tool to compare performance against some kind of reference or target value. Depending on the purpose, this may be the value of the best performer (most common variant found in classic business administration), a predefined policy target, or simply the average value of an indicator. As part of the benchmarking exercise, the reasons for any shortcoming relative to the target value are analyzed. In a final step, a set of measures necessary to reach the goal is created. In a less competitive environment (as assumed for our purpose of sustainability evaluations), this offers a particularly good opportunity for knowledge transfer.
- **SWOT-Analysis:** The analysis of Strengths, Weaknesses, Opportunities and Threats is a rather qualitative tool to assess the current situation and the future challenges of a given system, and to derive adequate policies. The latter follow four principles: Build on strengths, Eliminate weaknesses, Exploit opportunities, Mitigate the effect of threat (EU INNOREF 2005).
- **Audits**: Used for example in international schemes for quality management such as the ISO 9000 series, audits have become increasingly popular. They constitute a systematic and documented process for assessing the accomplishment of certain predefined criteria. Usually checklists are used. The focus is rather on the evaluation of knowledge and the existence of certain procedures than on quantitative measures. Audits may be performed internally, or by external organizations. Successful audits can lead to the certification of a company or organization for certain standards (ISO, Ecological standards etc.). In the context of an international evaluation for sustainability in the transport sector, audits may for example serve to assess the inclusion of sustainability issues in official policies.
- **Labels**: Labels may be considered a possible outcome of some of the above exercises rather than constituting a true evaluation scheme. Organizations (or administrative entities such as cities) can be awarded a label upon fulfilment of certain criteria. An example is the label “Energiestadt” (now also known as European Energy Award, see Horbaty 2010), which rewards cities with sustainable energy policies, or the Chinese “Eco-City” label. Labels often serve consumer information on products rather than evaluating transport systems. In contrast, the EcoMobility Label currently being developed by the SHIFT-Project (www.ecomobility.org/shift/) is exclusively transport-focused and builds on a set of well-defined criteria for more sustainable transportation.
- **Awards**: Similar to labels, awards improve the image of the recipient and help to raise awareness for certain issues. Criteria for awards may be more or less stringent, and often rely on a more qualitative evaluation. For example, for the Sustainable Transport Award (http://www.itdp.org/index.php/sustainable_transport_award/, see also http://www.sutp.org/index.php?option=com_content&task=view&id=2329&Itemid=155&lang=en) an expert panel selects a city with regard to their efforts to improve the sustainability of transport systems. An important difference e.g. to a label or certificate is that awards often include more qualitative indicators and recipients usually have no obligation to continue their efforts after having been rewarded, unless they choose to apply again for the next round of the respective

award.

The above list of possible frameworks for indicators is not meant to be exhaustive. In practice, differences between the concepts are often less clear. The European Energy Award, for example, issues a label while at the same time aiming at providing a benchmark for energy efficiency and fostering the exchange of experiences among European cities. Which concept is suitable for an international evaluation of sustainability in transport will largely depend on the goal pursued by the exercise and on issues such as the data used and the audience addressed.

4. A review of existing concepts in the transport sector

Measuring sustainability is not a new topic. There are numerous approaches in the transport sector. They differ with regard to the definition of sustainability used, the dimensions covered and the level of the transport system they are applied to. However, while most of the concepts develop a set of sustainability indicators, there are less examples for a true evaluation of sustainability. This section reviews selected existing approaches, focusing on those with practical relevance. Most of the schemes examined below are in use or have at least been tested in case studies. A key issue is to identify particular strengths of the approaches, which are highly divers given their respective goals and methodologies.

In Annex II the concepts are presented in fact-sheets with some key characteristics. In addition to a short description of the approach (or project objectives), lessons learnt and a comprehensive list of indicators used, overview tables include the following categories:

- Level (e.g. urban, national, inter-national),
- Type of concept (method for measurement and/or evaluation),
- Responsible body (organization which compiles and publishes the data),
- Target group (actors who use the indicators and/or evaluation),
- Year (project duration/date of publication),
- Reference (a link or publication for further reading).

Based on these fact sheets, Table 2 evaluates the different approaches with regard to compatibility with the definition of sustainable transport in Section 2 and other relevant criteria. The analysis of the approaches includes four dimensions:

- *Main application:* What purpose do the concepts and indicator schemes serve?
- *Dimensions covered:* Do they include all dimensions of sustainability in the transport sector as outlined in our definition in Box 1?
- *Consideration of governance issues:* Static indicators might not capture current efforts towards sustainability. A transport system that seems to be sustainable at the moment may well be moving towards an unsustainable path, and vice-versa. As such developments are only visible over time when using quantitative indicators, it is helpful to consider the current institutional environment. The inclusion of sustainability in relevant policy making indicates the likelihood that the situation will improve over the coming years.
- *Data availability:* Based on research and the experience of GIZ and its partners, this section shows whether the indicators used in the different concepts are available on a global scale or whether significant data gaps will have to be tackled.

Table 2: Evaluation of existing projects/concepts

Project/ concept	Main application						Status	Dimensions of sustainability				Gover-nance	Level	Data availability
	Identification of challenges	Transparency and information	Knowledge transfer	Benchmarking and policy target setting	Monitoring process toward sustainability	Gaining competitive advantages	Current status of implementation (e.g. ongoing, trialled for a limited period, available as preliminary concept only)	Environmental	Social	Economic	Public participation	Considering the institutional environment and current efforts towards sustainability in transport	Level of transport system to which the concept is applied	Availability of indicators on a global level
ADB/PSUTA - Indicators for sustainable transport	✓			✓			Trialled in case studies	✓	✓	✓	(✓)	✓	Urban	Significant gaps
SLoCat Indicators				✓	✓		Preliminary concept	✓	✓	✓	✓	✓	All levels	Large gaps
Urban Transport Benchmarking Initiative	✓		✓	✓			Trial phase terminated	✓	✓	✓			Urban	Significant gaps
EST Bangkok Declaration				✓	✓		Preliminary concept	✓	✓	✓	✓	✓	International (urban focus)	Large gaps
OECD	✓	✓		✓			Ongoing (Core indicators only)	✓	(✓)	(✓)			International	Some gaps
BMU – Local Agenda 21				✓	✓		Trial phase terminated	✓	✓		✓		Urban	Large gaps
The Urban Audit		✓	✓				One-time trial terminated	✓	✓				Urban	Large gaps
TERM		✓		✓	✓		Ongoing	✓	✓	✓		✓	International	Significant gaps
CSD / UNDESA Indicators		✓		✓	✓		Ongoing (last report from 2007)	✓	✓	✓	✓	✓	International	Some gaps
UBA – Indicators for Sust. Transp.					✓		Preliminary concept	✓	✓	(✓)		(✓)	National	Significant gaps
BESTRANS			✓	✓		✓	One-time trial phase terminated	✓		✓			Urban/ Sectoral	Large gaps
CST STPI	✓			✓	✓		Project completed	✓	✓				National	Some gaps
CAI-Asia Clean Air Scorecard	✓	✓		✓			Trial phase ongoing	✓				✓	Urban	unknown
Observatorio de movilidad urbana (OMU)	✓	✓					Ongoing	(✓)	(✓)	(✓)			Urban	Large gaps
UITP Indicators for Sustainability in Public Transportation	✓	✓			✓		Trial phase ongoing	✓	✓	✓	✓	✓	Sectoral	Large gaps

The analysis shows that there is currently no scheme to assess sustainability in transport that can be considered suitable and mature enough to be used on a global scale. At the same time, it should be kept in mind that almost none of the concepts were designed to fulfil such a task. There are many concepts that offer particular strengths, and there is certainly huge potential to learn from good practices. It is notable that most schemes treat sustainability as a multidimensional issue, thus affirming our definition of sustainable transportation presented in Chapter 2. One of the most serious challenges to establish schemes at the global level, i.e. under CSD, relates to the availability of data for indicators. This certainly requires major efforts to collect and process data to finally put life into any indicator approach.

5. Suggestions for further discussion – Towards Evaluation of Sustainable Transport

Given current trends in the transport sector, sustainability is unlikely to be reached unless transport policy is reoriented towards explicit sustainability goals. These goals can become more transparent and progress towards policy goals could be assessed through the use of indicators. Furthermore, indicator schemes are necessary to identify country-specific challenges. However, the lack of an agreed international definition of sustainable transport as well as of necessary data to establish a set of relevant indicators requires multilateral efforts to remedy these shortcomings. With transport being a focus theme in 2010/2011, the CSD and the “Rio plus 20” process offers an opportunity to address the issue. As a final goal, an international scheme is proposed to assess sustainability of transport systems on the national level.

A definition for sustainable transport

As a first step, it is recommended that the CSD acts as a participative platform to internationally agree on an acceptable definition of sustainable transport, and to derive more specific sustainability goals within the 4 dimensions of sustainability. This could build on widely used definitions such as the ones presented in Section 2. Upon development of the definition during CSD 18/19, it may be elaborated and endorsed at the Rio Plus 20 Conference in 2012. This process should involve all stakeholders from member countries to legitimate the outcome. At the same time, although international consensus on a definition of sustainable development applied to transport is imperative, it is important to keep in mind that it is at the local level that further action takes place. International standards should therefore be compatible to local processes and targets.

Selection of indicators and an evaluation method

Based on the selected definition and goals for sustainable transport, corresponding indicators and benchmarks for achieving the goals could be agreed in order to set up a suitable scheme for evaluation or at least presentation of results. While this task may initially look challenging, we note that work can build upon existing experiences. Available definitions and indicators for sustainable transport such as presented in this document may serve as basis for discussion. The widely recognized Bangkok declaration of the Fifth Regional Environmentally Sustainable Transport Forum in Asia (EST, see Factsheet 4) shows that an agreement can be reached even among a large group of stakeholders with diverse interests.

Procedures for the selection of indicators have also been established in the CSD context (see UN 2007, pp.29). Alternatively, approaches of the Global Reporting Initiative (http://www.globalreporting.org/ReportingFramework/SectorSupplements/LogisticsAndTransportation/) or Castillo and Pitfield (2010) may be considered. Professional associations, such as the Institute of Transportation Engineers, the Transportation Research Board, the American Planning Association, and others should be involved in developing and applying sustainable transport indicators.

A keys issue at this stage is to identify and evaluate existing transport-related data available from international organizations (e.g. UNFCCC, IEA, IRF, UNDP, ITF, Worldbank etc.). Problems with these data sets should be identified, including the types of data collected, the geographic areas where they are collected, and the quality and availability of the resulting data. Action can then be initiated to address data gaps (see below).

Building on existing approaches

Several evaluation schemes as presented in section 4 and Annex II provide ample opportunity to learn from good practices and avoid weaknesses identified. In methodological terms, we suggest keeping the task as simple as possible: Indicators and evaluation schemes may be used rather to "send signals about sustainability" (Gudmundsson 2003) than to prove sustainability, something which is unlikely to be conceptually possible in the near future. In addition, a selected set of quantitative indicators plus qualitative information may be more suitable than any composite index, which is likely to be neither conceptually sound nor acceptable for policy purposes.

Implementation

Following the selection of an evaluation scheme, CSD should task a suitable international agency with implementing the scheme. A second option is to establish a co-ordinator between existing agencies. Whatever approach is chosen, it's important that the agency or coordinator is independent and does not involve specific commercial interests and is supported by as many stakeholders as possible. International financing must guarantee this independency.

Besides compiling data from national sources, the implementing agency should provide funds to developing country parties to enable them to conduct necessary surveys and measurements. To keep costs low, linkages with other projects should be explored. Regular household living standard surveys have e.g. become increasingly common in developing countries, and offer the potential to include some relevant transport-related questions.

As for the time frame, CSD could task member countries and the implementing agency to provide necessary data and a first evaluation until the transport sector is to be treated again as a main focus in the CSD thematic cycle.

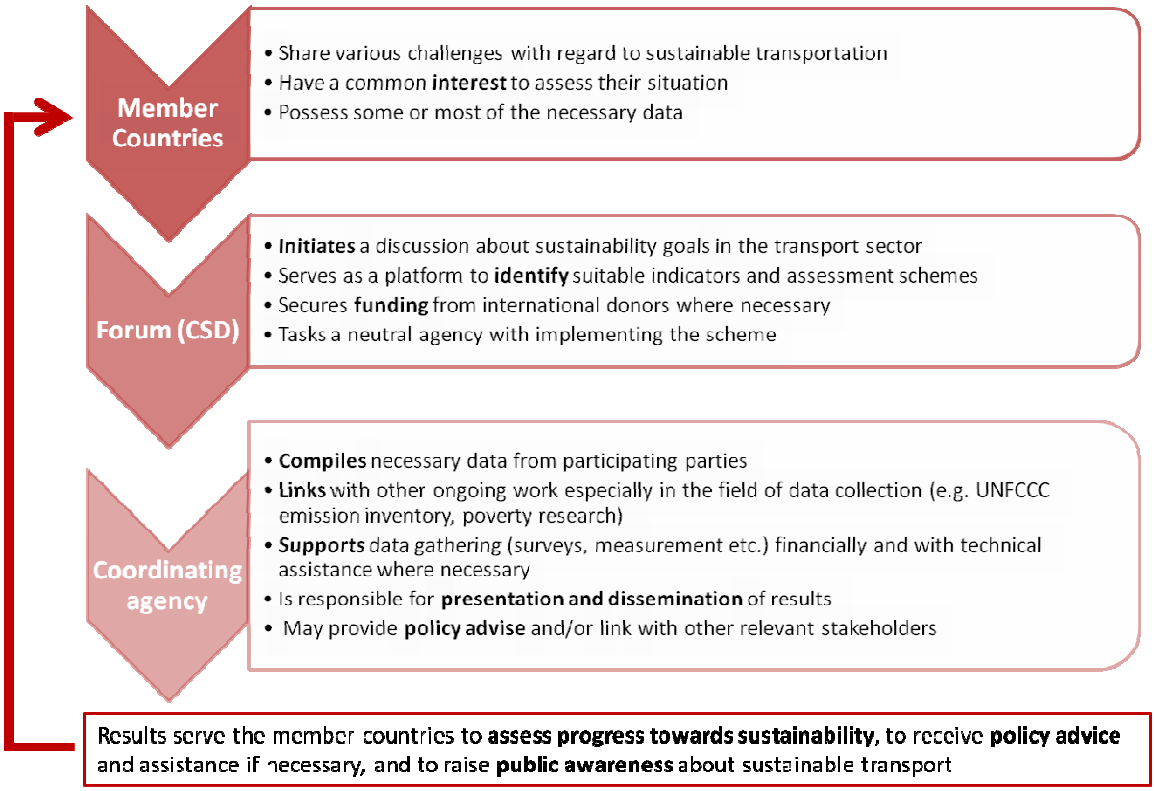
Applicability and benefits of an evaluation scheme

Once established, the evaluation scheme may be used for several different tasks. As already discussed in Section 4, CSD member states will benefit from the possibility to identify their specific challenges, enabling them to reorient their policy based on objective measurement, and to assess progress towards chosen sustainability goals. As the number of CSD members is limited to only 53, with varying countries taking on three-year-memberships, it will be necessary to find a way for establishing the scheme among a wider range of

countries. The impact of the evaluation scheme may not be sufficient, especially with regard to global challenges such as climate change, if major economies are not part of the effort.

In addition, the indicators used in an evaluation scheme may be used by donors – esp. multilateral development banks – to make sure their funds contribute to projects that foster sustainable transport. This would require from banks to relate to CSD indicators when they approve transport projects, and e.g. ADB's "Sustainable Transport Initiative" (http://www.adb.org/Media/InFocus/2009/sustainable-transport.asp) may be an interesting case for testing such an approach. An audit scheme could be based and linked to the international agreed goals and benchmarks and prove that projects contribute to the overall objective. Establishing a scheme for evaluation of progress towards sustainable transport will also help researchers around the world better understand the ultimate impacts of transport policy and planning decisions. Last, but not least an evaluation scheme may evolve into a powerful tool to raise public awareness about the subject of sustainable transportation.

Figure 1: Process for establishing an international evaluation scheme



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Annex I Attributes of a Good Performance Measure

Quality	Explanation
Able to discriminate	Must be able to differentiate between the individual components that are affecting the performance of the system
Able to integrate	Must be able to integrate the sustainability aspects of environmental, social, and economic sustainability
Acceptable	The general community must assist in identifying and developing the performance measures
Accurate	Must be based on accurate information, of known quality and origin
Affordable	Must be based on readily available data or data that can be obtained at a reasonable cost
Appropriate level of detail	Must be specified and used at the appropriate level of detail and level of aggregation for the questions it is intended to answer
Have a target	Must have a target level or benchmark against which to compare it
Measurable	The data must be available, and the tools need to exist to perform the required calculations
Multidimensional	Must be able to be used over time frames, at different geographic areas, with different scales of aggregation, and in the context of multimodal issues
Not influenced	Must not be influenced by exogenous factors that are difficult to control for, or that the planner is not even aware of
Realistic	Within the availability of resources, knowledge and time
Relevant	Must be compatible with overall goals and objectives
Sensitive	Must detect a certain level of change that occurs in the transportation system
Show trends	Must be able to show trends over time and provide early warnings about problems and irreversible trends
Timely	Must be based on timely information that is capable of being updated at regular intervals
Understandable and specific	Must be well defined, understandable and easy to interpret, even by the community at large

Source: Extended overview based on Texas Transportation Institute 2002, 24

Annex II Introduction to approaches on measuring sustainability

Factsheet 1 - ADB Indicators to measure sustainable transport

Type of concept	Indicator set
Level	Urban
Responsible body	Asian Development Bank / Partnership for Sustainable Urban Transport in Asia (PSUTA)
Target group	Stakeholders in Asian cities; Case Studies in Xi'an, Hanoi and Pune
Year	2004-2006
Status	Trialled in case studies
Link	http://www.cleanairnet.org/caiasia/1412/articles-58616_final.pdf
Approach	The project aimed "to help municipal decision makers to better understand the sustainability, or lack of it, of their urban transport systems, and to develop more structured and quantified approaches to policy making" (ADB 2006).
Description and lessons learnt Based on a framework for sustainable transport developed by PSUTA, the definition of indicators was handled in a decentralized manner: The three partner cities Xi'an (PRC), Hanoi (Vietnam) and Pune (India) each reported a set of indicators which were deemed relevant and for which the necessary data were available in the respective local context. The goal "was not a complete set of numbers, rather a recognition of which indicators counted the most for good policy development and a strategy to get the information required for those indicators" (ADB 2006). An important outcome was the identification of major data gaps in the three cities. The decentralized approach of this concept is especially noteworthy, as it involved numerous local stakeholders and thus increased acceptance of the indicator set, which of course is a challenge for comparability. Another important point is the focus on governance found in the sustainability framework. It highlights the relevance of current municipal transport policy for future progress towards sustainability – an issue difficult to capture by using only static, quantitative indicators.	
Main application	[✓] Identification of challenges [ ] Transparency and information [ ] Knowledge transfer [✓] Benchmarking and policy target setting [ ] Monitoring process toward sustainability [ ] Gaining competitive advantages
Dimension of Sustainability	[✓] Environmental [✓] Social [✓] Economic [0] Public participation The scheme is considering the institutional environment and current efforts towards sustainability in transport
Availability of data on a global level	Significant gaps
ADB Indicators to measure sustainable transport	- Minutes lost per person/ per km per day due to congestion - Deaths per 1 million kilometre of vehicle use - Days exceeding AQ limits - Transport industry profitability - Transport costs as share of household budget

	- Ability to measure and control traffic flow - Existence of road safety and air quality laws - Fuel quality and emission standards

Factsheet 2: SLoCat Initiative: Sustainable, Low Carbon Transport - Definition, Goals, Objectives and Performance Indicators

Type of concept	Indicator set
Level	On all levels
Responsible body	- not defined -
Target group	- not defined -
Year	2010
Status	Preliminary concept
Link	http://www.slocat.net/wp-content/uploads/2010/12/SLoCat-2010-Sustainability-and-Livability-Summary-draft.doc
Approach	Based on earlier work by Todd Litman (see reference section), the concept of SLoCat provides a consistent formulation of sustainability goals and probably one of the most comprehensive lists of indicators available to monitor progress towards such defined targets.
Description and lessons learnt The concept covers all relevant dimensions of sustainability and includes possible measures of governance. While the very large number of indicators implies serious challenges with regard to data availability, the concept may well serve as a menu from which to choose suitable items for a more confined, internationally applicable set.	
Main application	[ ] Identification of challenges [ ] Transparency and information [ ] Knowledge transfer [✓] Benchmarking and policy target setting [✓] Monitoring process toward sustainability [ ] Gaining competitive advantages
Dimension of Sustainability	[✓] Environmental [✓] Social [✓] Economic [✓] Public participation
Availability of data on a global level	Large gaps
SLoCat/Litman Indicators to measure sustainable transport	- Per capita GDP - Transport budget and road taxes - Efficiency of road, parking, insurance, and fuel prices (prices reflect full economic costs. - Access to education and employment opportunities. - Support for local industries. - Transport efficiency of freight and commercial passenger transport. - Per capita transport energy consumptionEnergy consumption per ton/kilometer - Per capita use of imported fuels. - Availability and Quality of affordable modes (walking, cycling, ridesharing and public transport). - Portion of low-income households that spend more than 20% of budgets on transport. - Results of performance audits - Service delivery unit costs compared with peers - Economic viability of transport operations (specifically public transport operations). - Prices reflect economic as well as social and environmental costs - Transport system diversity. - Portion of transport system that is universal design. - Portion of destinations accessible by transport services that reflect universal design. - Participation of women, elderly and children in transport systems design - Per capita traffic casualty (injury and death) rates. - Traveller assault (crime) rates. - Human exposure to harmful pollutants. - Portion of population that makes use of active transport modes - Land use mix. - Walkability and bikability - Interconnectivity of transport modes

	- Quality of road and street environments. - Preservation of cultural resources and traditions. - Responsiveness to traditional communities. - Accessible entertainment and arts - Cultural interchange - Per capita emissions of global air pollutants (CO2, CFCs, CH4, etc.). - Transport infrastructure and operations affected by climate change - Per capita emissions of local air pollutants (PM, VOCs, NOx, CO, etc.) - Air quality standards and management plans - Health impacts - Traffic noise levels - Noise standards and noise management - Occurrences of fuel leaks - Management of used oil, leaks and stormwater. - Share of impervious pavements - Portion of land paved for transport facilities. - Per capita land devoted to transport facilities. - Support for smart growth development. - Policies to protect high value farmlands and ecological habitat. - Share of open spaces - % recyclable materials in production process of vehicles - % recyclable materials in infrastructure - Per vehicle/mode/object non-recyclable/recyclable materials ratio - Mandates, staffing, budgets - Policy instruments - Capacity of institutions to implement sustainable transport principles - Planning considers all significant objectives, impacts and options. - Transport funds can be spent on alternative modes and demand management programs if most cost effective and beneficial overall. - Availability of planning information and documents - Portion of population engaged in planning process

Factsheet 3: Urban Transport Benchmarking Initiative

Type of concept	Indicator set + Ranking
Level	Urban
Responsible body	European Commission, Directorate General for Energy and Transport
Target group	European Cities
Year	2003-2006
Status	Trial phase terminated
Link	http://www.transportbenchmarks.eu/
Approach	The key goal of this EU-funded project was to "compare the transport systems of the participating cities in order to identify and promote interesting practices in urban transport" (UTBI 2006). Numerous stakeholders in participating cities were involved, and a total of 44 cities provided information on the selected common indicators during the course of the project.
Description and lessons learnt The results of the exercise are presented in the form of a ranking for each individual quantitative indicator, comparing cities with similar characteristics. The working groups established gathered more qualitative and in-depth information on specifics topics such as cycling or public transport organisation and policy. Their goal was not "creating a set of 'winners' and 'losers' [...], because it may dishearten those perceived to have 'bad practices', whereas these groups of participants probably have the most to gain from this type of project" (UTBI 2006). Best practices therefore were loosely defined as interesting practices in the various urban transport systems. Although the term 'Benchmarking' might be slightly misleading for this project as there were no defined benchmarks for which to strive, it certainly provides a good example of using a common indicator scheme to derive relevant policy implications and to learn from each other. The approach to avoid a "blame and shame" of low performers is especially noteworthy, as any evaluation scheme on a global level would have to deal with similar challenges.	
Main application	[✓] Identification of challenges [ ] Transparency and information [✓] Knowledge transfer [✓] Benchmarking and policy target setting [ ] Monitoring process toward sustainability [ ] Gaining competitive advantages
Dimension of Sustainability	[✓] Environmental [✓] Social [✓] Economic [ ] Public participation
Availability of data on a global level	Significant gaps
Urban Transport Benchmarking Initiative Indicators to measure sustainable transport	- Size of regional administrative area - Size of urban administrative area - Number of residents of the regional administrative area - Number of residents of the urban administrative area - Description of key geographical features influencing transport - One-way length of urban transport infrastructure in the administrative area (road/train/metro/tram) - One-way length of flexible urban transport routes in the administrative area (bus, trolleybus, ferry) - One-way length of bus lanes and segregated right of way for trams - One-way length of cycle network. If possible data to be segregated according to cycle lanes, on & off road tracks and routes - Number of cars and motorcycles registered in the administrative area - submitted separately - Number of individual vehicles (by mode) operating in the administrative area - % of public transport vehicles which are wheelchair accessible by mode - Cleanliness of vehicles in the public transport fleet - Sustainable fuel technologies for vehicles in the public transport fleet - Additional pollution reduction technologies for vehicles in the public transport fleet

	- Average fuel consumption of vehicles in the public transport fleet - Age of the vehicles in the public transport fleet - % of public transport stops/stations which are wheelchair accessible - Average speed of cars/motorcycles in peak hour - Average speed of buses/trains/metro vehicles/trams in peak hour - Most frequent service intervals of buses/trains/metro vehicles/trams in peak hour - Total number of daily one-way journeys by mode in the administrative area on a weekday - Total number of daily one-way journeys by mode in the administrative area on a Saturday - Total number of passengers carried by all public transport modes (segregated by mode) - Total distance of passenger kilometres travelled by all public transport modes (segregated by mode) - Total farebox revenue from ticket sales for all public transport modes (segregated by mode) in 2003 - The cost in Euros of a single 1km and 5km public transport trip to the city centre (by mode) - The cost in Euros of an annual pass for 1km, 5km and 10km public transport trips to the city centre (by mode) - Average cost to user of car use - Capital expenditure on public transport, by mode, averaged over the last 5 years - Capital expenditure on roads, averaged over the last 5 years - GDP per head of population - The number of urban administrative area residents in employment and the number of positions held in the city - Number of injuries on the road network, per annum - Number of deaths on the road network, per annum

Factsheet 4: Bangkok Declaration for 2020 – Sustainable Transport Goals for 2010-2020

Type of concept	Indicator set
Level	International, with urban focus
Responsible body	Fifth Regional Environmentally Sustainable Transport (EST) & Member states
Target group	Member states
Year	2010
Status	Preliminary concept
Link	http://www.itdp.org/documents/Final_Bangkok-Declaration_28Aug2010_Final.pdf
Approach	Complementing a joint declaration on the willingness to fostering policies for sustainable transportation, the EST parties set up a comprehensive list of potential indicators to "provide guidelines for objective measurement of the efficiency and effectiveness of the transport system to achieve the desired goals" (EST 2010).
Description and lessons learnt As the concept has only been developed very recently, no user experiences exist so far. The use of the presented indicator set is entirely voluntary, and member countries are encouraged to develop additional indicators as necessary in the local context. The indicators are structured according to the Avoid, Shift, Improve (ASI)-approach for sustainable transport policies, and may serve to measure effectiveness of the respective strategies.	
Main application	[ ] Identification of challenges [ ] Transparency and information [ ] Knowledge transfer [✓] Benchmarking and policy target setting [✓] Monitoring process toward sustainability [ ] Gaining competitive advantages
Dimension of Sustainability	[✓] Environmental [✓] Social [✓] Economic [✓] Public participation
Availability of data on a global level	Large gaps
Bangkok Declaration Indicators to measure sustainable transport	About 100 individual indicators in the following categories: - Integrated Land Use-Transport Planning - Mixed-Use Development - Information and Communications Technologies (ICT) - Non-Motorized Transport - Public Transport - Transportation Demand Management - Inter-City Passenger and Goods Transport - Cleaner Fuels and Technologies - Standards - Inspection and Maintenance - Intelligent Transportation Systems- - Freight Transport - Safety - Health - Air Pollution and Noise - Climate Change and Energy Security - Social Equity - Finance and Economics - Information and Awareness - Institutions and Governance

Factsheet 5: OECD Indicators for the Integration of Environmental Concerns into Transport Policies

Type of concept	Indicator set + Ranking
Level	International
Responsible body	OECD
Target group	Governments and sectoral decision makers in member states
Year	1999
Status	Ongoing (Core indicators only)
Link	http://www.oecd.org/LongAbstract/0,3425,en_2825_499047_2436259_1_1_1_37425,00.html
Approach	The main purpose of the OECD concept is "to promote the integration of environmental concerns into transport policies and decisions" (OECD 1999).

Description and lessons learnt

The OECD concept may be considered a basic evaluation scheme for one dimension of sustainability, as it focuses on the environmental indicators (although other dimensions are touched upon as well). Evaluating status and progress of sustainability is explicitly not part of the effort, as interpretation of the data is left to complementing OECD programs such as the regular reports on the core set of sustainability indicators. However, results are presented both in statistical tables and in the form of country rankings, which constitute at least a basic possibility for performance comparison. An important aspect is that indicators have been compiled for several years, thus identifying trends.

Main application	[✓] Identification of challenges [✓] Transparency and information [ ] Knowledge transfer [✓] Benchmarking and policy target setting [ ] Monitoring process toward sustainability [ ] Gaining competitive advantages
Dimension of Sustainability	[✓] Environmental [0] Social [0] Economic [ ] Public participation
Availability of data on a global level	Some gaps
OECD Indicators to measure sustainable transport	- Passenger transport trends by mode - Freight transport trends by mode - Road traffic trends and densities (passenger, goods) - Trends of airport traffic: number of movements - Capital expenditure: total and by mode - Road network: length and density - Rail network: length and density - Road vehicle stocks (passenger, goods) - Structure of road vehicle fleet (by type of fuel, by age classes, share of "clean" vehicles) - Private car ownership - Final energy consumption by the transport sector (share in total, per capita, by mode) - Consumption of road fuels (total, per vehicle-km, by type: diesel, gasoline, other) - Change in land use by transport infrastructures - Transport emissions - CO2, NOx, VOC, CO, etc. (share in total, by mode) and emissions intensities (per capita, per vehicle km, per GDP) - Population exposed to air pollution from transport - Oil released from marine transport (through accidents and discharges during current operations) - Population exposed to transport noise greater than 65 dB(A) - Transport-related waste and related recovery rates

	- Hazardous waste, imported or exported (tonnes) - Road traffic fatalities (number of people killed or injured, per veh.km) - Hazardous materials transported by mode (tonne-km) - Environmental damage relating to transport - Social cost of transport - Total expenditure on pollution prevention and clean-up - R&D expenditure on "ecovehicles" - R&D expenditure on clean transport fuels - Direct subsidies - Total economic subsidies (direct & indirect subsidies, plus externalities) - Relative taxation of vehicles and vehicle use (including road tolls) - Structure of road fuel prices in real terms (by type of fuel) - Trends in public transport prices in real terms Note that not all of the above indicators have actually been collected and presented in the report cited.

Factsheet 6: Service quality targets and indicators for sustainable mobility in cities (Local Agenda 21/UBA)

Type of concept	Indicator set + Development of city-specific sustainability goals
Level	Urban
Responsible body	Federal Environmental Agency (Umweltbundesamt/UBA)
Target group	Municipal stakeholders in four German cities (Erfurt, Görlitz, Lörrach, Herdecke)
Year	1999-2004
Status	Trial phase terminated
Link	http://www.umweltdaten.de/publikationen/fpdf-l/3793.pdf
Approach	The aim of this project embedded in the local Agenda 21 was to formulate goals for sustainable mobility and to establish a set of indicators which may be used to measure progress towards such defined targets. The procedures were applied to three medium-sized German cities as case studies.
Description and lessons learnt Even though the concept is embedded in the specific context of German urban transport planning, there are interesting results with relevance for an international evaluation scheme. The most important one refers to the fourth dimension of sustainability proposed in this document: Participatory transport planning and policymaking. As part of the Local Agenda 21, the development of sustainability goals and according indicators was conducted city-specific, involving not only urban planning and transport specialists, but also citizens engaged in Agenda 21 initiatives. This process contributed to successful outcomes of the project, such as particular measures taken in cities to reach defined sustainability goals. The experiences of this project may be used as background information e.g. when designing indicators (or even audits) for the participatory dimension of sustainability.	
Main application	[ ] Identification of challenges [ ] Transparency and information [ ] Knowledge transfer [✓] Benchmarking and policy target setting [✓] Monitoring process toward sustainability [ ] Gaining competitive advantages
Dimension of Sustainability	[✓] Environmental [✓] Social [ ] Economic [✓] Public participation
Availability of data on a global level	Large gaps
Local Agenda 21/UBA Indicators to measure sustainable transport	Major indicators: - Share of environmentally friendly transport modes in total trips (% of total) - Share of main streets with adequate facilities for pedestrians (% of total) - Share of pedestrian streets/zones with traffic calming (% of total network) - Share of main streets with adequate bikeways or 30km/h-speed restriction (% of total) - Share of inhabitants living within a 300m radius of a bus stop or 500m for light rail/S-Bahn - Share of main streets with 30km/h speed restriction (% of total) - Share of population exposed to more than 65 dB(A) during daytime and more than 55dB(A) during the night (% of total) - Share of population affected by a critical concentration of PM10 (% of total) - Persons killed or severely injured in road accidents in the city area, per 10.000 inhabitants

Factsheet 7: Urban Audit - Towards the Benchmarking of Quality of Life in 58 European Cities

Type of concept	Indicator set + Ranking
Level	Urban
Responsible body	European Commission and cities
Target group	Municipal stakeholders and the public
Year	2000-2004
Status	One-time trial (terminated)
Link	http://www.urbanaudit.org/
Approach	The overall goal of the extensive set of indicators was to measure the quality of life in European cities.

Description and lessons learnt

Transportation plays a minor role, with only half a dozen of the about 100 single indicators related to issues such as the modal split and GHG emissions of the transport sector. Data are available for several years. The latest data set has been collected in 2004. The related website allows user so select any of the numerous indicators and compare them across the city sample. Results can also be presented in the form of rankings. Despite the project title, there is no true audit or benchmarking, as no target values or policy goals are provided. Nevertheless, the web-based possibility for every user to compile specific data and rankings of interest may be of interest for dissemination and presentation of an international evaluation scheme to a wider audience.

Main application	[ ] Identification of challenges [✓] Transparency and information [✓] Knowledge transfer [ ] Benchmarking and policy target setting [ ] Monitoring process toward sustainability [ ] Gaining competitive advantages
Dimension of Sustainability	[✓] Environmental [✓] Social [ ] Economic [ ] Public participation
Availability of data on a global level	Large gaps
Urban Audit Indicators to measure sustainable transport	- Travel patterns (length, mode, purpose of trips) - Road accidents (death or serious injury) per 1000 of the population

Factsheet 8: Transport and Environment Reporting Mechanism (TERM)

Type of concept	Indicator set + Ranking
Level	International
Responsible body	European Environment Agency (EEA)
Target group	Wide audience from high-level policymakers to technical policy experts
Year	Since 2000
Status	Ongoing
Link	http://www.eea.europa.eu/themes/transport/term
Approach	Published annually, the TERM reports seek to monitor the progress and effectiveness of European transport and environment integration strategies on the basis of a core set of indicators. All EU members plus EFTA countries and Turkey are covered.

Description and lessons learnt

The set of indicators is linked to several policy goals (see below). Results are presented partly as rankings, and the repeated collection of indicators offers the possibility to illustrate trends.

Seven key questions addressed by TERM indicators

1. Is the environmental performance of the transport sector improving?
2. Are we getting better at managing transport demand and at improving the modal split?
3. Are spatial and transport planning becoming better coordinated so as to match transport demand to the need for access?
4. Are we optimising the use of existing transport infrastructure capacity and moving towards a better balanced intermodal transport system?
5. Are we moving towards a fairer and more efficient pricing system which ensures that external costs are internalised?
6. How rapidly are cleaner technologies being implemented and how efficiently are vehicles being used?
7. How effectively are environmental management and monitoring tools being used to support policy- and decision-making?

Main application	[ ] Identification of challenges [✓] Transparency and information [ ] Knowledge transfer [✓] Benchmarking and policy target setting [✓] Monitoring process toward sustainability [ ] Gaining competitive advantages
Dimension of Sustainability	[✓] Environmental [✓] Social [✓] Economic [ ] Public participation
Availability of data on a global level	Significant gaps
TERM Indicators to measure sustainable transport	- Transport final energy consumption by mode - Transport emissions of greenhouse gases - Transport emissions of air pollutants - Exceedances of air quality objectives due to traffic - Exposure to and annoyance by traffic noise - Transport accident fatalities - Passenger transport

	- Freight transport - Fuel prices and taxes - Transport taxes and charges - Internalisation of external costs - Energy efficiency and specific CO2 emissions - Specific emissions - Occupancy rates of passenger vehicles - Load factors for freight transport - Uptake of cleaner and alternative fuels - Size of the vehicle fleet - Average age of the vehicle fleet - Proportion of vehicle fleet meeting certain emission standards

Factsheet 9: CSD Indicators of Sustainable Development

Type of concept	Indicator set
Level	International
Responsible body	CSD / Department of Economic and Social Affairs of the United Nations
Target group	Member states (CSD indicators shall "provide a reference, or sample set, for use by countries to track progress toward nationally-defined goals, in particular, and sustainable development, in general")
Year	Since 2001
Status	Ongoing (last report from 2007)
Link	http://www.un.org/esa/dsd/dsd_aofw_ind/ind_index.shtml?utm_source=OldRedirect&utm_medium=redirect&utm_content=dsd&utm_campaign=OldRedirect Further and more up-to-date national reports, with some containing information on transport aspects, are available at: http://www.un.org/esa/dsd/dsd_aofw_ni/ni_index.shtml
Approach	CSD indicators aim to support countries in their efforts to develop and implement national indicators for sustainable development, which then serve for evaluation, monitoring, reporting and evaluation of national sustainability strategies.
Description and lessons learnt The set of indicators developed by CSD comprises 50 core indicators, structured along about 15 thematic clusters. Transport is treated as part of the category "Consumption and production patterns", and includes modal split and energy intensity as indicators. The design of the overall set of indicators captures all dimensions of sustainability, while the scope of the few transport-related indicators is somewhat limited given the necessity to limit the overall number of indicators. The CSD concept is designed to illustrate trends in sustainable development, not specifically sustainability in the transport sector. However, the process of establishing the indicator set (described in UN 2007, pp. 5) should be studied and may serve as model for a transport-specific scheme.	
Main application	[ ] Identification of challenges [✓] Transparency and information [ ] Knowledge transfer [✓] Benchmarking and policy target setting [✓] Monitoring process toward sustainability [ ] Gaining competitive advantages
Dimension of Sustainability	[✓] Environmental [✓] Social [✓] Economic [✓] Public participation
Availability of data on a global level	Some gaps
CSD Indicators to measure sustainable transport	Relevant transport-related indicators: - Ambient air pollution concentrations of ozone, particulate matter (PM10, and PM2,5), sulphur dioxide, nitrogen dioxide, lead. - Changes of the distribution of land uses within a country over time. - Modal split of passenger transport - Modal split of freight transport - Energy intensity (fuel used per unit of freight-kilometre hauled and per unit of passenger-km travelled by mode)

Factsheet 10: Development of sustainability indicators for the transport sector (UBA)

Type of concept	Indicator set
Level	National
Responsible body	Umweltbundesamt (UBA) – German Environmental Protection Agency
Target group	National government stakeholders
Year	1997
Status	Preliminary concept
Link	n/a
Approach	This research report commissioned by the German Federal Environmental Agency (UBA) aimed at further developing and complementing sustainability indicators in the transport sector.
Description and lessons learnt The concept provides a comprehensive conceptual and methodological framework and suggests eight key indicators. Although the study considered three dimensions of sustainability, no indicator was found suitable to represent the economic dimension. In addition, the authors of the study suggest to beyond quantitative indicators and to set up a 'sustainability report' that considers qualitative information related especially to the institutional environment.	
Main application	[ ] Identification of challenges [ ] Transparency and information [ ] Knowledge transfer [ ] Benchmarking and policy target setting [✓] Monitoring process toward sustainability [ ] Gaining competitive advantages
Dimension of Sustainability	[✓] Environmental [✓] Social [0] Economic [ ] Public participation
Availability of data on a global level	Significant gaps
UBA Indicators to measure sustainable transport	- Final energy consumption of the transport sector (p.a.) - Air pollution (CO2, NOx, VOC, PM) caused by the transport sector (p.a.) - Share of land surface not scattered by major transport infrastructure - Supply and quality of transport services (public transport) - Supply of grocery stores close to residential areas - Share of population affected by traffic noise - Number of people killed or injured in traffic accidents - Share of urban surface devoted to transport infrastructure

Factsheet 11: BESTRANS – Benchmarking of Energy and Emission Performance in Urban Public Transport Operations

Type of concept	Indicator set + Ranking + Benchmarking
Level	Urban/Sectoral
Responsible body	European Commission/SAVE Program, TISPT Consulting
Target group	Urban Public Transport Operators
Year	2002-2004
Status	One-time trial phase (terminated)
Link	http://www.tis.pt/proj/bestrans/
Approach	This project involved 22 public transport operators in several European countries. A set of indicators was used to determine the fuel efficiency and emission performance of their vehicle fleets.

Description and lessons learnt

Due to the focus on the company/operator level, the indicator set itself is of limited use for the purpose of this document. The most interesting point of this concept is its easy-to-understand method of illustrating the benchmarking results. Beside rankings and plot graphs, colour codes were used to show how individual operators performed compared to average values of indicators (see below). A SWOT analysis gathered additional qualitative data for each operator to identify external and internal factors which influence the quantitative results.

BESTRANS benchmarking visualization

	> 30% better than average[1]
	10% - 30% better than average
	Average +/- 10%
	10% - 30% worse than average
	> 30% worse than average

Table 5.2: Energy Consumption per Passenger-km Survey Data

Operator Code	MWh/ Mpkm	Occupancy Rate[2]
18	88.2	0.56
20	122.7	0.6
6	134.7	0.39
13	170.6	0.38
12	262.8	0.31
5	267.6	0.33
11	302.8	0.22
4	315.7	0.2
3	347.3	0.17
2	347.5	0.27
1	431.6	0.15
9	490.2	0.14
14	498.6	0.22

Main application	[ ] Identification of challenges [ ] Transparency and information [✓] Knowledge transfer [✓] Benchmarking and policy target setting [ ] Monitoring process toward sustainability [✓] Gaining competitive advantages
Dimension of Sustainability	[✓] Environmental [ ] Social [✓] Economic [ ] Public participation
Availability of data on a global level	Large gaps
BESTRANS Indicators to measure sustainable	Main categories: - Energy Consumption per Passenger Km - Energy Consumption per Vehicle Kilometre - Energy consumption per place-km

transport	

Factsheet 12: CST Sustainable Transport Performance Indicators (STPI)

Type of concept	Indicator set
Level	National
Responsible body	Centre for Sustainable Transportation (Toronto, Canada)
Target group	Official Stakeholders in Canada
Year	2000-2002
Status	Project completed
Link	http://www.centreforsustainabletransportation.org/researchandstudies.htm#STPerform_Ind
Approach	One of the main reasons for CST to start the development of an indicator set for sustainable transportation was the official request for "quantifiable performance measurements, based on the vision and definition [see Box 1], that can be used to track progress toward sustainability" (CST 2002).

Description and lessons learnt

The indicators are based on various official Canadian statistics, which usually provide data for several years. As with other concepts already introduced above, this good availability of data allows for the identification of trends. Interestingly, the STPI project also aimed to develop a single, possibly composite indicator to represent overall sustainability in the Canadian transport system. However, there were serious doubts whether "a single meaningful, non-controversial indicator could be realized" (CST 2002). Instead, the use of key indicators representing the major issues was suggested: Fossil fuel use for transport, per-capita use of urban land, energy intensity of cars and trucks, as well as emissions intensity of the road vehicle fleet. The latter three shall serve as indicators of progress towards sustainability, while the first one illustrates current trends.

Another noteworthy feature is the methodology used in some publications to illustrate progress towards sustainability by using smileys (see below for an example).

Trend illustration in the CST indicator scheme

Indicator 4 shows a decline in injuries and fatalities from road transport, and thus progress towards sustainable transportation.	☺
Indicator 5 mostly shows increased movement of people. Present transport patterns mean this represents movement away from sustainability.	☹ ⇨ 😐
Indicator 6 shows substantial growth in the movement of freight. Because of freight's impacts and costs, this represents movement away from sustainable transportation.	☹

Main application	[✓] Identification of challenges [ ] Transparency and information [ ] Knowledge transfer [✓] Benchmarking and policy target setting [✓] Monitoring process toward sustainability [ ] Gaining competitive advantages
Dimension of Sustainability	[✓] Environmental [✓] Social [ ] Economic [ ] Public participation
Availability of data on a	Some gaps

global level	
STPI Indicators to measure sustainable transport	- Use of fossil fuel energy for all transport - Greenhouse gas emissions from all transport - Index of emissions of air pollutants from road transport - Index of incidence of road injuries and fatalities - Total motorized movement of people - Total motorized movement of freight - Share of passenger travel not by landbased public transport - Movement of light-duty passenger vehicles - Urban land use per capita - Length of paved roads - Index of relative household transport costs - Index of the relative cost of urban transit - Index of energy intensity of cars and trucks - Index of emissions intensity of the road vehicle fleet

Factsheet 13: Clean Air Scorecard

Type of concept	Indicator set + Benchmarking
Level	Urban
Responsible body	CAI-Asia / Sustainable Urban Mobility in Asia (SUMA), with support from SIDA and ADB
Target group	Asian Cities
Year	2010
Status	Trial phase ongoing
Link	http://www.cleanairinitiative.org/portal/Scorecard
Approach	The Clean Air Scorecard developed by CAI-Asia represents a methodology for an objective and comprehensive evaluation of a city's management of air pollutants and GHG emissions and identification of improvement areas.

Description and lessons learnt

The Scorecard consists of three indices which assess:

- Air pollution levels of cities against World Health Organization (WHO) guideline values (Air Pollution and Health Index)
- The institutional environment of the city, focusing on the capacity to measure emissions and their impacts as well as the existence of adequate policies and financing to reduce emissions (Clean Air Management Capacity Index)
- the existence and enforcement of national and local policies and actions to address air pollutants and GHG emissions (Clean Air Policies and Actions Index)

The three indices contribute equally to the overall score, which can reach a maximum of 100 points. Results are presented for each index, thus highlighting strengths and weaknesses of particular cities.

Although capturing only one of the several dimensions of a sustainable transport system, the Clean Air Scorecard provides a good example of a true evaluation scheme, which uses indicators relative to benchmarks (such as WHO guidelines) and produces a result which is easy to understand for policymakers and the general public.

Main application	[✓] Identification of challenges [✓] Transparency and information [ ] Knowledge transfer [✓] Benchmarking and policy target setting [ ] Monitoring process toward sustainability [ ] Gaining competitive advantages
Dimension of Sustainability	[✓] Environmental [ ] Social [ ] Economic [ ] Public participation
Availability of data on a global level	unknown
Clean Air Scorecard Indicators to measure sustainable	- Air Pollution and Health Index (includes PM10, PM2.5, SO2, CO, NO2, Pb, O3) - Clean Air Management Capacity Index (a city's capacity to establish an emissions inventory, assess the status of air quality and its impact on health, environment and the economy, and to provide a suitable institutional, financial and policy framework for emission reductions) - Clean Air Policies and Actions Index (existence and enforcement of national and local policies and actions to address air pollutants and GHG emissions)

transport	

Factsheet 14: Observatorio de movilidad urbana (OMU)

Type of concept	Indicator set
Level	Urban
Responsible body	CAF Development Bank
Target group	Latin American Cities
Year	2009/2010
Status	Ongoing
Link	http://omu.caf.com/ (Spanish only) 2010 Report: http://omu.caf.com/media/2537/caf_omu_jun2010.pdf
Approach	The OMU gathers data on urban transport characteristics for 15 Latin American Cities. 11 different categories are included, ranging from basic socioeconomic background data to detailed information about modal splits and vehicle fleets as well as emissions and costs.
Description and lessons learnt The associated website offers excellent spreadsheet tables for every data category, which enables users to do their own data analysis. The additional report provides comprehensive information on the state of urban transportation in the 15 cities, and includes some basic ranking and benchmarking efforts (e.g. for costs of public transportation). However, there are neither underlying definitions of sustainability nor any policy goals to which the data are connected. While it may not be considered a true sustainability evaluation scheme, OMU certainly constitutes a noteworthy effort to compile relevant data on characteristics and negative effects of urban transportation.	
Main application	[✓] Identification of challenges [✓] Transparency and information [ ] Knowledge transfer [ ] Benchmarking and policy target setting [ ] Monitoring process toward sustainability [ ] Gaining competitive advantages
Dimension of Sustainability	[0] Environmental [0] Social [0] Economic [ ] Public participation
Availability of data on a global level	Large gaps
OMU Indicators to measure sustainable transport	The following 11 categories are included, each with about 2-20 individual indicators: - Socioeconomic characteristics - Transport system asset value - Costs and tariffs - Road safety - Emissions - Energy consumption and costs - Public Transportation - General mobility characteristics - Vehicle fleets - Infrastructure

Factsheet 15: UITP Evaluation of Sustainability in Public Transportation

Type of concept	Indicator set
Level	Sectoral
Responsible body	International Association of Public Transport (UITP)
Target group	UITP members (UITP Sustainable Development Charter Signatories)
Year	2011
Status	Trial phase ongoing
Link	Further information will be available after the 59th UITP World Congress & Exhibition (11.-14. April 2011, Dubai). For general information on UITP's activities see http://www.uitp.org/Public-Transport/sustainabledevelopment/
Approach	UITP members are invited to use a self-assessment tool to evaluate their sustainability performance with regard to a number of different indicators.
Description and lessons learnt The UITP evaluation scheme, which is currently being trialled among a number of members, serves as a tool for public transport operators to assess their own performance with regard to sustainability. Indicators should be shown in their development/progress compared to previous period to identify trends over time. Some very early lessons learnt point at the importance of a common understanding of the meaning of indicators and their purpose. For the final version of the evaluation scheme, a reduced number of indicators is envisaged.	
Main application	[✓] Identification of challenges [✓] Transparency and information [ ] Knowledge transfer [ ] Benchmarking and policy target setting [✓] Monitoring process toward sustainability [ ] Gaining competitive advantages
Dimension of Sustainability	[✓] Environmental [✓] Social [✓] Economic [✓] Public participation
Availability of data on a global level	Large gaps
UITP Indicators to measure sustainable transport	- Total passengers carried (Urban/suburban/regional) - Information on revenue sources - EBIT and EBITDA data - Percentage of total investment to total depreciation - Overall cost/km (by mode/vehicle type) - Percentage of development of revenues from operations - Overall cost recovery ratio - Modal split of public transport in served area - Annual capital investments in public transport improvement or improved efficiency - Average age of vehicle fleet - Average commercial speed - Produced seat-kilometres per operations employee - Incorporation of sustainable development in purchasing and investment processes - Passengers with concession or subscription tickets compared to total number of passengers - Separate right-of-way in network

	- Coverage rate (percentage of households and jobs well served within 500 meters from a public transport stop) - Jobs directly and indirectly associated with the production - Are sustainable principles included in personnel evaluations and rewards/awards/bonuses? - Ability to satisfy the present demand - Transparency of payments - Environmental Management System in operation - Sites certified at international or national level - Total amount of operational energy use for traction per passengerkm (in kJ) - Total amount of operational energy use for non-traction purposes - Percentage of total renewable energy use for traction & non traction - Energy (kJ) used per 100 km and trend - Direct CO2 emissions for operations (scope 1 or tailpipe emissions from vehicles/rolling stock) - CO2 emissions (in grams) of energy use per passenger-km - Percentage of fleets considered clean (meeting Euro IV Standard or better, and fitted with particulate filters) - Noise levels, noise monitoring and noise mapping - Air quality management - Percentage of fresh to recycled water use (recycled includes harvested rainwater) - Soil contamination from hazardous waste and oil spills - Waste sorting policy - Life cycle analysis of products and services - Recycled or 'eco' products - Low or no chemical cleaning products - Introduction of innovations with quantifiable resource saving results - Training in eco or defensive driving - Customer satisfaction - Employee satisfaction survey - Employee Turnover Rate - Annual trips by public transport per resident city/town-wide (on average) compared to all motorised trips - How accessible is your network to the less abled? - Special workforce health programmes (over and above the legal requirements - Investment on training and personal development of staff - Average percentage of days of absence to total working days of employees - Employees with the possibility to flex-time or flexible hours - Do you provide crèche or child care facilities (help over legal requirements) - Average wage in company/organisation in relation to average wage in city/state - Do you have a specific diversity policy - Jobs offered to less abled, disadvantaged people or underprivileged people - Do you have community relationships (volunteer/CSR programmes)? - Health and Safety infractions (accidents in the workplace or on network) - Number of accidents with personal liability/number of injuries or fatalities on site for non staff/employees - Programme for employee mobility management (expressed as numbers of employees not using a car to come to work) - Do you have one or more youth orientated programmes? - Participation in events related to sustainable transport - Does your organisation have a Sustainable Development Manager, special business unit/department or working group? - Does your organisation report regularly on Sustainable Development performance at a Board level? - Website/section about Sustainable Development - Sustainable development charter/programmes - Does your organisation have an external stakeholder engagement process/es? - Does your organisation have an internal stakeholder engagement process/es? - Policy on human rights, labour practises and fair trading with suppliers and procurement - National or international standards such as ISO 14001, EMAS, OHSAS 18001 - Quality Management processes - Risk management process - Are your sustainable development reports independently verified? - Do you have anti-corruption policies? - Sustainable procurement and tendering procedures - Recognition awards received at international/national, regional or local level - Does your organisation have a policy on recycling? - Does your organisation have a scrappage policy? - Is your city/town taking measures to improve intermodality with any of the following schemes - Do you use participate in Global Reporting Initiative, Balanced score card approach, ISO 26000 (CSR guidelines) or AA 1000 (for stakeholder engagement)