



## Review of Existing and Potential Indicators on Transport to Support the SDGs-DRAFT IN PROGRESS<sup>1</sup>

*Partnership for Sustainable Low Carbon Transport (SLoCaT Partnership)*

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### 1. Purpose

As a contribution to the discussion on indicators in the context of the SDG process, this document has been prepared to:

- Map a broad set of currently proposed indicators, and others that could be developed, by proposed SDGs and targets (refer Table 1); Propose a more concise set of indicators that are both desirable and feasible to measure now or in the near future, mapped by proposed SDGs and Targets (refer Table 2); and
- Discuss proposed indicators and alternative formulations in greater detail with respect to measurability, currently available data sets and what would be needed to operationalize measurement, where data sets are incomplete or need to be developed (refer Annex A).

***The document is the second draft of an earlier version of this document<sup>2</sup> that was circulated to SLoCaT members in February 2015. This draft benefits from comments made by ITDP and UC-Davies/GFEI as well comments from the World Bank.***

The proposed indicators were derived from the same four sources referenced in the earlier document prepared by SLoCaT for this project:

- **SLoCaT's Draft Results Framework on Sustainable Transport<sup>3</sup>** (July 2014). Annex B numbers SLoCaT's targets and indicators uniquely to aid clarity for the discussion presented below.
- **Indicators and a monitoring framework for Sustainable Development Goals: Launching a data revolution for the SDGs<sup>4</sup>**, prepared by the Sustainable Development Solutions Network (SDSN), January 16, 2015.

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<sup>2</sup> [http://slocat.net/sites/default/files/for\\_member\\_review\\_-\\_draft\\_initial\\_review\\_of\\_indicators\\_component\\_a\\_for\\_wb\\_by\\_slocat\\_partnership\\_feb26\\_15\\_.pdf](http://slocat.net/sites/default/files/for_member_review_-_draft_initial_review_of_indicators_component_a_for_wb_by_slocat_partnership_feb26_15_.pdf)

<sup>3</sup> Refer [<http://www.slocat.net/resultsframework>].

- **List of Proposed Preliminary Indicators and Background Information to the List of Proposed Preliminary Indicators** (February 2015) that were formulated by specialized agencies and entities of the wider United Nations System i.e. UN Technical Support Team.
- **Second Urban Sustainable Development Goal Campaign Consultation on Targets and Indicators: Bangalore Outcome Document**<sup>5</sup> and the proposed urban indicators facilitated by UN-Habitat/ SDSN and others to support the proposed urban goal (SDG 11).

Four potential indicators were identified during the process of preparing this document: (i) shares of land-based transborder passenger volumes of total transborder volumes as a measure of improvement in relevant regional and transborder transport infrastructure and facilitation under SDG 9; (ii) shares of land-based transborder trade volumes and value of total transborder trade volumes and value as a measure of improvement in relevant regional and transborder infrastructure and facilitation under SDG 9; (iii) presence of a conducive regulatory environment for rural transport services under SDG 2; and (iv) urban household accessibility to jobs as proposed by World Bank under SDG 11. Potential indicators (i) to (iii) were identified by SLoCaT during preparation of this document.

## 2. Mapping of Proposed/Potential Indicators by Proposed SDG and Target

Table 1 maps the proposed and possible indicators from the four sources listed above by proposed SDGs and targets. In many cases, a proposed or possible indicator can be mapped against several targets. For the purposes of Table 1, the detailed description of an indicator has been provided against the target identified as most relevant by each of the four source documents. Where it is considered another target is also relevant for a particular indicator this is noted. For example: (i) SLoCaT consider that Rural Access is most relevant to Target 2.3 (under SDG 2) while SDSN and the UN Agencies have mapped a similar indicator under Target 9.1 (under SDG 9); and (ii) World Bank have suggested that the possible urban accessibility index would be mapped against a relevant Target in SDG 11 and others have mapped a different indicator on access to sustainable transport but which could be derived during the preparation of the accessibility index against Target 11.2 on access to sustainable transport systems.

In some cases, proposed indicators from SLoCaT and others do not have an obvious target to align with even though there is a relevant SDG. A pertinent example is SLoCaT's target for mitigation of GHG emissions from transport which seems to fit best under SDG 13 ('Take urgent action to combat climate change and its impacts') but proposed targets under the SDG emphasize climate adaptation.

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<sup>4</sup>Refer [<http://unsdsn.org/wp-content/uploads/2015/01/150116-Indicators-and-a-Monitoring-Framework-for-SDGs-working-draft-for-consultation.pdf>].

<sup>5</sup>Refer [<http://www.africancentreforcities.net/wp-content/uploads/2015/01/Urban-SDG-Campaign-Bangalore-Outcome-Document-Goal-11-Targets-and-Indicators-Jan-27-20151.pdf>].

### 3. Assessment of Advantages, Disadvantages and Measurability of Proposed and Potential Indicators

On the basis of the above description, the right hand column of Table 1 identifies six relevant topics under which the advantages, disadvantages and measurability of proposed and potential indicators are discussed in Annex A in further detail (refer Tables A.1 to A.9):

- Universal rural access for passengers and goods;
- Universal urban passenger access by sustainable transport;
- National, regional including transborder infrastructure and passenger and freight/ trade services;
- Road safety and reduction of associated fatalities and serious injuries;
- Air quality and human health and contribution of transport; and
- Mitigation of transport's contribution to GHG emissions while ensuring the design of transport networks and infrastructure fully considers resilience and resource-efficiency.

A conclusion on what indicators are feasible (or will soon be), and the potential lead agency, is also provided in Tables A.1 to A.9 for each of the six topic areas described above.

### 4. Mapping of Feasible Indicators by SDG and Target

Based on the conclusions on the advantages, disadvantages and measurability of currently proposed indicators described in Section 2 (refer Table 1), as supported by Annex A, the indicators considered to be desirable and feasible (i.e. measurable today or in the very short term<sup>6</sup>) are mapped by what is considered the most relevant SDG and target (refer Table 2).

Both main indicators and supportive indicators are identified in Table 2. Supportive indicators indirectly measure the effectiveness of sustainable transport solutions to meet specified targets. They could be considered if sufficient resources are available and could either be implemented by individual countries or professional groups. For some of the indicators, the source identified an achievement level by 2030 and this is reported.

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<sup>6</sup>'Measurable today' means the indicator exists and has been measured for virtually all countries although data sets may be out of date. 'Measurable in the short term' means that the indicator has been, or could be, measured in specific cases but has not yet been applied on a comprehensive basis for every country.

**Table 1: Mapping Relevant SDGs and Targets by Proposed Indicators of Others and Possible Indicators**

No.	SDG and Target	SLoCaT	SDSN	UN Agencies	Urban Group	Possible Indicator	Key Topics for discussing advantages and disadvantages of indicators
2.	<b>End hunger, achieve food security and improved nutrition and promote sustainable agriculture</b>						
	<i>Targets relevant to transport are:</i>						
2.3	By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment	<p><u>Target 1 - Rural access:</u> Secure universal access by sustainable transport for rural populations by 2030 (<u>achievement level: 100%</u>)</p> <p><u>Indicators:</u> 1.1 Proportion of the rural population living within two kilometers of a road, motorable trail or other appropriate infrastructure providing all-year access for sustainable transport (<u>desired achievement:100%</u> achievement of local access targets, monitoring the poorest and remotest quintiles)</p>	<p><u>SDSN’s indicator 61 on rural access:</u> SDSN preferred under SDG 9 – refer below</p> <p><u>SDSN’s indicator 14</u> Access to storage and drying facilities</p> <p>(Represents a particular partial aspect of rural and national access requiring improved transport in rural areas)</p>	<u>Proposed relevant UN Agency proposed Indicator 2</u> under SDG 9 – refer below	Not applicable	Conducive regulatory environment for rural transport services (in-country panels of experts to assess whether prevailing regulations facilitate provision of safe, affordable and adequate rural transport services) – refer Table A.1 in Annex A	Universal rural access for passengers and goods

No.	SDG and Target	SLoCaT	SDSN	UN Agencies	Urban Group	Possible Indicator	Key Topics for discussing advantages and disadvantages of indicators
		<p>1.2 Proportion of rural population living within 30 minutes' walk of appropriate formal or informal transport services (<u>desired achievement:100%</u> achievement of local access targets, monitoring remotest quintile)</p> <p>1.3 Travel time, including walking, from villages to local towns with markets and medical facilities for the poorest rural income quintile (<u>desired achievement:100%</u> achievement of local travel-time targets)</p>					
<b>3.</b>	<b>Ensure healthy lives and promote well-being for all at all ages</b>						
	<i>Targets relevant to transport are:</i>						
3.6	By 2020, halve the number of global deaths and injuries from road traffic accidents	<u>Target 4: Road safety:</u> Halve the burden due to global road traffic crashes by halving the number of fatalities and serious	<u>SDSN's indicator 27:</u> Road traffic deaths per 100,000 population	<u>Proposed relevant UN Agency _____ proposed Indicator:</u> Number of deaths due to road traffic	None		Road safety and reduction of associated fatalities and serious injuries

No.	SDG and Target	SLoCaT	SDSN	UN Agencies	Urban Group	Possible Indicator	Key Topics for discussing advantages and disadvantages of indicators
		<p>injuries by 2030 compared to 2010</p> <p><u>Indicators:</u></p> <p>4.1 Fatalities due to road crashes (<u>desired achievement</u>: reduce by half the number of fatalities due to road crashes compared with 2010 baseline of 1.24 million per year).</p> <p>4.2 Serious injuries due to road crashes (<u>desired achievement</u>: reduce by half the number of serious injuries due to road crashes compared with 2010 baseline of 12.4 million per year)</p> <p>4.3 Economic impact due to road crashes (<u>desired achievement</u>: reduce by half the economic impact of road crashes compared with 2010 baseline of 3% of GDP per year)</p>		accidents			
3.8	Achieve universal health	Rural and urban	Rural and urban	Rural and urban	Rural and urban		Rural and urban

No.	SDG and Target	SLoCaT	SDSN	UN Agencies	Urban Group	Possible Indicator	Key Topics for discussing advantages and disadvantages of indicators
	coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all education' (also require physical access so transport is partially relevant)	transport-access indicators are relevant & discussed under other SDGS and targets	transport-access indicators are relevant & discussed under other SDGS and targets	transport-access indicators are relevant & discussed under other SDGS and targets	transport-access indicators are relevant & discussed under other SDGS and targets		transport access to medical facilities as part of treatment of 'universal rural access' and 'universal urban access' by transport'
3.9	By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	<p><u>Target 5 -Air Pollution and Human Health:</u> Halve premature deaths from road related air pollution by 2030 compared to 2010</p> <p><u>Indicators:</u> 5.1 Premature deaths from air pollution (desired achievement: 50% reduction compared to 2010 baseline of 184,000)</p> <p>5.2 PM10 and/or PM2.5 air pollution from passenger and freight vehicles (desired achievement: 70% reduction)</p>	<u>SDSN's indicator 33</u> Mean urban air pollution of particulate matter (PM10 and PM2.5)	<u>Indicator on air quality impact</u> – refer SDG 11	Target was on solid waste		Air quality and human health & contribution of transport

No.	SDG and Target	SLoCaT	SDSN	UN Agencies	Urban Group	Possible Indicator	Key Topics for discussing advantages and disadvantages of indicators
		5.3 Travel share of public transport, cycling, walking and other sustainable modes (desired achievement: double the global share by 2030)					
<b>4.</b>	<b>Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all</b>						
	<i>Targets relevant to transport are:</i>						
	Several targets on 'access to education' <u>also require physical access</u> e.g. Targets 4.1-4.3 and 4.5	Rural and urban transport-access indicators are relevant & discussed under other SDGS and targets	Rural and urban transport-access indicators are relevant & discussed under other SDGS and targets	Rural and urban transport-access indicators are relevant & discussed under other SDGS and targets	Rural and urban transport-access indicators are relevant & discussed under other SDGS and targets		Rural and urban transport access to educational opportunities as part of treatment of 'universal rural access' and 'universal urban access' by transport' respectively
<b>5.</b>	<b>Achieve gender equality and empower all women and girls</b>						
	<i>Targets relevant to transport are:</i>						
5b.	Enhance the use of	Rural and urban	Rural and urban	Rural and urban	Rural and urban		Enhanced rural and

No.	SDG and Target	SLoCaT	SDSN	UN Agencies	Urban Group	Possible Indicator	Key Topics for discussing advantages and disadvantages of indicators
	enabling technology, in particular information and communications technology, to promote the empowerment of women – <u>although this indicator is about ICT, it reminds us transport is also an enabler</u>	transport-access indicators are relevant & discussed under other SDGS and targets	transport-access indicators are relevant & discussed under other SDGS and targets	transport-access indicators are relevant & discussed under other SDGS and targets	transport-access indicators are relevant & discussed under other SDGS and targets		urban transport can support gender equality but treated as part of discussion of 'universal rural access' and 'universal urban access' by transport' respectively
<b>6.</b>	<b>Ensure availability and sustainable management of water and sanitation for all</b>						
	<i>Targets relevant to transport are:</i>						
6.1	By 2030, achieve universal and equitable access to safe and affordable drinking water for all( <u>also require physical access so transport is partially relevant</u> )	Rural and urban transport-access indicators are relevant & discussed under other SDGS and targets	Rural and urban transport-access indicators are relevant & discussed under other SDGS and targets	Rural and urban transport-access indicators are relevant & discussed under other SDGS and targets	Rural and urban transport-access indicators are relevant & discussed under other SDGS and targets		Enhanced rural and urban transport can support access to safe drinking water but treated as part of discussion of 'universal rural access' and 'universal urban access' by transport' respectively
<b>7.</b>	<b>Ensure access to affordable, reliable, sustainable and modern energy for all</b>						
	<i>Targets relevant to transport</i>						

No.	SDG and Target	SLoCaT	SDSN	UN Agencies	Urban Group	Possible Indicator	Key Topics for discussing advantages and disadvantages of indicators
7.3	By 2030, double the global rate of improvement in energy efficiency	<u>Indicator 6.1:</u> Fuel economy in all new Light Duty Vehicles by 2030, and in all Light Duty Vehicles by 2050 both from a base year of 2005 ( <u>desired achievement:</u> double fuel economy)	Part of <u>SDSN's Indicator 79 under SDG 13</u> (but also refers to fuel economy in heavy duty diesel vehicles)	None	None		Fuel economy in cars and trucks and associated emissions as part of 'mitigation of transport's contribution to GHG emissions..' mentioned below
<b>8.</b>	<b>Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all</b>						
	<i>Targets relevant to transport are:</i>						
8.3	Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro- small-and medium-sized enterprises, including through access to financial services	Rural and urban transport-access indicators are relevant & discussed under other SDGS and targets	Rural and urban transport-access indicators are relevant & discussed under other SDGS and targets	Rural and urban transport-access indicators are relevant & discussed under other SDGS and targets	Rural and urban transport-access indicators are relevant & discussed under other SDGS and targets		Rural and urban transport access job opportunities as part of treatment of 'universal rural access' and 'universal urban access' by transport' respectively. Support to efficient logistics also supports enhanced productivity.
<b>9.</b>	<b>Build resilient</b>						

No.	SDG and Target	SLoCaT	SDSN	UN Agencies	Urban Group	Possible Indicator	Key Topics for discussing advantages and disadvantages of indicators
	<b>infrastructure, promote inclusive and sustainable industrialization and foster innovation</b>						
	<i>Targets relevant to transport are:</i>						
9.1	<p>Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all</p> <p>(This target has some relevance to Target 17.11: Significantly increase the exports of developing countries, in particular with a view to doubling the least developed</p>	<p><u>Target 3 - National access and regional connectivity</u>: Facilitate national inclusion and regional connectivity by sustainable multi-modal freight and passenger services by 2030 (achievement level: to be determined)</p> <p><u>Indicators</u>:</p> <p>3.1 Logistics Performance Index for all countries (<u>desired achievement</u>: 80% of countries to achieve a rating of 3.5)</p>	<p><u>SDSN's indicator 61</u> Access to all-weather road (% within x-km distance to road)<sup>7</sup> (SDSN preferred this indicator here in SDG 9)</p>	<ul style="list-style-type: none"> <li>Proposed relevant UN Agency proposed Indicator 2 in "Indicator" Document: Transport by air, road and rail (millions of passengers and ton-km and % population with access to all season road). This is a two part indicator with <u>rural access</u> the <u>second part</u></li> </ul> <p>Proposed relevant indicators in "Background" Document</p>	None	<p>Volume and value of transborderland-based trade as a share of total trade (refer Table A.6 in Annex A)</p> <p>Volume of transborderperson volumes by land based modes of total international passenger volumes (refer Table A.6 in Annex A)</p>	National, regional including transborder infrastructure and passenger and freight/ trade services

<sup>7</sup>Page 84 of SDSN's document states that "Preferably such roads should be paved to ensure all-year access for heavy vehicles". While all-year access may be desirable it may be prohibitively expensive to ensure 365 day x 24 hourpassability. Instead SLoCaT proposed that 'all season' be the most relevant, socially-relevant and affordable standard since 'all season' accepts that occasionally roads may not be passable for a day or two at a time. To build all roads to all-year access standard would be significantly more expensive (likely 20-30% more) and risks a more limited coverage of the needed rural access network, that may be detrimental to achievement of the desired target.

No.	SDG and Target	SLoCaT	SDSN	UN Agencies	Urban Group	Possible Indicator	Key Topics for discussing advantages and disadvantages of indicators
	countries' share of global exports by 2020)	<p>3.2 Passenger-kilometre shares by land public transport in major national and regional corridors (<u>desired achievement</u>: an increase, based on baselines &amp; forecasts to be developed, in specific corridors by nation and region)</p> <p>3.3 Cost of national and regional bulk freight per tonne-km (<u>desired achievement</u>: 80% of best international practice for relevant commodities, in specific corridors by nation and region).</p> <p>3.4 Empty freight land transport distance travelled (<u>desired achievement</u>: 50% reduction)</p>		<p>on Regional and trans-border infrastructure:</p> <ul style="list-style-type: none"> <li>• 9.1.2. Transport by air, road and rail (million of passengers and ton-km and % population with access to all season road)</li> <li>• 9.1.3. Container port traffic (number of TEU twenty-foot Equivalent unit)</li> <li>• 9.1.4. Number of hours spent in land border</li> <li>• Disaggregate data by sex, age, and location (urban/rural), where applicable</li> <li>• World Bank LPI given as main source of indicators for 9.1.2 and 9.1.3</li> </ul> <p>No achievement level set/ baseline incomplete, notably for pax). (UN Agencies preferred this indicator in SDG 9)</p>			

No.	SDG and Target	SLoCaT	SDSN	UN Agencies	Urban Group	Possible Indicator	Key Topics for discussing advantages and disadvantages of indicators
11.2	By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons	<p><u>Target 2 - Urban access:</u>Secure universal access by sustainable transport for urban populations by 2030 (achievement level: 100%)</p> <p><u>Indicators:</u></p> <p>2.1 Mean daily travel time budget for women, men and children using sustainable transport (<u>desired achievement:</u> 90 minutes or less travel time per individual per day, including return or multipurpose trips for employment, education, health and community services)</p> <p>2.2 Proportion of income spent by urban families on transport to reach employment, education, health and community services (<u>desired achievement:</u> less than 20% of household income for poorest quintile)</p>	SDSN's Indicator 71:Percentage of people within 0.5km of public transit running at least every 20 minutes (similar to SLoCaT indicator 2.3)	<ul style="list-style-type: none"> <li>• <u>Proposed Indicator 1:</u> Percentage of people living within 0.5 km of public transit [running at least every 20 minutes] in cities with more than 500,000 inhabitants</li> <li>• Proposed Indicator 2: km of high capacity (BRT, light rail, metro) public transport per person for cities with more than 500,000 inhabitants</li> </ul> <p><u>Secondary indicators</u> (refer "Background Document"):</p> <ul style="list-style-type: none"> <li>• km of high capacity (BRT, light rail, metro) public transport per person for cities with more than 500,000 inhabitants; trips on public transit as a proportion of total trips, motorized and nonmotorized;</li> <li>• share of income spent by urban households on transport (by income quintile)</li> </ul>	Same as SDSN and Indicator 1 of UN Agencies	<p>Accessibility of households to jobs (refer Table A.5 in Annex A)</p> <p>(Could be mapped against Target 11.7 if wording of the Target was broadened to include access to jobs and other opportunities)</p>	Universal urban passenger access by sustainable transport

No.	SDG and Target	SLoCaT	SDSN	UN Agencies	Urban Group	Possible Indicator	Key Topics for discussing advantages and disadvantages of indicators
		2.3 Proportion of households within 500 metres of good quality affordable public transport accessible by dedicated walking and/or cycling facilities ( <u>desired achievement</u> : 100%).		<ul style="list-style-type: none"> <li>• Source of data given as Administrative Data</li> <li>• The Institute for International Development Policy which has also supported an urban access indicator and the particular inclusion of nonmotorized transport and the formulation of indicators above</li> </ul>			
11.6	By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management	Covered under SDG 3, Target 3.9	Covered under SDG 3, Target 3.9	<u>Proposed indicator</u> : Level of ambient particulate matter (PM 10 and PM 2.5)	None		Air quality and human health (as stated above)
<b>12.</b>	<b>Ensure sustainable consumption and production patterns</b>						
	<i>Targets relevant to transport are:</i>						
12.3	By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and	Partially covered by Target 3 and Indicators 3.1 and 3.3 on logistics under SDG 9	<u>SDSN Indicator 74</u> :Global Food Loss Indicator “(or other indicator to be developed to track	<u>Proposed Indicator</u> : Global Food Loss Index (GFLI)	None		Transport aspects covered under ‘universal rural access’ and ‘national, regional

No.	SDG and Target	SLoCaT	SDSN	UN Agencies	Urban Group	Possible Indicator	Key Topics for discussing advantages and disadvantages of indicators
	supply chains, including post-harvest losses		the share of food lost or wasted in the value chain after harvest)"				including transborder infrastructure and passenger and freight/ trade services' as mentioned above
12.c	Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, .....	<u>Indicator 6.2:</u> Motor vehicle fossil fuel subsidies by 2020 (desired achievement: 100% phase-out)	<u>SDSN's proposed complementary indicator under SDG 7:</u> Fossil fuel subsidies (\$ or % GNI) is noted as only as a "potential complementary indicator" for countries to consider (page 79)	<ul style="list-style-type: none"> <li><u>Proposed Indicator:</u> Amount of fossil fuel subsidies, per unit of GDP (production and consumption), and as proportion of total national expenditure on fossil fuels</li> </ul>	None		Phase-out of subsidies for fuels in transport covered under 'mitigation of transport's contribution to GHG emissions...' mentioned below
<b>13.</b>	<b>Take urgent action to combat climate change and its impacts</b>						
	<i>Targets mainly focus on adaptation although Target 13.a on capitalization and operationalization of the Green Climate Fund relates to mitigation. Transport is relevant to mitigation and adaptation but there is no specific target related to transport.</i>	<u>Target 6 - Greenhouse Gas Emissions:</u> Total world transport-related GHG emissions peak no later than 2020 then begin to decline at a 2% per year rate and at 2030 transport-related emissions are no higher than 2010 emissions	<u>SDSN's Indicator 78:</u> Availability and implementation of a transparent and detailed deep decarbonization strategy, consistent with the 2°C - or below - global carbon budget, and	<u>Several output-related indicators for countries</u> such as the proposed indicator for Target 13.2: Integrate climate change measures into national policies, strategies and planning	Target 11.b on enhancing capacity for planning and strengthening instruments for resource efficiency, climate change adaptation and mitigation, and community		Mitigation of transport's contribution to GHG emissions while ensuring the design of transport networks and infrastructure fully considers resilience and resource-

No.	SDG and Target	SLoCaT	SDSN	UN Agencies	Urban Group	Possible Indicator	Key Topics for discussing advantages and disadvantages of indicators
		<p><u>Indicators:</u></p> <p>Indicators 6.1 and 6.2 discussed under SDGs 7&amp;12 respectively</p> <p>6.3 Black carbon emissions from transport by 2030 (<u>desired achievement:</u> 60% reduction)</p> <p>6.4 Zero Emission Vehicle share of light-duty 4-wheel and motorised 2-wheel vehicle sales worldwide by 2030 (<u>desired achievement:</u> 20%)</p>	<p>with GHG emission targets for 2020, 2030 and 2050</p> <p><u>SDSN's Indicator 79:</u> CO2 intensity of new power generation capacity installed (gCO per kWh), and of new cars (gCO2/pkm) and trucks (gCO2/tkm)</p>		resilience		efficiency

**Table 2: Mapping of Desirable and Feasible Indicators by SDGs and Targets**

No.	Main SDG and Target	Other SDG and Target	Indicators		Proposed Lead Agency	Implementation Steps
			Measurable today	Measurable in short term		
<b>2.</b>	<b>End hunger, achieve food security and improved nutrition and promote sustainable agriculture</b>					
2.3	By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, ... through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets ...	SDG 9 & Target 9.1  (also Target 3.8 on access to health services; several targets under SDG 4 on access to education, & Target 6.1 on access to safe water)	<u>Main Indicator 1:</u> Rural Accessibility Index (RAI)  RAI is established but baseline requires updating, target needs to be established	<u>Proposed main indicator 2:</u> Indicator to assess the presence of a conducive regulatory environment for rural transport services (e.g. use in-country expert panels)	World Bank	Needs a lead agency, a work plan and a multi-year budget  Measure on 3-5 year cycle based on technical attributes and resourcing needs
<b>3.</b>	<b>Ensure healthy lives and promote well-being for all at all ages</b>					
3.6	By 2020, halve the number of global deaths and injuries from road traffic accidents	SDG11 & Target 11.2	<u>Main Indicator:</u> Fatalities due to road crashes ( <u>desired achievement</u> : reduce by half the number of fatalities due to road crashes compared with 2010 baseline of 1.24 million per year).	NA	WHO	Needs a continuing multi-year budget  Measurable every 2 to 3 years based on recent experience
3.9	By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	SDG 11 & Target 11.6	<u>Main indicators:</u> 1. Proportion of population exposed to 'above guideline' values for ambient PM10 and PM2.5	NA	World Bank/ WHO for main Indicator 1	Needs confirmation of lead agencies, work plan and a multi-year budget  Reporting likely to be feasible on 3-5 year cycle

No.	Main SDG and Target	Other SDG and Target	Indicators		Proposed Lead Agency	Implementation Steps
			Measurable today	Measurable in short term		
			<p>2. Halve premature deaths from road related air pollution by 2030 compared to 2010(<u>desired achievement</u>: 50% reduction compared to 2010 baseline of 184,000)</p> <p><u>Supportive Indicator</u>: PM10 and/or PM2.5 air pollution from passenger vehicles (<u>desired achievement</u>: 70% reduction)</p>		<p>WHO for main indicator 2</p> <p>Global Fuel Economy Initiative for supportive indicator</p>	
7.	<b>Ensure access to affordable, reliable, sustainable and modern energy for all</b>					
7.3	By 2030, double the global rate of improvement in energy efficiency	SDG 13 (no specific targets as current ones focus on adaptation)	<p><u>Main Indicator</u>: Fuel economy in all new Light Duty Vehicles by 2030, and in all Light Duty Vehicles by 2050 both from a base year of 2005 (<u>desired achievement</u>: double fuel economy)</p>		<p>UNEP and Global Fuel Economy Initiative (and member agencies FIA, IEA and ICCT)</p>	<p>Needs a multi-year budget</p> <p>Measure every two to three years</p>
9.	<b>Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation</b>					

No.	Main SDG and Target	Other SDG and Target	Indicators		Proposed Lead Agency	Implementation Steps
			Measurable today	Measurable in short term		
9.1	Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, ..., with a focus on affordable and equitable access for all	SDG 17, Target 17.11	<u>Main Indicators:</u> 1. Logistics Performance Index (LPI) ( <u>desired achievement:</u> 80% of countries to achieve a rating of 3.5)  2. Rail and airline passenger data  3. Data on trade volumes by air and sea  <u>Supportive Indicator:</u> 1. Component of LPI on perceptions of infrastructure by country	<u>Main Indicators:</u> 4. Volume and value of transborder land-based trade as a share of total trade <sup>8</sup>  5. Volume of transborder person volumes by land based modes of total international passenger volumes  <u>Supportive Indicators:</u> 2. Delays at border crossings for goods	World Bank for LPI  World Bank and UN Agencies (the Economic and Social Commissions) for others	Relevant agencies to confirm priorities, then work plans and a multi-year budget  LPI can be reported every 2 years as currently & others annually
<b>11.</b>	<b>Make cities and human settlements inclusive, safe, resilient and sustainable</b>					
11.2	By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations,	SDG 11 & Target 11.7	<u>Main Indicators:</u> Proportion of households within 500 metres of good quality affordable public transport accessible by dedicated walking and/or cycling facilities	<u>Supportive indicators:</u> 2. City-level indicators on affordability (several cities)  3. Public transport passenger satisfaction	World Bank with UN-Habitat	Needs confirmation of lead agencies, work plan and a multi-year budget  Main indicators likely to focus on major cities only & 3-5 year reporting cycle due to technical & budget limitations

<sup>8</sup>In terms of volume of trade, land and sea based trade comprise most of the total trade volumes. Accordingly, this indicator provides information on the changes in sea-based trade also.

No.	Main SDG and Target	Other SDG and Target	Indicators		Proposed Lead Agency	Implementation Steps
			Measurable today	Measurable in short term		
	women, children, persons with disabilities and older persons		(measured in conjunction with accessibility indicator – refer Target 11.7) <sup>9</sup>  <u>Supportive Indicator:</u> 1. Length (km) of high capacity (BRT, light rail, metro, bus) public transport per person for cities with more than 500,000 inhabitants	surveys in cities where accessibility is measured to assess the quality of public transport		
11.7	By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities	SDG 11 & Target 11.2 (also Target 3.8 on access to health services; several targets under SDG 4 on access to education, & Target 6.1 on access to safe water)	<u>Main Indicator:</u> World Bank’s accessibility index to jobs, <u>or</u> travel times by traveller type and purpose <sup>10</sup>	NA	World Bank	Needs confirmation of lead agency, work plan and a multi-year budget  Likely to focus on major cities only & 3-5 year reporting cycle due to technical & budget limitations
<b>12.</b>	<b>Ensure sustainable consumption and production patterns</b>					
12.c	Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions ....and phasing out	SDGs 9 & 13	Motor vehicle fossil fuel subsidies by 2020 (desired achievement: 100% phase-out)	NA	GIZ	Needs on-going budget  Annual reporting is feasible with budget

<sup>9</sup>This indicator has often been calculated in major cities in many countries at different times and may not include informal modes.

<sup>10</sup>Even though this indicator does not fully meet the requirements for being measurable today as set out in the text, wherever a major transport study has been undertaken, in effect the indicator could be calculated. Most major cities of the world have undertaken major transport studies and developed associated transport models.

No.	Main SDG and Target	Other SDG and Target	Indicators		Proposed Lead Agency	Implementation Steps
			Measurable today	Measurable in short term		
	those harmful subsidies ..					
13.	<b>Take urgent action to combat climate change and its impacts</b>					
	<i>Targets mainly focus on adaptation. Transport is relevant to mitigation and adaptation but there is no specific target related to transport.</i>	NA	<u>Main Indicator:</u> Total world transport-related GHG emissions peak no later than 2020 then begin to decline at a 2% per year rate and at 2030 transport-related emissions are no higher than 2010 emissions  <u>Supportive indicators:</u>  1.Black carbon emissions from transport by 2030 ( <u>desired achievement:</u> 60% reduction)  2.Zero Emission Vehicle share of light-duty 4-wheel and motorised 2-wheel vehicle sales worldwide by 2030 ( <u>desired achievement:</u> 20%)	NA	IEA for main indicator  ICCT for supportive indicator 1 (black carbon emissions)  IEA with UN-Habitat for supportive indicator 2 ( ZEV share of vehicle sales)	Needs confirmation of lead agencies, work plan and a multi-year budget  Annual reporting feasible

## Annex A: Proposed Indicators, Alternative Formulations & Measurability

### A.1 Universal Rural Access

The discussion is done in two parts by grouping alike indicators in Tables A.1 and A.2.

#### Conclusion:

Based on the information in Tables A.1 and A.2 it appears feasible and desirable to adopt:

- The Rural Accessibility Index (RAI) as the primary means of measuring rural access but resources are needed to apply/ update it in every country.
- Since RAI does not measure the availability of adequate and affordable transport services, it would be feasible to establish in-country panels of experts to assess whether prevailing regulations facilitate provision of safe, affordable and adequate rural transport services – WHO use the same approach to track implementation of road safety related regulations in every nation.
- Annual measurement is unlikely to be warranted – refer discussion in Table A.1.

**Table A.1: The Rural Accessibility Index and Variants**

<b>Proposed Indicator</b>	The number of rural people who live within two kilometers (typically equivalent to a walk of 20-25 minutes) of an all-season road as a proportion of the total rural population road (% within x-km distance to road). This is the Rural Accessibility Index (RAI) developed by the World Bank <sup>11</sup> .
Proposed achievement level	Not stated
Status of baseline	Results for 32 IDA countries, representing 88% of the total rural population in all IDA countries in early 2000s, show that “on average 57% of rural dwellers had access to the transport network”. That is, 57% were within 2km of an all-season road.
Alignment with SDG & targets	SLoCaT aligned their index with Target 2.3 <sup>12</sup> because of the strong linkages to people, access of all kinds and agricultural productivity. SDSN and UN Agencies aligned it with Target 9.1 focusing on “infrastructure”.
Proposed by	SLoCaT proposed a variation of the indicator above as did SDSN. SLoCaT’s indicator 1.1 variation was to replace ‘all season’ with ‘all-year’ with the same meaning but additional words were provided to convey the idea that rural transport was varied e.g. a rural road may be a small track, or that walking or water transport, may be the only means of rural access. SDSN’s variation was to replace ‘all season’ with ‘all weather’ which implies a higher cost of road provision in some cases. UN agencies proposed a similar wording to RAI as part of a two-part indicator (with the first part being “Transport by air, road and rail

<sup>11</sup>Refer [<http://www.worldbank.org/transport/transportresults/headline/rural-access.html>].

<sup>12</sup>Target 2.3 states “By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment”.

	<p>(millions of passenger and tonne-km)...”.</p> <p>SLoCaT proposed two additional indicators:</p> <p>1.2 Proportion of rural population living within 30 minutes’ walk of appropriate formal or informal transport services (<u>desired achievement</u>:100% achievement of local access targets, monitoring remotest quintile)</p> <p>1.3 Travel time, including walking, from villages to local towns with markets and medical facilities for the poorest rural income quintile (desired achievement:100% achievement of local travel-time targets)</p> <p>Indicator 1.2 emphasizes the need for appropriate transport services to actually operate. Indicator 1.3 focuses on the need to consider the actual end to end travel times for important journeys for the poorest income quintile.</p>
If new, why proposed	Not applicable (NA)
Current data sets and lead agency	RAI was developed by the World Bank that originally defined the indicator in 2003 as part of the Results Measurement Framework of the International Development Association (IDA). RAI information from [ <a href="http://www.worldbank.org/transport/transportresults/headline/rural-access/rai-updated-modelbasedscores5-20070305.pdf">http://www.worldbank.org/transport/transportresults/headline/rural-access/rai-updated-modelbasedscores5-20070305.pdf</a> ] indicates baseline data is available for most countries but is generally 10 years or older and estimated in a variety of ways.
Status of measurability today	Not immediately measurable
Advantages	Widely accepted. Experience available.
Disadvantages	The current formulation does not indicate whether appropriate and affordable passenger and transport services actually operate on these roads. Current formulation indicates nothing about end to end journey times to medical facilities, schools or markets nor about the income groups or other features (e.g. gender) of rural travellers. As what constitutes rural transport services can vary widely from use of motorcycles, farm vehicles, and pick-ups (shared-basis), to formal or informal bus services, attempting to measure the availability of adequate rural transport services on roads with the RAI would be challenging.
Actions for measurability	<p>An updated RAI baseline likely able to be measured in majority of countries in one or two years with ownership and a multi-year budget. Appropriate targets for improvement would be difficult to set as it appears has been the case in the past. Appropriate targets would necessarily be country and context-specific. Because of the nature of the index, RAI will likely be estimated using GIS based upon satellite imagery and other mapping. Estimation year to year as desired by UNSC will likely show no significant difference in measured RAIs. A more relevant time interval would be likely around 5 years.</p> <p>One possibility to measure the potential presence of services of adequate quality on rural roads in a country is to have local experts to identify: (i) whether there are any regulations that prohibit transport services on certain roads or the presence of state-owned operators with monopolies; and (ii) any regulations that facilitate investment and operation of safe and affordable transport services (e.g. competitive market, with no tariff regulation etc). Such an approach is used by WHO in their Global Status Report on Road Safety where they track progress in introducing various types of safety regulations in each country using in-country expert panels.<sup>13</sup></p>

**Table A.2: Other Indicators with Rural Access Relevance**

<b>Proposed Indicator</b>	<u>SDSN’s indicator 14</u> : Access to storage and drying facilities.
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<sup>13</sup>WHO (2013,) “Global Status Report on Road Safety 2013 – Supporting a Decade of Action.”

	<p><u>SDSN Indicator 74</u>: Global Food Loss Indicator “(or other indicator to be developed to track the share of food lost or wasted in the value chain after harvest).”</p> <p>Both have implications for rural and national transport systems.</p>
Proposed achievement level	Not stated
Status of baseline	<p>Nil for SDSN’s indicator 14. SDSN (2015) state “index is to be developed.”</p> <p>FAO (2014), page 10, states that the Global Food Loss Index<sup>14</sup> “... measures quantitative food losses and is based on a model which uses observed variables that conceivably influence food losses (e.g. road density, weather, pests) to estimate quantitative loss ratios for specific commodities and specific countries over time. Data on these variables are readily available from several sources, including country statistics, FAOSTAT, WFP’s Logistics Capacity index, World Road Statistics, etc. Development of the index is a key deliverable within FAO’s 2014-2015 programme of work”.</p>
Alignment with SDG & targets	<ul style="list-style-type: none"> <li>• Target 2.3 for SDSN’s Indicator 14</li> <li>• Target 12.3 for the Global Food Loss Index.</li> </ul>
Proposed by	SDSN for both, with source of the Global Food Loss Index being FAO
If new, why proposed	NA
Current data sets and lead agency	<ul style="list-style-type: none"> <li>• Nil for SDSN’s Index 14 with FAO proposed as lead agency</li> <li>• Global Food Loss Index by FAO.</li> </ul>
Status of measurability today	<ul style="list-style-type: none"> <li>• Index 14 not specified and therefore not measured.</li> <li>• Global Food Loss Index measurable today.</li> </ul>
Advantages	GFLI measurable and supported
Disadvantages	Index 14 does not exist but only has partial relevance to transport
Actions for measurability	<ul style="list-style-type: none"> <li>• From a transport point of view Index 14 does not seem critical.</li> <li>• GFLI measurable already.</li> <li>• A transport-specific index on rural access or improved logistics would be a more direct way of addressing the relevant transport concerns of both.</li> </ul>

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<sup>14</sup>FAO (2014), “Post 2015 Development Agenda: Targets and Indicators.” March. Refer [http://www.fao.org/fileadmin/user\_upload/post-2015/Targets\_and\_indicators\_RBA\_joint\_proposal.pdf]. Accessed March 9, 2015.

## A.2 Universal Urban Passenger Access

The discussion is done in three parts given the wide variety of indicators that have been proposed:

- The first part discussed an indicator that was proposed by all four sources with some slight wording variation. As expressed by SLoCaT this was Indicator 2.3 “Proportion of households within 500 metres of good quality affordable public transport accessible by dedicated walking and/or cycling facilities.”
- The second part describes the proposed accessibility index put forward by World Bank<sup>15</sup>. With it, SLoCaT’s proposed Target 2 for urban access is also discussed as both attempt to measure access to activities at destinations.
- The third part discusses the remaining indicators of SLoCaT and UN agencies.

### Conclusion:

Based on the information in Tables A.3 to A.5, a method to measure access to opportunities rather than sustainable transport services is desirable. Both types of indicators require resources for measurement and in practical terms this would likely limit measurement to a handful of cities in each country for some time. Much existing information would be available but not on a comprehensive basis.

With sufficient resources, it would be feasible to measure:

- An accessibility measure for major cities in a majority of countries, with roll-out to other countries and secondary cities when possible – as proposed by World Bank this would be the proportion of households that can access jobs within 60 or 75 minutes by walking, cycling and public transport.
- Supplement this with a measure of access to public transport services or other sustainable modes at the same time as the accessibility index is computed since it shares the same method of measurement (i.e. information on up to date public transport schedules). Where up to date schedules are available locally appropriate measures of quality (based on frequency and other considerations) could be established.

Supportive indicators<sup>16</sup>:

- Share of daily person trips made by public transport, walking and other nonmotorized modes of total daily person trips (a better formulation would be expressed in person-km of travel but may be more difficult to obtain). It is included as a potential supportive indicator rather than a main indicator as it measures the outcome of a range of policies and trends, not just of transport.

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<sup>15</sup> Refer [<http://blogs.worldbank.org/transport/how-does-investment-help-accessibility-metropolitan-area-s-poorest-40-percent>] Accessed March 9, 2015.

<sup>16</sup> ‘Supportive indicators’ indicate those that indirectly measure effectiveness of sustainable transport solutions to meet specified targets. They could be considered if sufficient resources are available and could either be implemented by individual countries or professional groups.

- Length (km) of high capacity (BRT, light rail, metro, bus) public transport per person for cities with more than 500,000 inhabitants – this indicator is not included as main indicator as it does not measure access well as most cities would continue not to have rapid transit, and in almost all cities, the normal public transport system carries the majority of passenger trips.
- Limited surveys at city-level in each country could be encouraged to provide data on income quintiles etc. of travellers. Best done across several cities.
- Public transport passenger satisfaction surveys in cities where accessibility is measured to supplement the assessment of the quality of public transport.

Annual measurement is unlikely to be warranted or feasible as discussed in Tables A.3 and A.4.

A lead agency is needed. World Bank appears relevant possibly in conjunction with UN Habitat.

**Table A.3: Urban Access to Public Transport**

<b>Proposed Indicator</b>	<p><u>SLoCaT's Indicator 2.3:</u> Proportion of households within 500 metres of good quality affordable public transport accessible by dedicated walking and/or cycling facilities (<u>desired achievement: 100%</u>).</p> <p><u>SDSN's Indicator 71 and Urban Group proposal:</u> Percentage of people within 0.5km of public transit running at least every 20 minutes</p> <p><u>UN Agencies' proposed Indicator 1:</u> Percentage of people living within 0.5 km of public transit [running at least every 20 minutes] in cities with more than 500,000 inhabitants</p>
Proposed achievement level	SLoCaT proposed an 'ideal' 100%. Others did not propose an achievement level. A baseline is needed before achievement levels can be contemplated.
Status of baseline	Does not exist.
Alignment with SDG & targets	All indicators are aligned with Target 11.2 on "...access to safe, affordable, accessible and sustainable transport systems.." as part of SDG 11.
Proposed by	As stated above
If new, why proposed	NA
Current data sets and lead agency	Likely available (or derivable) in many major cities of middle and high income countries where computerized, multi-modal transport models have been developed at different times. This information is not centrally collated on a comprehensive and on-going basis and not up to date.
Status of measurability today	Not measurable comprehensively
Advantages	Is comparable to RAI for rural access but includes the concept of access to transport services rather than the presence of roads alone.
Disadvantages	It is therefore more complex to measure as the presence of roads does not guarantee public transport services of a desired quality exist. The availability of services can be measured by surveys of public transport services using conventional methods or using new methods such as the Global Transit Feed Standard <sup>17</sup> to develop public transport route and service schedules including by informal public transport.

<sup>17</sup>The General Transit Feed Specification (GTFS) defines a common format for public transportation schedules and associated geographic information. GTFS "feeds" allow public transit agencies to publish their transit data and developers

	<p>Effort taken to measure the indicator fully in a particular city would therefore be significant. As there are several thousand cities with nearly half of the world's 3.9 billion urban dwellers reside in relatively small settlements with fewer than 500,000 inhabitants<sup>18</sup> proper measurement of the indicator would have to be done by some sort of sampling (e.g. 1 metro city per country, several secondary cities, several representative smaller cities). The UN Agencies' formulation of the indicator suggests the need for sampling.</p> <p>The indicator measures access to transport services, the means, not to desired opportunities. The indicator is therefore not directly comparable to other SDGs, for example, on access to clean water.</p> <p>The indicator formulations all suggest the idea of the quality of public transport services rather than quantity alone. The types of transport that are appropriate will be context specific (e.g. in many parts of many cities, motorcycles may be the only mode that can access small streets in which many people live. <u>What constitutes 'quality' will also vary greatly.</u> The proposed 20 minute headway service of SDSN and UN Agencies is an attempt at defining quality. In the metro-cities a 20 minute service would likely be inadequate in many locations". Where the public transport schedules including for informal transport are developed using the GTFS or other means, then locally appropriate quality could be assessed. An alternative is to use passenger satisfaction surveys.</p>
Actions for measurability	Needs a lead agency and a multi-year budget. A work plan is also needed setting out realistically what exactly should be measured, how and where and over what time frame.

**Table A.4: Urban Accessibility Measures**

<b>Proposed Indicator</b>	<p><u>World Bank proposal:</u> The share of jobs in the metropolitan area an 'average' household can access within 60/75 minutes without a private car, i.e. using walking, cycling and public transport.</p> <p><u>SLoCaT's proposed Target 2.1 :</u> Mean daily travel time budget for women, men and children using sustainable transport (<u>desired achievement</u>: 90 minutes or less travel time per individual per day, including return or multipurpose trips for employment, education, health and community services)</p>
Proposed achievement level	SLoCaT proposed an 'ideal' 100%. World Bank did not propose an achievement level. A baseline is needed before achievement levels can be contemplated.
Status of baseline	Not available for either indicator
Alignment with SDG & targets	Target 11.2 (or possibly 11.7 on access to green and public spaces if the scope of the target is widened).
Proposed by	As set out above
If new, why	World Bank proposed the indicator on accessibility to jobs as it is a theoretically

to write applications that consume that data in an interoperable way. Refer [<https://developers.google.com/transit/gtfs/>] accessed March 9, 2015.

<sup>18</sup> Refer [<http://www.un.org/en/development/desa/news/population/world-urbanization-prospects-2014.html>] accessed March 9, 2015.

proposed	sound form of indicator and they have developed a methodology.
Current data sets and lead agency	Both have been measured in some locations. Unlikely to be any comprehensive data set for either. World Bank would be lead for their indicator. SLoCaT proposed World Bank and /or UN Habitat as lead agency for their indicator.
Status of measurability today	<p>World Bank's indicator can be measured in specific locations. As a by-product of the calculation of the accessibility index, the indicator on access to public transport and other sustainable modes discussed in Table A.3 can be calculated as it shares common information. SLoCaT's indicator can be measured by survey or via available transport models in specific locations.</p> <p><u>Comments on measurement approaches</u></p> <p>World Bank's proposed accessibility indicator relies on knowing population home locations, job locations by small area and measuring the travel time between home and jobs by public transport etc. While home location information on a small area basis is available from census or registration data, job location information is poor even in developed cities. Available small-area job location information is commonly estimated from time to time in developed cities typically uses three sources: (i) specific industry surveys, for example, of manufacturing industry; (ii) journey to work information if collected by census; and (iii) other estimation. These three sources are used in conjunction with top-down job classifications of jobs by industry sector. Particular problems are: (i) informal jobs or home-based jobs on which little information may exist; (ii) non-fixed location jobs; and (iii) population-serving jobs are assumed to be distributed according to the population locations but this may not hold in a poor city, where services provided to the population are not evenly distributed. Travel time information of public transport is derived from schedules which is assumed to be up to date and cover all modes (informal modes also). Walking and cycling travel times may be estimated or surveyed directly.</p> <p><u>There are four survey approaches possible:</u></p> <p><u>Home Interview Surveys</u> of a small % of the urban population (likely less than 0.1% of households – for example, in a city of 10 million with 2.5 million households, 0.1% would represent 2,500 households. This would be more than adequate for sampling of all key population segments and simple collection of data on <u>reported</u> trip purpose (e.g. to work), trip length and times by income and gender. For comparison, even large scale home interview surveys done to support development of comprehensive transport models would rarely survey more than 20,000 households (e.g. Hanoi for a population of 6 million, Sydney for a population of 4 million). These surveys are used to develop complex transport models to simulate trip making on an origin-destination basis. They utilize the small sample to build models by household categories and expand the results using knowledge of the number of such households in the sample frame. The final model is calibrated against on ground measurements. However, at \$ 20-\$ 50 per household interviews would be expensive and time consuming.</p> <p><u>Small sample surveys:</u> if a sample frame is available and relatively simple travel time information is wanted as above, small sample direct interview surveys could be valuable. This would accord with basic sampling theory ideally using systematic sampling from a sample frame. Surveys would likely have to be done in the field. They would be cheap (\$2-3 per interview). Such small sample surveys are done for pre-election polling using telephones in developed countries. It is likely market research companies use such approaches in developing countries. Problems may occur if sample frames are poor, if parts of the population may not be easily found and surveyed, and if people's reporting of travel times etc. are not accurate. However, reported travel times and trip characteristics have been the basis of transport planning models for many years, although trip times are also calibrated from the</p>

	<p>models themselves using other direct measurements to aid calibration. Reported travel times are also used in other types of surveys e.g. refer discussion on Bhutan’s household living standard surveys below. It is also quite common today for diary methods to be used by survey respondents with GPS measurement of travel times. A combination of direct finding of samples (i.e. in the field) and partial measurement of actual travel times would be possible at greater cost in a small number of cities.</p> <p><u>National household surveys.</u> These are done frequently in many countries by national statistical departments and with a little effort the scope of questions could be expanded and standardized to include suitable questions on transport (and other sectors) with substantial benefits.<sup>19</sup> The surveys are often called ‘household expenditure’ or ‘household living standard’ surveys. They may measure incomes, demographic characteristics, assets owned, expenditures by type of goods and services, and amongst other things may include one or two questions on transport and access to energy services. At present the transport questions are often rudimentary. However, as an example of what can be done even in small countries, Bhutan’s National Statistics Bureau has conducted comprehensive national living standards surveys in 2003, 2007 and 2012<sup>20</sup> in which a full range of questions on urban and rural transport access (% h/holds within 30, 60 mins etc. of different types of facilities), affordability, ownership of cars etc., and incidence of walking, cycling, use of public transport and cars, as well as access to energy, medical and other services. Because such surveys cover all or most sectors the cost per individual sector is low<sup>21</sup>. However, it may take several years before a standardized set of survey questions can be implemented in the majority of nations in part because intervals between surveys can vary from 2 to 10 years, and one or two years, are needed for analysis.</p> <p><u>Data from mobile telephone tracking</u></p> <p>Use of ‘big data’ collected primarily from mobile phone location, use and user characteristics is seen as having significant potential for assisting with timely measurement of the quality and quantity of services and accessibility to these services<sup>22</sup>. ‘Open Transport’ is a new approach to data collection promoted by the World Bank and others, with open data standards, open source software, and open data enabling the next generation of managing and planning transport systems in resource-constrained environments. The General Transit Feed Specification (GTFS), for example, has now been demonstrated across the world as a way to cheaply collect, disseminate, and allow analysis of public transport service data by multiple software platforms, generating spatial data on service frequency. A growing body of data exists for measuring service provision and frequency of public transportation, though data often do not exist or are of poor quality in lower income countries. There is a lack of international data standards or reporting, and data harmonization is a challenge. To obtain this data requires going down to municipal/city level, as urban transport is most often not under direct responsibility of national governments.</p>
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<sup>19</sup> Currently, in many developing and developed cities household travel surveys (for transport studies) are carried out periodically. Such surveys are expensive (interviews cost from \$20 to 60 per household) and it is likely impractical to do them more than every 5 years.

<sup>20</sup> National Statistics Bureau, Royal Government of Bhutan, (2013). “Household Living Standards Surveys 2003, 2007 and 2012”

<sup>21</sup> The 10,000 sample 2012 survey cost approximately USD 200,000. This covered 5% of national households.

<sup>22</sup> Refer SDSN (2015) page 14.

	<p>Within the scope of 'open data' is the use of aggregate, anonymized mobile phone data for obtaining information on access times, travel distances and travel speeds in cities and other information. Even where non-Smart Phones predominate in local markets, information on travel can be estimated. Several issues must be addressed to realize the potential: (i) national privacy laws that vary by nation; (ii) technological level of phones in the market; and (iii) cost of obtaining the data – dependent on how the telecommunications company that owns the data perceives its value. For example, in a recent study by ADB in Dhaka, Bangladesh, the telecommunications company provided the data for no charge, permitting detailed estimates of travel patterns and travel times/ distances to be obtained cheaply. Despite the potential, the magnitude of the task of achieving universal and reliable measurement across urban areas should not be underestimated. Obtaining equivalent information across most rural areas is likely to be even more challenging.</p>
Advantages	<p>World Bank have proposed a standardized methodology<sup>23</sup> for their accessibility indicator. It measures access to opportunities at destinations, in this case jobs, by sustainable transport modes. The same type of index could be used to measure access to education and medical facilities although in these forms the indicator may indicate more about the level of provision of these facilities, than access by transport. In effect, in any city, with an up to date, calibrated multi-modal, computerized transport model the same index could be computed relatively easily. Such models will likely exist and be maintained in the major cities of many middle income and high income countries.</p> <p>SLoCaT's indicator was intended to measure the same type of measure but to express it as an average travel time by trip purpose but the direct survey method provides the opportunity to collect other data (e.g. gender, fare paid for public transport etc.).</p>
Disadvantages	<p><b>Accessibility index:</b> because information on job location is poor and likely only currently available in a sample of cities per country, estimation of job locations would be needed in the cities where the index is to be estimated. Travel time data needs to be relatively precise as is envisaged by the methodology and would take budget and effort in each city where public transport schedules (formal and informally provided) are not up to date. In practice, this may mean the index would likely only be applied to a few cities per nation. It is unlikely that annual estimation of the index would be warranted even if budget were available as in many locations the errors in job location estimation and travel time measurement would exceed the advantages to be gained by annual updating.</p> <p>SLoCaT's indicator ought to be more easily measured and would be cheaper than measuring the accessibility index in a particular location but sampling issues may be problematic and in others, reported travel times may not be sufficiently precise.</p>
Actions for measurability	<p>Needs a lead agency and a multi-year budget. A work plan is also needed setting out realistically what exactly should be measured, how and where and over what time frame. The precise indicator and method of measurement would need to be determined. It appears necessary that either a survey approach or the accessibility method would have to be done on sampling basis possibly aiming to start with the metro-cities in a majority of countries only.</p>

**Table A.5: Other Urban Access Indicators**

<b>Proposed Indicator</b>	<u>SLoCaT's proposed Indicator 2.2:</u>
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<sup>23</sup><http://blogs.worldbank.org/transport/how-does-investment-help-accessibility-metropolitan-area-s-poorest-40-percent>.

	<p>Proportion of income spent by urban families on transport to reach employment, education, health and community services (<u>desired achievement</u>: less than 20% of household income for poorest quintile)</p> <p><u>UN agencies proposed indicators</u>:</p> <ul style="list-style-type: none"> <li>Proposed Indicator 2: km of high capacity (BRT, light rail, metro) public transport per person for cities with more than 500,000 inhabitants</li> </ul> <p><u>Secondary indicators</u> (refer “UN Agencies’ Background Document”):</p> <ul style="list-style-type: none"> <li>km of high capacity (BRT, light rail, metro) public transport per person for cities with more than 500,000 inhabitants; trips on public transit as a proportion of total trips, motorized and nonmotorized;</li> <li>share of income spent by urban households on transport (by income quintile)</li> <li>Source of data given as Administrative Data</li> </ul> <p>The Institute for International Development Policy (ITDP) which has also supported an urban access indicator and the particular inclusion of nonmotorized transport and the formulation of indicators above. ITDP has also proposed the first secondary indicator on km of rapid transit should be replaced with proportion of urban population within 1km of a rapid transit station.</p>
Proposed achievement level	Except for the SloCaT indicator, nil. (SloCaT target is a variation of Armstrong Wright maxim that situations in which more than 10% of households spend more than 15% of their household incomes on work journeys can be regarded as discriminatory. <sup>24</sup> )
Status of baseline	<p><u>SLoCaT Indicator and UN Agencies’ second indicator both on expenditure: Not available comprehensively.</u> Data are normally collected from small sample surveys for particular purposes. Data on expenditure on transport by households in national expenditure surveys uses different definitions and would also include expenditure on motor vehicle expenses in the same measure.</p> <p><u>UN Agency indicator 2 and first secondary indicator:</u> <u>Km of rapid transit:</u> baseline likely easily established as relatively few cities have rapid transit systems</p> <p><u>Trips on public transport as a % of total trips:</u> baseline likely easily established but care will be needed with definitions as ticket sale data over count public transport journeys from A to B due to transfers and therefore the results can vary from mode split information reported by transport studies. Non-motorized trips are often not included in travel surveys in many developing cities.</p>
Alignment with SDG & targets	Target 11.2 (or possibly 11.7 on access to green and public spaces).
Proposed by	As stated above
If new, why proposed	ITDP proposed enhancements above with the aim of strengthening the formulation of the UN Agency indicators
Current data sets and lead agency	Unlikely to be integrated data sets of any of the above. World Bank, UN-Habitat or other
Status of measurability today	As above
Advantages	The indicator on proportion of income used in travel addresses equity concerns.

<sup>24</sup>World Bank (2002), “Cities on the Move: A World Bank Urban Transport Strategy Review.” Page 34.

	The other indicators are simple and likely easily collected particularly if confined to cities above 500,000 population as stated above.
Disadvantages	<p>The indicator on proportion of income used in travel has been collected on a case by case basis likely using different definitions.</p> <p><u>In relation to the other indicators:</u></p> <ul style="list-style-type: none"> <li>• Even if km of rapid transit is measured in cities with more than 500,000 population it would not be representative of the thousands of smaller cities that do not have rapid transit.</li> <li>• Development of rapid transit systems in some cities is not an adequate proxy for improvement in city-wide transit systems. Most public transport travel in any city is on non-rapid transit (i.e. bus or similar).</li> <li>• Public transport (rapid transit, bus etc.) modal share data is an insufficient measure of access – trends in most cities are for public transport shares to decline due to increasing motorization and improvements in rapid transit and public transport may not be able to reverse these trends. Modal shares are a result of outcomes of more than transport policies e.g. industry and energy policies also. That is, dramatic improvements in public transit across a city would likely greatly improve access but the main beneficiaries would be existing public transport users.</li> <li>• Mode share information is poorly reported and can uses different definitions of trips (refer discussion above).</li> </ul>
Actions for measurability	Needs a lead agency and work plan. Budget need would be modest.

### A.3 National, Regional Including Transborder Infrastructure and Services

The targets and indicators proposed by SLoCaT and the UN Agencies address the passenger and trade logistics components of national, regional including transborder transport. While the focus of the proposed SDG and targets is on infrastructure, both SLoCaT and the UN Agencies emphasize the services and the desired outcomes of providing the associated infrastructure. The UN Agencies address all modes of transport while SLoCaT focuses on land transport. Further background information on the availability of relevant passenger data is provided in Annex C.

#### Conclusion:

Based on the information in Table A.6, would be feasible to measure:

- The existing Logistics Performance Index (LPI) index for all countries.
- Data on trade volumes by air and sea.
- Proportion of transborder trade by land based modes of total international trade by country to track improvements in relevant transborder and regional infrastructure improvement and trade facilitation.
- Proportion of transborder person volumes by land based modes of total international passenger volumes by country to track improvements in relevant transborder and regional infrastructure improvement and facilitation.
- Rail and airline passenger data.

Supportive indicators could be:

- Delays at border crossings for goods.
- Component of LPI on perceptions of infrastructure by country.

World Bank as a key developer of LPI would be the lead. World Bank with the UN Agencies (the Economic and Social Commissions) would seem to be a suitable lead for other indicators.

**Table A.6: National, Regional and Transborder Indicators**

Proposed Indicator	<p>SLoCaT Target 3 - National access and regional connectivity: Facilitate national inclusion and regional connectivity by sustainable multi-modal freight and passenger services by 2030 (achievement level: to be determined)</p> <p>Indicators:</p> <p>3.1 Logistics Performance Index for all countries (desired achievement: 80% of countries to achieve a rating of 3.5)</p> <p>3.2 Passenger-kilometre shares by land public transport in major national and regional corridors (desired achievement: an increase, based on baselines &amp; forecasts to be developed, in specific corridors by nation and region)</p> <p>3.3 Cost of national and regional bulk freight per tonne-km (desired achievement: 80% of best international practice for relevant commodities, in specific corridors by nation and region).</p> <p>3.4 Empty freight land transport distance travelled (desired achievement: 50% reduction)</p> <p>UN Agencies proposed the following indicators</p> <ul style="list-style-type: none"> <li>• Proposed relevant UN Agency proposed Indicator 2 in “Indicator” Document: Transport by air, road and rail (millions of passengers and ton-km and % population with access to all season road). Rural access part of this indicator was discussed above.</li> </ul> <p>Proposed relevant indicators in “Background” Document on Regional and transborder infrastructure:</p> <ul style="list-style-type: none"> <li>• 9.1.2. Transport by air, road and rail (million of passengers and ton-km and % population with access to all season road)</li> <li>• 9.1.3. Container port traffic (number of TEU twenty-foot Equivalent unit)</li> <li>• 9.1.4. Number of hours spent in land border</li> </ul> <p>SLoCaT proposals (during preparation of this document):</p> <ul style="list-style-type: none"> <li>• Proportion of transbordertrade by land based modes of total international trade by country to track improvements in relevant transborder and regional infrastructure improvement and trade facilitation.</li> <li>• Proportion of transborderperson volumes by land based modes of total international passenger volumes by country to track improvements in relevant transborder and regional infrastructure improvement and facilitation.</li> </ul>
Proposed achievement level	<p>SLoCaT proposed an achievement level for the Logistics Performance Index based on an examination of LPI results in 2012. They showed that only 26 countries or 17% of the total surveyed had an LPI of more than 3.5. Consequently, the desired LPI achievement level was set as ‘80% of countries to be a rating of 3.5’</p> <p>For other indicators of SLoCaT and UN Agencies no achievement levels were set.</p>
Status of baseline	<p>LPI exists for 2007, 2010, 2012 and 2014.</p> <ul style="list-style-type: none"> <li>• Data on passenger travel (pax, pax-km) by rail and air exists and is normally reported at national level by relevant agencies. Passenger travel by bus services</li> </ul>

	<p>which are often privately provided are not normally available. Passenger volumes by car are not normally available on a reliable basis. Refer Attachment 2.</p> <ul style="list-style-type: none"> <li>• Trade and person volumes are normally available at a national level from relevant agencies. It may be possible to identify from these data the proportion by land based modes and construct a suitable index to track improvements in transport border and regional infrastructure and person and trade facilitation.</li> <li>• SLoCaT’s Indicators 3.3 and 3.4 would be available from Industry Associations but a global baseline is unlikely to exist.</li> <li>• UN Agencies’ indicators 9.1.3 on “Container Port Traffic” and 9.1.4 on “Number of Hours Spent in Land Border”</li> </ul>
Alignment with SDG & targets	Target 9.1 (and 17.11 on trade exports).
Proposed by	As above
If new, why proposed	The SDG target 9.1 focuses on infrastructure but definition of what constitutes appropriate regional and transborder infrastructure is problematic. While km of new regional roads, railways etc. built could be measured these statistics would not be very informative. More valuable would be information on ‘delays at border crossings’ as proposed by UN or alternatives e.g. (i) the share of land-based trade as a % of total trade; or (ii) the LPI index that measures the overall result of improved infrastructure and trade facilitation and other factors. Refer Annex 2.
Current data sets and lead agency	<ul style="list-style-type: none"> <li>• World Bank for LPI.</li> <li>• UN Economic and Social Commission for Africa, Asia and Pacific, and Western Asia for railway and airline pax. data at regional level, trade and related data.</li> <li>• Data on regional passenger travel by car and bus poor (refer Annex 2) and there may be no agency actively involved on these topics.</li> </ul>
Status of measurability today	<ul style="list-style-type: none"> <li>• LPI is measurable.</li> <li>• A trade volume indicator (e.g. % of land-based trade of total trade) to be formulated) should be measurable. Delays at land borders could likely be collated easily. – would measure extent of land-based trade facilitation and supporting infrastructure improvement.</li> <li>• Goods volumes and value by sea and air would be available.</li> <li>• Rail and airline pax. data would be available (not for bus and car)</li> <li>• Information on regional transport infrastructure would be available.</li> </ul>
Advantages	As above
Disadvantages	As above
Actions for measurability	Because of the complexity of the topic and scope of proposed indicators, the first step is for relevant agencies to decide what is desirable, what can be measured and over what time frame. The selection of lead agencies, work plans and budgets follows.

#### A.4 Road Safety

All sources propose the same indicator for road safety that was developed by the UN Road Safety Collaboration.

#### Conclusion:

As shown in Table A.7, fatalities from road crashes are measurable and there is a process in place.

**Table A.7: Road Safety Indicators**

<b>Proposed Indicator</b>	<ul style="list-style-type: none"> <li>Fatalities due to road crashes (desired achievement: reduce by half the number of fatalities due to road crashes compared with 2010 baseline of 1.24 million per year).</li> <li>Target is same as main indicator</li> </ul> <p><u>Secondary indicators</u>, also developed by the UN Road Safety Collaboration, on serious injuries and economic losses due to road trauma closely co-related to fatalities.</p>
Proposed achievement level	As above
Status of baseline	<ul style="list-style-type: none"> <li>Measured by WHO in 2007 and 2010<sup>25</sup> (standardized methodology for systematically collecting data)</li> <li>Target and indicators proposed by WHO and other members of the UN Road Safety Collaboration</li> <li>Differentiated targets proposed by low, middle and high income countries</li> </ul>
Alignment with SDG & targets	Target 3.6 (but also 11.2)
Proposed by	UN Road Safety Collaboration and supported by SLoCaT and other sources
If new, why proposed	NA
Current data sets and lead agency	Proposed lead agency: WHO (UN-Habitat have expressed interest in a leading role on urban road safety aspects)
Status of measurability today	As for baseline
Advantages	<ul style="list-style-type: none"> <li>Fatalities are a powerful metric</li> <li>Measurable today</li> </ul>
Disadvantages	<ul style="list-style-type: none"> <li>Nil</li> </ul>
Actions for measurability	Measurable.

## A.5 Air Pollution

Air pollution is created by many sources of which transport is one. In a discussion on transport, the contribution of transport-related indicators and air pollution this should be borne in mind. Air pollution while frequently a problem in urban areas is not exclusively confined to urban areas (e.g. China where industrial pollution has sub-regional impacts).

### Conclusion:

Based on the information in Table A.8, it is concluded the following indicators are feasible:

- Estimates of PM2.5 and PM10 are relevant measure of air pollution but is not transport-specific. WHO indicate it will soon be measurable for each country (it is expected that WHO would estimate the proportion of population exposed to 'above guideline' values for ambient PM10 and PM2.5).
- Transport-related premature deaths from air pollution are relevant to transport.

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<sup>25</sup>E.g. WHO (2013), "Global Status Report on Road Safety 2013 – Supporting a Decade of Action."

Supportive indicator:

- Estimation of PM10 and PM 2.5 from vehicles would be useful to track/ analyze impacts of vehicle emission policies to reduce air pollution.

Lead agencies would be:

- WHO for ambient PM2.5 and PM10 and exposed populations.
- WHO/ World Bank for premature deaths for transport-related air pollution (and other major sector).
- IEA/ ICCT for estimate of PM10 and PM 2.5 from vehicles.

**Table A.8: Air Pollution**

<p><b>Proposed Indicator</b></p>	<p><u>SLoCaT’s Target 5 -Air Pollution and Human Health:</u> Halve premature deaths from road related air pollution by 2030 compared to 2010</p> <p><u>SLoCaT’s indicators:</u> 5.1 Premature deaths from air pollution (<u>desired achievement:</u> 50% reduction compared to 2010 baseline of 184,000) 5.2 PM10 and/or PM2.5 air pollution from passenger and freight vehicles (<u>desired achievement:</u> 70% reduction) 5.3 Travel share of public transport, cycling, walking and other sustainable modes (<u>desired achievement:</u> double the global share by 2030)</p> <p><u>SDSN’s indicator 33</u> Mean urban air pollution of particulate matter (PM10 and PM2.5)</p> <p><u>UN Agencies’ Indicator:</u> Level of ambient particulate matter (PM10 and PM2.5)</p>
<p>Proposed achievement level</p>	<p>As stated above for SLoCaT. Others not specified.</p>
<p>Status of baseline</p>	<ul style="list-style-type: none"> <li>• WHO have a baseline for major cities &amp; advised in 2013<sup>26</sup> that they are close to developing estimates of populations exposed to ‘above guideline’ levels of PM 10 and PM 2.5 for every country. PM2.5 and PM10 estimates are therefore estimated.</li> <li>• World Bank (2014)<sup>27</sup> using Global Burden of Disease methods (assessing air pollution, source apportionment, human exposure, premature deaths etc.) for 2010</li> <li>• SLoCaT’s indicator 5.2 is able to be estimated by ICCT using their Roadmap model<sup>28</sup> or IEA using their MoMo model<sup>29</sup></li> </ul>

<sup>26</sup>Personal communication with Carlos Dora, WHO, December 2013.

<sup>27</sup>World Bank (2014), “Transport for health: the global burden of disease from motorized road transport” prepared by the Institute for Health Metrics and Evaluation for the Global Road Safety Facility. Refer page 23 and Annex 2 for Country Estimates. [<http://documents.worldbank.org/curated/en/2014/01/19308007/transport-health-global-burden-disease-motorized-road-transport>].

<sup>28</sup>ICCT (2013), “The Impact of Stringent Fuel and Vehicle Standards on Premature Mortality and Emissions.” ICCT’s Global Transportation Health and Climate Roadmap Series. October

<sup>29</sup>IEA (2014), “The IEA Mobility Model: as of February 2014.” A presentation made by the Division of Energy Technology Policy, IEA. February. Refer: [[https://www.iea.org/media/transport/IEA\\_MoMo\\_Presentation.pdf](https://www.iea.org/media/transport/IEA_MoMo_Presentation.pdf)]

	<ul style="list-style-type: none"> <li>• SLoCaT’s indicator 5.3 on modal shares: Mode share information is poorly reported and can uses different definitions of trips (refer discussion above). Mode share is a result of more than transport policy e.g. industry and energy policies also. Refer discussion in Table A.5 also.</li> </ul>
Alignment with SDG & targets	Target 3.9 (and 11.6)
Proposed by	As above
If new, why proposed	NA
Current data sets and lead agency	As above
Status of measurability today	<ul style="list-style-type: none"> <li>• Exposure to ‘above guideline’ air pollution measurable (or soon will be) by WHO</li> <li>• Premature deaths from transport air pollution estimated</li> <li>• PM10 and/or PM2.5 air pollution from passenger and freight vehicles has been estimated on a regional basis though not by country</li> </ul>
Advantages	<ul style="list-style-type: none"> <li>• From a transport point of view, estimates of premature deaths are the most relevant</li> </ul>
Disadvantages	<ul style="list-style-type: none"> <li>• As above</li> </ul>
Actions for measurability	<ul style="list-style-type: none"> <li>• WHO already taking steps to measure PM10 and PM 2.5 – it is expected that WHO would estimate the proportion of population exposed to ‘above guideline’ values for ambient PM10 and PM2.5.</li> <li>• World Bank has estimated premature deaths but the study may have been a ‘once off’ so continued funding would be needed</li> <li>• Estimation of PM10 and PM 2.5 from vehicles requires further refinement to the available models</li> </ul>

## A.6 GHG Emissions and Climate Change

GHG emissions is a global concern. But mitigation and adaptation actions are needed at country level. Under the proposed SDG 13 “Take urgent action to combat climate change and its impacts” the current targets focus on output-based measures on adaptation in general. As shown in Table A.9, the focus of SLoCaT and SDSN was on mitigation measures specific to transport.

### Conclusion:

Based on the information in Table A.9, it is concluded the following indicators are relevant and measurable today:

- GHG emissions from energy-related sources including transport estimated by International Energy Agency.
- Fuel economy in all new Light Duty Vehicles by UNEP and Global Fuel Economy Initiative.

(Fuel economy potential in heavy vehicles needs to be explored further by relevant experts and industry).

Supportive indicators that are feasible and lead agencies:

- Black carbon emissions by International Council on Clean Transportation.

- Motor vehicle fossil fuel subsidies by GIZ.
- Zero Emission Vehicle share of vehicle sales (IEA with UN-Habitat).
- An output indicator that reflects (i) the availability; and (ii) use of appropriate design guidelines and planning methods for transport infrastructure, so that they are climate resilient and resource efficient (to the extent that can justified from an welfare economics point of view on a whole-of-life basis, i.e. where benefits are reasonably likely to exceed costs) appears to have potential.

**Table A.9: GHG Emissions and Climate Change**

<p><b>Proposed Indicator</b></p>	<p><u>SLoCaT’s Target 6 - Greenhouse Gas Emissions:</u> Total world transport-related GHG emissions peak no later than 2020 then begin to decline at a 2% per year rate and at 2030 transport-related emissions are no higher than 2010 emissions</p> <p><u>Indicators:</u></p> <p>6.1 Fuel economy in all new Light Duty Vehicles by 2030, and in all Light Duty Vehicles by 2050 both from a base year of 2005 (desired achievement: double fuel economy) – <i>The Light Duty part was proposed by several other agencies at present e.g. UNEP/ Global Fuel Economy Initiative<sup>30</sup>.</i></p> <p>6.2 Motor vehicle fossil fuel subsidies by 2020 (desired achievement: 100% phase-out)</p> <p>6.3 Black carbon emissions from transport by 2030 (desired achievement: 60% reduction)</p> <p>6.4 Zero Emission Vehicle share<sup>31</sup> of light-duty 4-wheel and motorised 2-wheel vehicle sales worldwide by 2030 (desired achievement: 20%)</p> <p><u>SDSN’s Indicator 78:</u> Availability and implementation of a transparent and detailed deep decarbonization strategy, consistent with the 2°C - or below - global carbon budget, and with GHG emission targets for 2020, 2030 and 2050</p> <p><u>SDSN’s Indicator 79:</u> CO2 intensity of new power generation capacity installed (gCO per kWh), and of new cars (gCO2/pkm) and trucks (gCO2/tkm)</p> <p><u>SDSN’s proposed complementary indicator under SDG 7:</u> Fossil fuel subsidies (\$ or % GNI) is noted as only as a “potential complementary indicator” for countries to consider (page 79)</p> <p><u>UN Agencies:</u> Several output-related indicators for countries such as the proposed indicator for</p>
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<sup>30</sup>The FIA Foundation, IEA, ITF and UNEP have been working in partnership as the Global Fuel Economy Initiative since 2009. The ICCT became a full partner in the Initiative in May 2012.

<sup>31</sup>UN-Habitat propose two relevant indicators: “Increase the market share of electric vehicles in cities to least 30%, of all new vehicles (incl. cars and motorized 2-3 wheelers) sold on annual basis by 2030 while simultaneously developing the enabling infrastructure for their effective use”; and “Through increased use of electric mobility for passenger transport (both private and public) as well as freight transport combined with measures to reduce the need for individualized motorized transport and increased use of public and non-motorized transport achieve a 30% reduction of CO2 emissions in urban areas by 2030.”.

	<p>Target 13.2: Integrate climate change measures into national policies, strategies and planning</p> <p><u>SLoCaT proposed a supplementary indicator in its results framework</u> that pertained to the design of transport infrastructure and networks so that they were climate resilient and resource efficient (to the extent that can justified from an economic point of view on a whole-of-life basis, i.e. where benefits are reasonably likely to exceed costs). An output indicator that reflects (i) the availability; and (ii) use of appropriate design guidelines and planning methods for transport infrastructure, may have some value.</p>
Proposed achievement level	<ul style="list-style-type: none"> <li>• SLoCaT set achievement levels for the target and indicators. Others did not specify.</li> <li>• SLoCaT proposed their target and achievement level to directly relate to UNFCCC assessments of need for reductions in GHG emissions to contain global warming to a 2-degree C warming scenario. Achievement level for indicators were based on existing industry consensus.</li> </ul>
Status of baseline	<ul style="list-style-type: none"> <li>• International Energy Agency measures GHG emissions from energy sources across all sectors and so measures the baseline and tracks the SLoCaT target</li> <li>• Fossil fuel subsidies for transport tracked by GIZ Fuel Prices Survey<sup>32</sup> for countries and tracks them over time (last time was 2010/11)</li> <li>• Black carbon emissions estimated by ICCT using their Roadmap model<sup>33</sup> for major countries, regions for the globe – currently only modelled for 16 global regions – 2010.</li> <li>• ZEV sales data available and tracked by IEA<sup>34</sup>. Fuel economy tracked by IEA MoMo model<sup>35</sup> and ICCT Roadmap Model<sup>36</sup> with input data on fleets etc. for major countries, regions for the globe. Currently excludes heavy vehicles due to lack of industry/ professional consensus on potential. IEA and ICCT are both members of the Global Fuel Economy Initiative.</li> <li>• Extent of availability of convincing decarbonization strategies likely low at present</li> </ul>
Alignment with SDG & targets	<ul style="list-style-type: none"> <li>• All align with SDG 13 (but no specific target)</li> <li>• The fuel subsidy indicators align with 12.c and the fuel economy or equivalent indicators align with Target 7.3.</li> </ul>
Proposed by	<ul style="list-style-type: none"> <li>• As stated above</li> </ul>
If new, why proposed	NA
Current data sets and lead agency	As above
Status of measurability today	As above
Advantages	All measurable and relevant
Disadvantages	NA

<sup>32</sup>GIZ (2011), “International Fuel Prices 2010/ 2011.” Seventh Edition. August.

<sup>33</sup>ICCT (2013), “The Impact of Stringent Fuel and Vehicle Standards on Premature Mortality and Emissions.” ICCT’s Global Transportation Health and Climate Roadmap Series. October.

<sup>34</sup>IEA (2013), Electric Vehicle Initiative “Global EV Outlook.” April.

<sup>35</sup>IEA (2014), “The IEA Mobility Model: as of February 2014.” A presentation made by the Division of Energy Technology Policy, IEA. February.

<sup>36</sup>Fulton, L (2013), “How vehicle fuel economy improvements can save \$2 trillion and help fund a long-term transition to plug-in vehicles.” Working Paper 9. Prepared by UC Davis Institute of Transport Studies for Global Fuel Economy Initiative.

Actions for measurability	Nil
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## Annex B: SLoCaT Results Framework with Numbering of Indicators

### SLoCaT Results Framework Targets and Indicators as Numbered

No.	Target	No.	Process Indicators (2030 compared to 2010)
1.	<i>Rural access:</i> Secure universal access by sustainable transport for rural populations by 2030		
		1.1	Proportion of the rural population living within two kilometers of a road, motorable trail or other appropriate infrastructure providing all-year access for sustainable transport (desired achievement: 100% achievement of local access targets, monitoring the poorest and remotest quintiles)
		1.2	Proportion of rural population living within 30 minutes' walk of appropriate formal or informal transport services (desired achievement: 100% achievement of local access targets, monitoring remotest quintile)
		1.3	Travel time, including walking, from villages to local towns with markets and medical facilities for the poorest rural income quintile (desired achievement: 100% achievement of local travel-time targets)
2.	<i>Urban access:</i> Secure universal access by sustainable transport for urban populations by 2030		
		2.1	Mean daily travel time budget for women, men and children using sustainable transport (desired achievement: 90 minutes or less travel time per individual per day, including return or multipurpose trips for employment, education, health and community services)
		2.2	Proportion of income spent by urban families on transport to reach employment, education, health and community services (desired achievement: less than 20% of household income for poorest quintile)
		2.3	Proportion of households within 500 metres of good quality affordable public transport accessible by dedicated walking and/or cycling facilities (desired achievement: 100%).
3.	<i>National access and regional connectivity:</i> Facilitate national inclusion and regional connectivity by sustainable multi-modal freight and passenger services by 2030		
		3.1	Logistics Performance Index for all countries (desired achievement: 80% of countries to achieve a rating of 3.5 <sup>37</sup> )
		3.2	Passenger-kilometre shares by land public transport in major national and regional corridors (desired achievement: an increase, based on baselines & forecasts to be developed, in specific corridors by nation and region)
		3.3	Cost of national and regional bulk freight per tonne-km (desired achievement: 80% of best international practice for relevant commodities, in specific corridors by nation and region). Empty freight land transport distance travelled (desired

<sup>37</sup> Of the 156 countries surveyed in 2012, the LPI varied from a low of 1.61 to a high of 4.39. The bottom 100 performing countries had an LPI lower than 3 with an average of 2.5. Only 26 countries or 17% of the total surveyed had an LPI of more than 3.5 (<http://data.worldbank.org/indicator/LP.LPI.OVRL.XQ>)

No.	Target	No.	Process Indicators (2030 compared to 2010)
			achievement: 50% reduction)
		3.4	Empty freight land transport distance travelled (desired achievement: 50% reduction)
4.	<i>Road safety:</i> Halve the burden due to global road traffic crashes by halving the number of fatalities and serious injuries by 2030 compared to 2010		
		4.1	Fatalities due to road crashes (desired achievement: reduce by half the number of fatalities due to road crashes compared with 2010 baseline of 1.24 million per year).
		4.2	Serious injuries due to road crashes (desired achievement: reduce by half the number of serious injuries due to road crashes compared with 2010 baseline of 12.4 million per year)
		4.3	Economic impact due to road crashes (desired achievement: reduce by half the economic impact of road crashes compared with 2010 baseline of 3% of GDP per year)
5.	<i>Air Pollution and Human Health:</i> Halve premature deaths from road related air pollution by 2030 compared to 2010		
		5.1	Premature deaths from air pollution (desired achievement: 50% reduction compared to 2010 baseline of 184,000)
		5.2	PM10 and/or PM2.5 air pollution from passenger and freight vehicles (desired achievement: 70% reduction)
		5.3	Travel share of public transport, cycling, walking and other sustainable modes (desired achievement: double the global share by 2030)
6.	<i>Greenhouse Gas Emissions:</i> Total world transport-related GHG emissions peak no later than 2020 then begin to decline at a 2% per year rate and at 2030 transport-related emissions are no higher than 2010 emissions		
		6.1	Fuel economy in all new Light Duty Vehicles by 2030, and in all Light Duty Vehicles by 2050 both from a base year of 2005 (desired achievement: double fuel economy)
		6.2	Motor vehicle fossil fuel subsidies by 2020 (desired achievement: 100% phase-out)
		6.3	Black carbon emissions from transport by 2030 (desired achievement: 60% reduction)
		6.4	Zero Emission Vehicle share of light-duty 4-wheel and motorised 2-wheel vehicle sales worldwide by 2030 (desired achievement: 20%)

## Annex C: Further Information on Regional and Transborder Passenger and Trade Logistics Data Sets

Except for international movements, data on land-based passenger and freight passenger movements are not usually collected on a systematic and routine basis. At a national level, passenger movement statistics may be collected by a national agency such as a Ministry of Transport as part of its annual reporting. It may collect and analyse passenger ticket sales data from airline companies, bus and railway companies but it would not normally have available data on corresponding private travel except in a rudimentary form such as traffic counts. Often however the data on ticket sales are incomplete and may be confined in some cases to major transport services only.

National Customs and Immigration agencies will often but not always routinely collect data on cross border movement of vehicles by type and passengers. At the same time, national highway authorities would often automatically count traffic volumes. However, in the authors' experience, what is counted will vary by nation and by border crossing. Definitions used by national agencies for vehicle types will also vary with the result that data collected on two sides of a border are not easily reconciled. Nevertheless, countries will have data on international passenger volumes that would be built up from individual gateways including land based crossings.

Freight movement is largely the domain of the private sector and by its nature information would not be centralised unless a government regulatory agency made mandatory reporting an obligation as part of the issuing of licences and permits. Where governments collect such data it tends to be done on a limited basis. External trade volumes and value are collected in most countries.

National and regional travel studies/ surveys or specific corridor studies may also be undertaken to provide data. But such undertakings are complex and expensive and rarely undertaken on a regular basis. In many cases, they rely heavily on the limited government statistics, traffic counts and surveys of shippers of freight and passengers and so are not comprehensive.

National studies tend to be the responsibility of national agencies. Regional land travel is usually only studied by MDBs such as the ADB or World Bank in groups of countries that may have entered into agreements on regional economic cooperation (e.g. ASEAN). Data collection on regional maritime and air passenger and freight movements is usually routinely collated from ports, shipping firms, the airlines and airport authorities.

World Bank's International Trade Department developed and implemented the LPI in conjunction with the United Nations Economic and Social Commission for Asia and the Pacific (UN-ESCAP), the International Transport Forum, and Transport Canada. Industry stakeholders included: (i) International Federation of Freight Forwarders Associations; (ii) the Global Express Association; (iii) the Global Facilitation Partnership for Transportation and Trade; (iv) many global logistics companies world-wide. The surveys themselves are contracted out. LPI has been estimated every two years since 2007 (2007, 2010, 2012 and 2014). The LPI overall score reflects perceptions of a country's logistics based on efficiency of customs clearance process, quality of trade- and transport-related infrastructure, ease of arranging competitively priced shipments, quality of logistics services, ability to track and trace consignments, and frequency with which shipments reach the consignee within the scheduled time". Refer [<http://lpi.worldbank.org/report>] accessed on March 10, 2015]. The survey was designed and implemented with Finland's Turku School of Economics. While the LPI is aimed at measuring national level logistics from an international trade perspective its components

particularly on quality of infrastructure, competitiveness and quality of logistics services would be relevant to domestic including rural freight movements (national but general level).