RESULTS FRAMEWORK ON SUSTAINABLE TRANSPORT[1]

1. The Results Framework on Sustainable Transport describes the potential contribution of sustainable land-based transport to the realisation of the post-2015 Development Agenda and associated Sustainable Development Goals (SDGs). Possible SDGs have been discussed and formulated by the special Open Working Group (OWG) of the United Nations General Assembly. The final 13th OWG session took place in New York, USA, during July 2014[2]. The first draft of this Results Framework was prepared for the 7th OWG that met in January 2014. This version takes into account the outcome of the final OWG session and the proposed Sustainable Development Goals and associated targets. As a 'living' document it is expected that this Results Framework will be updated prior to September 2015 when the UN General Assembly is expected to make a final decision on the post-2015 development framework.[3]

2. With the global population set to increase by one quarter by 2030, increasing urbanisation and continued occurrence of rural and urban poverty, sustainable transport is essential to securing the "The Future We Want" agreed upon in the 2012 Rio+20 Conference on Sustainable Development. Transport infrastructure and services facilitate urban and rural dwellers to participate in economic opportunities and to access essential services such as education and health. When designed to be inclusive (taking into account the special needs of women, children, vulnerable people and different socio-economic groups) transport is a strong driver of economic growth and poverty reduction. But transport currently has serious negative impacts including road crashes resulting in loss of life and injuries, noise and air pollution that harms human health, and greenhouse gas emissions that contribute to global warming.

3. Sustainable transport is vital for poverty reduction by providing low income people with access to jobs and services and by enabling them to conduct their income-earning activities safely, affordably, conveniently and equitably. There is much evidence that improving sustainable transport (particularly rural access roads) reduces rural poverty, increases incomes and work opportunities, increases agricultural production, increases school attendance (for girls and boys), increases attendance at maternal health facilities and reduces mortality rates[4]. Transport infrastructure and services facilitate access and mobility so that women and men can participate in economic opportunities, obtain vital services and exercise their democratic rights, thus promoting good governance and stability. Sustainable transport that takes into account the various different travel needs of men, women, children, older persons, youth, people with disability and minority groups is therefore inclusive and contributes to the aspiration of 'leaving no one behind'[5] in development.

4. Sustainable transport has strong positive economic, social and environmental outcomes as shown in Table i. By adopting policies and planning practices to ensure that all population groups and industries

[1]The Results Framework is prepared on behalf of the Partnership on Sustainable, Low Carbon Transport by Phil Sayeg, Paul Starkey and Cornie Huizenga with support from the Deutsche Gesellschaft für InternationaleZusammenarbeit (GIZ) GmbH and UN-Habitat (with funding provided by the Department for International Development, UK).

[2] See http://sustainabledevelopment.un.org/owg13

[3] See http://www.slocat.net/resultsframework for latest version of the document.

[4] For example see review of evidence by Starkey and Hine (2014) in a study for Overseas Development Institute and UN-Habitat, Fortcoming.

[5] "A New Global Partnership: Eradicate Poverty and Transform Economies through Sustainable Development", http://www.post2015hlp.org.

can conveniently access basic services, goods and activities, sustainable transport assists to maximise beneficial societal outcomes. Sustainable transport planning balances economic, social and environmental objectives, and favours 'win-win' solutions that provide multiple benefits for passenger transport and freight movements (operating as part of logistics chains). Sustainable transport is safe, affordable, convenient, equitable and resource-efficient with both passenger and logistics chains exhibiting a reduced reliance on private automobile travel and sole reliance on heavy road-based goods vehicles, consistent with the capacity of transportation and ecological systems.

Table i: Mapping Economic, Social and Environmental Benefits of Transport

Dimensions	**Economic**	**Social**				**Environmental**	
		The Poor	**Women and families**	**Other vulnerable groups**	**Safety/ security**	**Air pollution and health**	**Climate change mitigation**
Improving rural access	√√√	√√√	√√√	√√√	√√	√√	√
Improving urban access	√√√	√√√	√√√	√√√	√√	√√	√
Improving national access and regional connectivity	√√	√	√	√	√	√	√
Improving road safety & security	√√√	√√√	√√√	√√√	√√√	√	√
Reducing air pollution	√√	√√	√√	√√	-	√√√	√√√
Reducing GHG **emissions**	√√	√√	√√	√√	√	√√	√√√

Note: √√√ is strongly positive; √√ is moderately positive, √ is positive; - is neutral, X is negative

5. Sustainable transport measures often have multiple benefits that cut across the economic, social and environmental dimensions of sustainable development. The benefits of sustainable transport go far beyond transport, and directly influence national and regional growth, poverty reduction and improvements in health care, education, agricultural production and the well-being of vulnerable groups. While all people benefit from better transport, particular opportunities become available to women and young people in terms of accessing markets, economic opportunities, health care and education so increasing equity and reducing poverty. Large and small enterprises benefit from enhanced accessibility through access to a wider pool of labour that can result in expanded production, new investment and creation of new jobs. Reduced road fatalities and serious injuries that lower the burdening on health systems and social support services will free up resources for other health-based priorities. Tackling air pollution will have significant benefits for health and the economy and improve conditions for the urban poor. Reducing greenhouse gas emissions from transport is essential to tackle climate change.

6. The sustainable transport community, which has come together in the Partnership on Sustainable Low Carbon Transport (SLoCaT[6]) advocates for large-scale implementation of sustainable transport to comprehensively enhance inclusive access to education and jobs, reduce poverty, enhance economic productivity and provide a healthier environment as called for the in "The Future We Want".

[6] The Partnership on Sustainable Low Carbon Transport (SLoCaT) is a multi-stakeholder partnership of over 80 organizations including UN organizations, multilateral and bilateral development organisations, NGOs and foundations, academia and the business Sector which promotes the integration of sustainable transport in global policies on sustainable development and climate change. See: [www.slocat.net]. See Appendix A, for an overview of organizations that were consulted in the development of the Results Framework .

7. While transport was not specifically included within the Millennium Development Goals (MDGs), there is widespread agreement that none of the MDGs could have been achieved without improvements in transport. The crosscutting contribution of transport to sustainable development was emphasised in the Co-Chairs Summary bullet points for the 7th OWG session (January 2014), which stated "It was underlined that transportation is crucial for sustainable development addressing the mobility of goods and persons. The importance of its inclusion in the SDGs was well recognized, with many calling for it to be included at the level of targets under other goals".

8. During the course of development of this Results Framework it was recognised that sustainable transport had a greater chance of attracting attention and mobilising the required level of resources to dramatically scale-up, by featuring transport's key dimensions as targets under other Sustainable Development Goals (SDGs) rather than attempting to achieve an SDG for sustainable transport in its right. SLoCaT therefore adopted a flexible and pragmatic approach in reaching out to communities representing potential thematic SDGs.

9. Six main targets that are ambitious by design are proposed to realise the potential of the proposed SDGs as summarised in Table ii based on the latest research and analysis by the leading organisations and researchers working in relevant fields. They represent a consensus in the sustainable transport community on the key ingredients to change the growth trajectory of the transport sector towards a more sustainable future. The targets acknowledge the need for development of additional transport infrastructure and services in urban and rural areas to improve access where required for economic and social reasons. Similarly, additional transport infrastructure and services are required to improve national level access and regional connectivity. The targets aim to ensure that development of additional infrastructure and services is done in an economically, socially and environmentally sustainable manner. At the same time the targets also aim to enhance the economic, social and environmental sustainability of existing transport infrastructure and services and therefore of the communities and industries that rely on them.

10. The proposed six targets and the selected associated process indicators presented in Table ii are part of the more comprehensive Results Framework on Sustainable Transport that contains additional process indicators that can also be used for measuring progress in the implementation of the targets. It also defines key implementation and enabling measures needed for the implementation of the proposed targets. The process indicators that will be used to measure the progress towards realizing the proposed 2030 targets are chosen based on a combination of the following considerations: (a) they are a reflection of the structural transformation aimed for by the targets; (b) they respond to the "leave no one behind" appeal of the High Level Panel of Eminent Persons on the Post-2015 Development Agenda; and (c) they are being measured already, or they are measurable making use of available, including emerging, technologies. Some of the proposed process indicators are relevant for several targets. For example a doubled global travel share for urban public transport and other sustainable modes, is used here to measure progress on the climate change target but is also relevant for the air pollution and human health target as well as the urban access target.

11. If substantially achieved, the targets would lead to a structural transformation of the land transport sector by 2030 and an enhanced contribution to overall economic development, social equity and poverty reduction, and enhanced sustainability. They would make the land transport sector fit for the 21st Century.

12. The development of the Results Framework, especially the wording or targets and process indicators was an iterative process. The final formulation of targets and indicators will be guided by the SDGs ultimately adopted by the UN General Assembly in September 2015 and the willingness to integrate transport related targets and indicators. The formulation of the proposed SDGs that emerged from the final OWG session in July 2014 fully covers five of the targets. However, the treatment of the importance of rural access in achieving the SDGs is not as prominent as would have been hoped. Due to the need for a comprehensive Results Framework for sustainable transport to exist alongside the post-

2015 Development Agenda's final SDGs and also within the development community, this document will be retained with its current structure and as a stand-alone document until at least late 2015.

Table ii: Proposed Sustainable Transport Targets and Selected Process Indicators

Rural access target: **Secure universal access by sustainable transport for rural populations by 2030**

Process Indicators (2030 compared to 2010 baseline):

- **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, special monitoring the poorest and remotest quintiles).**
- **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 poorest and remotest quintile).**

Urban access target: **Secure universal access by sustainable transport for urban populations by 2030**

Process Indicators (2030 compared to 2010 baseline):

- **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). With disaggregated data and special monitoring of poorest quintile).**
- **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).**

National access and regional connectivity target: **Facilitate national inclusion and regional connectivity by sustainable multi-modal freight and passenger services by 2030**

Process Indicators (2030 compared to 2010 baseline, except where indicated):

- **Logistics Performance Index for all countries (desired achievement: 80% of countries to achieve a rating of 3.57.**
- **Passenger-kilometre shares by land public transport in major national and regional corridors (desired achievement: an increase based on baselines and forecasts to be developed, in specific corridors by nation and region).**

***Road safety target*: Halve road traffic deaths by 2030 compared to 2010**

Process Indicators (2030 compared to 2010 baseline):

- **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).**
- **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).**

Air pollution and human health target: **Halve premature deaths from road related air pollution by 2030 compared to 2010**

Process Indicators (2030 compared to 2010 baseline):

- **Premature deaths from air pollution (desired achievement: 50% reduction compared to 2010 baseline of 184,000)**
- **PM_{10} and/or $PM_{2.5}$ emissions from passenger and freight vehicles (desired achievement: 70% reduction compared to 2010)[8]**

[7] World Bank (2013) states "Logistics Performance Index 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://data.worldbank.org/indicator/LP.LPI.OVRL.XQ] accessed on 23 January 2014.

[8] Currently many countries are measuring and regulating PM_{10} (less than 10 micrometers in diameter) but increasingly this is shifting towards $PM_{2.5}$ (less than 2.5 micrometers in diameter). This is why a process indicator is proposed which can measure PM_{10}, $PM_{2.5}$, or both.

Greenhouse Gas emissions target: **Total world transport-related GHG emissions peak no later than 2020 then begin to decline at a 2% per year rate, with 2030 transport-related emissions no higher than 2010 emissions**

Process Indicators (compared to 2010 except where indicated):

- **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).**
- **Motor vehicle fossil fuel subsidies by 2020 (desired achievement: 100% phase-out)**

13. All six targets and the proposed process indicators are either measurable and verifiable today or will be in the near future using: (i) existing data collation and estimation efforts that are comprehensive; (ii) existing proven data collection methods on a more comprehensive basis to address information gaps; and (iii) existing methods enhanced by new technologies such as satellite imaging and meta-data technologies which are used routinely for specific purposes and could be scaled-up quickly and cheaply.

14. The proposed targets are global targets and it is important to consider how to differentiate the accomplishment of targets between and within countries. Differentiation of the global targets can be on the basis of geographic region, or by individual country circumstance, if necessary. It is proposed that the system of classification follow the existing system of country income and geographic clusters adopted for other SDGs that would likely be based on United Nations' World Development Indicators. Road Safety can be seen an example. Differentiated targets for the reduction of road fatalities and serious injuries have been established for high, middle and low income countries reflecting the need for action as well the impact of previous action. In line with the concept that "no one is left behind" that underpins the post-2015 development agenda it is especially important to monitor the impact on low income groups to ensure they receive a fair share of the benefit.

15. The targets proposed in this Results Framework, are ambitious out of necessity. They will require large resources if they are to be implemented successfully by 2030. In many cases this will involve a reallocation of current and planned funding for the development of transport infrastructure and services by local and national governments and by international organisations supporting transport in developing countries. These changes have started but will need to be accelerated to realize the ambitious targets proposed.

16. The SLoCaT Partnership, which represents a broad array of organisations, offers to play a major role in creating the Means of Implementation for the proposed Results Framework on Sustainable Transport. SLoCaT has been instrumental in developing a series of Voluntary Commitments on sustainable transport in support of the 2012 United Nations Conference on Sustainable Development and another smaller number of Voluntary Commitments on the first anniversary of the Rio+20 conference in June 2013 with a number of new Voluntary Commitments to be announced before or at the SG Climate Summit in September 2014. Together these voluntary commitments represent the collective resolve of the transport sector for concrete action. SLoCaT has also initiated the development of a Financing Framework for Sustainable Transport, which will outline a strategy on how the 2030 vision on Sustainable Transport laid out in the Results Framework can be financed.

17. The ultimate success of this Results Framework will be determined by its implementation. It will be important to have periodic updates on the status of Sustainable Transport as defined by the targets and indicators in this Results Framework. As is explained in this document and Annex B, most of the targets and indicators proposed are measurable now already. Work is required for some of the targets and indicators such as rural access. The SLoCaT Partnership will promote the development of additional information collection methodologies as part of the two yearly reporting on Sustainable Transport and its integration in the SDGs.

TABLE OF CONTENT

I. INTRODUCTION

1. The Results Framework on Sustainable Transport, developed by the Partnership on Sustainable, Low Carbon Transport (SLoCaT) describes the contribution of sustainable transport to the realisation of the post-2015 Development Agenda that is currently being discussed by a special Open Working Group of the United Nations General Assembly. Sustainable transport cuts across many of the areas for which the OWG is currently discussing possible Sustainable Development Goals. This document lays out options for targets on sustainable transport that support these possible SDGs. It provides targets and indicators that can be used over the next 15 years to measure the realisation of the proposed targets. It suggests key implementation and enabling measures, which if realised in a timely manner will help to bring about sustainable transport.

2. This Results Framework is a means through which national governments; civil society and international agencies can deliver sustainable transport.

II. THE BENEFITS OF ACTION ON SUSTAINABLE TRANSPORT

3. With the global population set to increase by one quarter by 2030, increasing urbanisation and continued occurrence of rural and urban poverty, sustainable transport is essential to securing the "The Future We Want" agreed upon in the 2012 Rio+20 Conference on Sustainable Development. Transport touches every person's daily life. Transport infrastructure and services facilitate urban and rural dwellers to participate in economic opportunities and to access essential services such as education and health. When designed to be inclusive, transport is a strong driver of economic growth and poverty reduction. But transport has serious negative impacts including road crashes resulting in loss of life and injuries, air pollution and noise that harms human health, and greenhouse gas emissions that contribute to global warming.

4. Based on analysis[1] carried out in support of the development of this Results Framework it is apparent that there are very large costs if no action is taken on transport. Alternatively the global community has the option to take effective action on sustainable transport. Such action can over the next 15 years:

- Halve the 18 million people that will otherwise die in traffic crashes and reduce by 93 million the number of people that would be seriously injured;
- Lessen the toll of millions of people that would die prematurely due to exposure to ambient air pollution, a considerable part of which is transport related;
- Reduce the impact of transport on climate change through the greenhouse gases and black carbon it emits, making it more likely that overall GHG emissions will be in line by 2030 with the 2^{o} Celsius scenario recommended by the Intergovernmental Panel on Climate Change to avert dangerous climate change;
- Substantially lower the negative economic impacts of transport. If no action is taken at about 5% of global GDP for the period 2015 - 2030 will be lost because of the negative impacts of congestion, road crashes, air pollution and climate change related extreme

[1] See the introductory sections of the respective Results Frameworks on Access, Safety and Environmental Performance of Transport.

weather events. A disproportionate part of this loss will occur in low and middle-income countries, thereby hampering the potential for economic and social development.[2]

5. Taking action on sustainable transport through the provision of environmentally sound and inclusive transport infrastructure and services will also provide hundreds of millions of people, both in rural and urban areas, will with universal access to goods, services and markets. By adopting policies and planning practices to ensure that all population groups and industries can access basic services, goods and activities, sustainable transport assists to maximise beneficial societal outcomes. Sustainable transport planning balances economic, social and environmental objectives, and favours 'win-win' solutions that provide multiple benefits for passenger and freight transport. Sustainable transport is affordable, safe, equitable and resource-efficient exhibiting a reduced reliance on private automobile travel, and logistics chains with sole reliance on heavy road based goods vehicles, consistent with the capacity of transportation and ecological systems.

6. Sustainable transport has strong positive economic, social and environmental outcomes as illustrated in Table 1.

Table 1: Mapping Economic, Social and Environmental Benefits of Transport

Dimensions[3]	**Economic**	**Social**				**Environmental**	
		The Poor	**Women and families**	**Other vulnerable groups**	**Safety/ security**	**Air pollution and health**	**Climate change mitigation**
Improving rural access	√√√	√√√	√√√	√√√	√√	√√	√
Improving urban access	√√√	√√√	√√√	√√√	√√	√√	√
Improving national access and regional connectivity	√√	√	√	√	√	√	√
Improving road safety & security	√√√	√√√	√√√	√√√	√√√	√	√
Reducing air pollution	√√	√√	√√	√√	-	√√√	√√√
Reducing GHG emissions	√√	√√	√√	√√	√	√√	√√√

Note: √ √ √ is strongly positive; √ √ is moderately positive, √ is positive; - is neutral, X is negative

7. Box 1 shows how sustainable transport measures often have multiple benefits that cut across the economic, social and environmental dimension of sustainable development. The examples provided confirm how investments in sustainable transport may have direct and

[2] At current levels of GDP, this would be at least 50 trillion dollars.

[3] The ratings of welfare benefits (i.e. economic), road safety (under social) and environmental benefits are indicative but reflect the relative, monetised benefits as would be accounted for in an economic evaluation. The benefits to women and families, the poor, and vulnerable groups are a subset of welfare benefits enjoyed by travellers, and counted in the first instance under the 'economic' heading. The ratings of the benefits of these three sub-groups under 'social' are qualitatively assessed based on how these groups are likely to perceive benefits. These benefits are not additional benefits in monetised terms.

indirect benefits that justify the funding and contribute to economic growth, poverty reduction and the quality of people's lives.

Box 1: Examples of Multiple Benefits of Sustainable Transport Measures

Rural transport reduces poverty, stimulates growth and improves access to essential community services

Before 2003, people in Bhimsthan Village in the Sindhuli District of Nepal had no access to the road network or bus services. They walked for four hours to reach the district centre, its markets, healthcare and schools. Agricultural produce and farm inputs were carried. Between 2003 and 2006, the District Roads Support Programme organised the construction of a 22km road, using labour-based methods[4]. Women and low-status ethnic groups benefited from employment. Following road construction, bus licenses were issued and 10,000 people now live within half-an-hour's walk (two kilometres) of an all-season road with transport services. 40,000 people have improved access. Day-return trips to the district town including health care facilities are now possible (a key gender issue empowering women). Agricultural production and marketing have increased. Women have better access to maternal healthcare. The project cost USD1.2 million and its economic internal rate of return was 17%. The new road and services contribute to economic growth, agricultural production, marketing, employment, improved opportunities for women and disadvantaged groups, and better access to hospitals, maternal health services and education.

BRT in Mexico City improves travel for existing and new users with reductions in emissions

Bus rapid transit (BRT) systems with dedicated road lanes; prepaid tickets, and multiple entry/exit doors are more efficient and productive than conventional bus systems. With infrastructure costing USD30 million and vehicles costing USD18 million, the initial BRT corridor of the Mexico City "Insurgentes Metrobús" started operations in 2005[5]. Most of its passengers shifted to the BRT from other public transport, but an important 6.4% of the passengers shifted from private cars or taxis. Quicker passenger travel saved two million travel hours a year (saving an estimated USD10.1 million). Associated vehicle operating cost savings of private vehicles (estimated at USD21.5 million) contributed to improved productivity and quality of life. Other benefits included fewer emissions of greenhouse gases (not monetised) and air pollution (estimated at USD23.7 million a year in health benefits). The benefits of the BRT are on-going and are likely to increase with improved connectivity and will contribute towards the sustainable growth and equity of Mexico City.

Road pricing reduces unnecessary travel with strong welfare benefits to continuing users plus other co-benefits

The Stockholm congestion pricing system was implemented in 2007[6]. The primary purpose of the central area congestion tax was to reduce traffic congestion and improve the environmental situation in central Stockholm. A cost-benefit analysis undertaken following the earlier trial showed that if congestion pricing and supporting public transport improvements were to be implemented on a permanent basis they quickly would recover their implementation and whole of life operating costs. This would be achieved through the following socio-economic benefits: shorter travel times (value: Swedish Kroner (SEK) 600 million p.a.), improved traffic safety (SEK 125 million p.a.) and positive effects on health and the environment (SEK 90 million p.a.). This example illustrates the strong co-benefits of a pricing measure that reduces some unnecessary car travel, contributes to a shift to public transport and provides travel time reductions to transport users.

[4] Source: Starkey P, Tumbahangfe A and Sharma S 2013. Building roads and improving livelihoods in Nepal: External review of the District Roads Support Programme (DRSP). Swiss Agency for Development and Cooperation (SDC), Kathmandu, Nepal. 82p. http://drsp.squarespace.com/storage/DRSP-Review-FinalReport.pdf

[5] Source: INE 2008. The benefits and costs of a bus rapid transit system in Mexico City. Instituto Nacional de Ecologia (INE), Mexico City, Mexico. Page 44.

[6] Source: Transtek (2006) "Cost Benefit Analysis of the Stockholm Trial." http://www.stockholmsforsoket.se/upload/Sammanfattningar/English/Cost-benefit analysis of the Stockholm Trial v2.pdf

III. MAINSTREAMING TRANSPORT TO SECURE THE FUTURE WE WANT

8. The sustainable transport community, which has come together in the Partnership on Sustainable Low Carbon Transport (SLoCaT) considers that large-scale implementation of more sustainable transport is required to comprehensively enhance inclusive access to education and jobs, reduce poverty and enhance economic productivity and provide a healthier environment. The aim is to maximize transport's contribution to the "The Future We Want".

9. Transport has many dimensions and the policies, strategies, and measures needed to address these dimensions will require an active coordination and cooperation between the transport sector and the constituencies (e.g. health, urban, rural, energy) that are likely to benefit from action on sustainable transport. Transport is a key building block for sustainable development referred to by the Secretary General's High Level Panel of Eminent Persons on the Post-2015 Development Agenda which emphasised that it is "our vision and our responsibility to end extreme poverty in all its forms in the context of sustainable development and to have in place the building blocks of sustained prosperity for all."[7]Transport's key role, due to its crosscutting nature, is confirmed by the "The Future We Want", that states that transport is "central to sustainable development".[8]

10. Featuring transport's key dimensions at the level of targets under other possible Sustainable Development Goals (SDGs) would hopefully generate a higher level of attention and allocation of resources to accelerate the introduction of more sustainable transport infrastructure and services than in the case of a standalone SDG on transport. Examples of how the six transport targets proposed in this Results Framework could be included under other proposed SDGs is set out in Table 2.

Table 2: Proposed Sustainable Transport Targets and Contribution to Proposed SDGs

Potential SDGs[1]	Transport-related targets proposed in SLoCaT Results Framework	Rationale
End poverty in all forms everywhere	• Rural: secure universal access • Urban: secure universal access • Road Safety: Halve the burden due to global road traffic crashes • Air pollution and human health: Increase share of urban population with air quality within WHO limits Air Quality: Reduce the impact of diseases caused by air pollution	• Access to jobs, markets, schools provided through sustainable transport is crucial for reduction of rural and urban poverty • Air pollution related diseases can lead to earlier death and serious limitation of earning opportunities and high private and social costs for their treatment. Children growing up in polluted environments are especially affected • Fatalities and serious injuries can lead to poverty through lost income. Improved transport security during travel is important to enable participation in society
End hunger, achieve food security and improved nutrition and promote sustainable agriculture	• Rural: secure universal access • Urban: secure universal access • National: facilitate national access and regional connectivity	• Sustainable transport is crucial for improving agricultural productivity and ensuring food security
Ensure healthy lives and promote well-being for all at all ages	• Rural: secure universal access • Urban: secure universal access	• Sustainable transport is crucial for providing access to rural and urban health services and their delivery

[7] "A New Global Partnership: Eradicate Poverty and Transform Economies through Sustainable Development", http://www.post2015hlp.org. Accessed 23 December 2013

[8] "The Future We Want", paragraph 132.

	• Road Safety: Halve the burden due to global road traffic crashes • Air pollution and human health: Increase share of urban population with air quality within WHO limits Air pollution and health: Increase urban population living in cities with air quality within WHO limits	systems. Improved road safety & security and reduction of deaths and disability due to transport-related pollution are two key areas where transport is linked to health improvements
Ensure inclusive and equitable quality education and promote life-long learning opportunities for all	• Rural: secure universal access • Urban: secure universal access	• Sustainable transport is crucial for providing access to schools both in rural and urban areas
Achieve gender equality, empower all women and girls	• Rural: secure universal access • Urban: secure universal access • Road Safety: Halve the burden due to global road traffic crashes • Air pollution and human health: Increase share of urban population with air quality within WHO limits	• Sustainable transport can facilitate gender equity and human rights • Secure sustainable and transport and related public spaces are important for reducing violence against women and girls.
Ensure availability and sustainable use of water and sanitation for all	• Rural: secure universal access • Urban: secure universal access	• Sustainable transport is a key element of improved access to clean water and sanitation and protection of water quality and aquifer recharge capacity
Ensure sustainable energy for all	• Rural: secure universal access • Urban: secure universal access • National: facilitate national access and regional connectivity • Greenhouse Gas Emissions: 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	• Sustainable transport facilitates the public and private providers of sustainable energy. Improved national access and regional connectivity supports energy supply chain security. Reduced GHG emissions would result from use of improved use of sustainable energy sources. Sustainable transport counters the trend of fast-rising consumption of non-renewable energy for mobility.
Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	• Rural: secure universal access • Urban: secure universal access • National: facilitate national access and regional connectivity	• Sustainable transport is crucial for equitable growth and job creation. Rural, urban and national access and regional connectivity targets are directly relevant
Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	• Rural: secure universal access • Urban: secure universal access • National: facilitate national access and regional connectivity	• Sustainable transport is a key component of infrastructure and sustainable transport is needed to create competitive industries and economies
Make cities and human settlements inclusive, safe and sustainable	• Urban: secure universal access • Rural: secure universal access • National: facilitate national access and regional connectivity	• Sustainable transport is crucial for resilient cities and urban access targets are directly relevant. Due to reliance on rural linkages and connections to the nation so are rural and national access targets
Take urgent action to combat climate change and its impacts	• Greenhouse Gas Emissions: Total world transport-related GHG emissions peak no later than 2020 etc. • Rural: secure universal access • Urban: secure universal access National: Facilitate national	• Sustainable transport is crucial to reduce transport-related GHG. GHG target Rural, urban and national access and regional connectivity targets are also directly relevant

	access and regional connectivity	

[1] *Based on Final Report of the Open Working Group (OWG) of the UN General Assembly on July 19, 2014.*

11. The benefits of sustainable transport go far beyond transport, and influence national and regional growth, poverty reduction and improvements in health care, education, agricultural production and the well-being of vulnerable groups. Sustainable transport can contribute directly to poverty reduction by providing low income people access to jobs and services and by enabling them to conduct their income-earning activities safely, affordably, equitably and conveniently. Transport facilitates equitable access and mobility so that people can access key services and exercise their democratic rights, promoting good governance and stability. Large and small enterprises benefit from enhanced accessibility through access to a wider pool of labour that can result in expanded production, new investment and creation of new jobs. Reduced road fatalities and serious injuries that lower the burdening on health systems and social support services will free up resources for other health-based priorities. Tackling air pollution and greenhouse gas emissions from transport that harms human health and contributes to climate change will assist in global efforts to facilitate sustainable development.

IV. THE NEED FOR A COORDINATED APPROACH TO SUSTAINABLE TRANSPORT ACROSS SDGS

12. Sustainable Transport has been long been neglected as a sustainable development issue in part because the solutions are in one area (the transport sector) and the benefits are seen in many other sectors. While the benefits of improved road safety, for example, are in improved health and economic outcomes, the solutions lie in the provision of safe, sustainable and affordable transport options. This Results Framework addresses this concern by placing sustainable transport targets under different proposed SDGs.

13. There are risks, however, in dividing transport targets among other goals involving other sectors since these sectors cannot directly implement measures to enhance transport's positive impacts (e.g. improved access) and mitigate its negative impacts (emissions and serious injuries and fatalities). This risk can be mitigated through institutional coordination and capacity building. It will also be helpful if there is coordinated monitoring of transport elements of the post-2015 development framework across the SDGs. This is one of the planned follow-up measures by the SLoCaT Partnership. A clear acknowledgement of the need of horizontal monitoring of crosscutting issues such as sustainable transport in the post-2015 framework will be helpful.

V. SIX TARGETS TO ENCOURAGE SUSTAINABLE TRANSPORT FIT FOR THE 21ST CENTURY

14. The SLoCaT partnership is proposing six main targets to realise the potential of others SDGs. The six targets represent collectively the economic, social and environmental dimensions of sustainable land transport. The targets acknowledge the need for development of additional transport infrastructure and services in urban and rural areas where access required for economic and social development has not been sufficiently developed. Similarly, additional transport infrastructure and services are required to improve national level access and regional connectivity. The targets aim to ensure that development of additional infrastructure and services is done in a more economically, socially and environmentally sustainable manner. At the same time the targets also aim to enhance the economic, social and environmental sustainability of existing transport infrastructure and services. If realised they would lead to a structural transformation of the land transport sector by 2030, resulting in greater sustainability of the

transport sector and contribute to overall economic development, social equity and poverty reduction. It would make the land transport sector fit for the 21st Century.

15. The proposed targets are far-reaching and ambitious but grounded on the latest research and analysis by the leading organisations and initiatives working in relevant fields. Measurement and verification as discussed later in the document are feasible today, or will become so in the near future, especially if increased funding is available for regular and comprehensive reporting.

16. The proposed targets are:

- *Rural access:* Secure universal access by sustainable transport for rural populations by 2030.
- *Urban access:* Secure universal access by sustainable transport for urban populations by 2030.
- *National access and regional connectivity:* Facilitate national inclusion and regional connectivity by sustainable multi-modal freight and passenger services by 2030.
- *Road safety:* Halve the burden due to global road traffic crashes by halving the number of fatalities and serious injuries by 2030 compared to 2010.
- *Air Pollution and Human Health:* Halve premature deaths from road related air pollution by 2030 compared to 2010.
- *Greenhouse Gas Emissions*: 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.

VI. RESULTS FRAMEWORK

17. Rather than pursue sustainable transport as a standalone Sustainable Development Goal, the OWH has opted featuring transport's key dimensions under other possible Sustainable Development Goals (SDGs). This can help generate the level of attention and allocation of resources required to accelerate the implementation of sustainable transport. The SLoCaT Partnership has adopted a flexible and pragmatic approach in reaching out to communities representing potential SDGs. In some cases it might be that one the proposed transport related targets could be incorporated (e.g. the proposed Road Safety target would fit well under a Health related SDG) while in others this would a process indicator (e.g. the proposed Fuel Economy process indicator from the proposed Climate Change target could well be used for an Energy related SDG).

18. The ambition levels for the six targets are supported by process indicators, which can also be used for measuring progress in the implementation of the targets. The process indicators that will be used to measure the progress towards realizing the proposed 2030 targets are chosen based on a combination of the following considerations: (a) they are a reflection of structural transformation aimed for by the targets; (b) they respond to the "leave no one behind" appeal of the High Level Panel of Eminent Persons on the Post-2015 Development Agenda; and (c) they are being measures already, or they are measurable making use of available, including emerging, technologies. Some of the proposed process indicators are relevant for multiple targets. For example a doubled global travel share for public transport, walking and cycling, used here to measure progress on the Air Pollution and Human Health Target is also relevant for the climate change target as well as the urban access target.

19. The development of the Results Framework, especially the wording on targets and process indicators was an iterative process. The final formulation of targets and indicators was guided by the wider choices of possible SDGs and the willingness to integrate transport related targets and indicators. If a Sustainable Energy SDG were to be agreed upon, SLoCaT could for example fine-tune the proposed fuel economy process indicator in order to facilitate its integration.

20. The achievement of the targets requires the realisation of supporting implementation and enabling measures (See Box 2 for a definition of terms used in the Results Framework).

Box 2: Definition of Components of Results Framework on Sustainable Transport

- *Targets:* sub-goal or sub-impact using metrics that are as communicative as possible measurable with a time dimension over which improvements are (to be) achieved. They may be measured at intermediate time periods.
- *Process indicators*: these measure progress towards achievement of the key dimensions of targets. They are measurable and have a time dimension and can be used to measure intermediate results.
- *Implementation measures*: these focus on the actions/ implementation measures that are needed for implementation – typically the measures and policies needed to implement the components of a program. Compared to enabling measures they are more readily quantifiable and would have a time dimension. Implementation measures often contribute towards multiple targets. Implementation measures should be inclusive and take into account the special needs of a wide range of people, including women, men, children, people with disabilities and minority groups.
- *Enabling measures*: are 'facilitators' i.e. the standards, skills, regulatory and legal frameworks, institutional arrangements, and means of engaging stakeholders needed to support delivery of the above. Able to be measured qualitatively. Enabling measures often contribute towards multiple targets. Enabling measures should be inclusive and take into account the special needs of a wide range of people, including women, men, children, people with disabilities and minority groups.

21. The Results Framework outlined in this section is comprehensive, but not exhaustive, in terms of targets, indicators, and measures. It represents a consensus in the sustainable transport community on key ingredients to change the growth trajectory of the transport sector towards a more sustainable future. It is not expected that all the supporting process indicators be reflected in the post-2015 development framework. Those that are recommended for inclusion are written in bold italics. They are summarised as well in the Executive Summary at the beginning of this document. They are chosen based on their importance for realising the SDG they support, the ease of measuring them and their communicative potential.

22. The SLoCaT Partnership has chosen to develop a more comprehensive Results Framework in addition to just the targets and process indicators to foster an internal consensus within the sustainable transport community on how to best realise the contribution of sustainable transport towards sustainable development. It would also provide a comprehensive monitoring framework.

A. RURAL ACCESS

Rural transport is vital for poverty reduction, equitable development and people's access to services, including healthcare and education. Notwithstanding growing urbanisation, by 2030, three billion people will be living in rural areas[9]. In many countries, rural communities are at risk of being 'left behind' due to their isolation and lack of universal access to transport, employment, markets, education, health facilities and information connectivity. There is strong evidence from many countries in the world that rural access roads lead to poverty reduction, increased

[9] UN-DESA estimates 60% of projected 8.3 billion world population will be urban in 2030 and the rural population will be about 3.3 billion then. Source: http://esa.un.org/unup/CD-ROM/Urban-Rural-Population.htm

economic opportunities, greater agricultural production and marketing, better school enrolment (girls and boys), better public health and more women attending maternal healthcare facilities[10].

23. Rural roads connect villages with local towns, markets and services. Rural roads may be very small (perhaps single track). In both industrialised and developing countries, traffic levels on rural roads can be very low, sometimes below 50 vehicle movements a day. Rural roads tend to be the responsibility of decentralised local government authorities (e.g. district level). Inter-urban roads that travel through rural areas have much higher traffic volumes and are not 'rural roads': they tend to be the responsibility of national or provincial authorities (or agencies). While inter-urban roads are important for both rural and urban connectivity, these are mainly constructed for the benefit of the national economy rather than rural interests and they may have some negative impacts on rural communities. It is the lack of adequately maintained rural roads with appropriate transport services that prevent rural residents from accessing markets, jobs and services. There is evidence from many countries that investment in these small rural roads and tracks not only reduces rural poverty but also contributes significantly to the national GDP with rates of return greater than investment in larger and more expensive roads[11].

24. Rural roads may be seasonally disrupted, particularly in poorer countries, and transport services are often infrequent and expensive[12]. To overcome rural poverty, remote rural settlements need to be connected to local towns (with markets and services) by roads that are passable all the year. Improved access can be often achieved through better maintenance of existing roads. Where appropriate, this should be complemented by the environmentally sensitive and resource efficient construction of new village access roads that should safeguard and benefit the local people (see Box 1). In the remoter areas, safe footpaths, footbridges and waterways may be required. Local priorities will determine which means of transport are promoted and some countries may include water-based transport. As many rural people depend on passenger and freight services, it is important that rural transport services are affordable, safe, accessible, convenient and appropriate.

25. Better rural road maintenance (and the construction of new roads, where appropriate) needs to be matched by ensuring adequate transport services to reach markets and essential services. Rural transport services are vital for rural economic growth, enhanced agricultural production and greater rural prosperity. In rural areas, travel patterns are often associated with periodic markets and the convenient transport of small quantities of freight is often crucial. Spoiled harvests due to poor access to urban markets discourage enhanced agricultural production. As many rural people depend on passenger and freight services, it is important that these are affordable, safe, accessible, convenient and appropriate.

26. Equitable rural access is a key gender issue. One reason is the crucial importance of women's access to maternal and peri-natal health care. Furthermore, poor rural access and insecure means of transport disproportionately limits girls' access to education and women's access to markets, employment and entrepreneurial opportunities (See Box 1). People with disabilities are at a particular disadvantage in rural areas that lack the infrastructure and support services they need. Improved rural transport services incorporating 'universal design' principles increase the access of women, children, youth, people with disabilities, and other disadvantaged

[10] For example see review of evidence by Starkey and Hine (2014) in a study for Overseas Development Institute and UN-Habitat, which will be available on the SLoCaT website.

[11] For example, see For example see Fan and Chan-Kang (2005). IFPRI Research Report 138: Road development, economic growth and poverty reduction in China. http://www.ifpri.org/publication/road-development-economic-growth-and-poverty-reduction-china-0

[12] Rural transport services indicators: Final Report, August 2013. International Forum for Rural Transport and Development (IFRTD). Available at: http://www.ruraltransport.info/RTSi/resources/project_outputs.php

groups and enhance their contributions to equitable economic development. With inadequate rural transport, rural people are less likely to register births, and undocumented individuals are more vulnerable to human rights violations.

27. Government departments responsible for planning and managing rural access tend to be under-resourced[13] and international efforts to improve rural access remain fragmented. National and international organisations shouldchampion the importance of rural access and work together to improve policy frameworks, knowledge management and data gathering.

28. The results framework for rural access is shown in Table 3. Progress on the achievement of the rural access target will be measured by combining Geographic Information Systems (GIS) technologies and transport-related survey data. The existing Rural Access Index[14] (proximity to roads with year-round access) will be complemented by assessments of transport services. Data from sample surveys will be disaggregated for income, gender and disadvantaged groups to monitor trends and ensure 'no one is left behind'. As the Rural Access Index baseline is very variable (from less than 30% to about 100%), local achievement target levels will need to be set, based on guidelines and realistic investment prospects. The desired achievement will be 100% of these target level by 2030. All process indicators and implementation measures are quantifiable today, with further improved measurement techniques anticipated within three years.

Table 3: Results Framework on Rural Access

Target: Secure universal access by sustainable transport for rural populations by 2030.

Process Indicators (2030 compared to 2010 baseline):

- **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**).
- **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).**
- 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)

Implementation measures:

1. Ensure existing rural roads are maintained to all-season standards (desired achievement by 2030:100%)
2. Rehabilitate, upgrade or construct appropriate[15]infrastructure (rural roads, trails, bridges) to reach isolated communities (desired achievement by 2030:100% achievement of local rural access index targets).
3. Promote and regulate affordable, accessible, effective and appropriate public and/or collective transport systems suitable for all passengers (including the special needs of women, children, older persons and people with disabilities) and small freight (desired achievement by 2030: all nations).
4. Develop and implement integrated rural transport and development plans, incorporating pro-poor, inclusive and equitable access (appropriate infrastructure and services), enhanced agricultural marketing mechanisms, job creation and access to services and information (desired achievement by

[13]Improving Rural Mobility. World Bank Technical Paper 525.
[14] Rural access index: a key development indicator.
http://www.worldbank.org/transport/transportresults/headline/rural-access/tp-10-final.pdf
[15]This specifically excludes inter-urban roads passing through rural areas

2030: rural development plans in all nations).

5. Promote appropriate use of intermediate means of transport (such as bicycles, carts, motorcycles and three-wheelers) for short-distance passenger and small freight transport and ensure appropriate enabling infrastructure is available (desired achievement by 2030:all nations).
6. Ensure that all new transport infrastructure and transport services and prioritised 'at risk' existing facilities are climate resilient and are resource efficient (desired achievement by 2030:100%).

Enabling Measures:

1. Develop national transport programs for sustainable and inclusive rural transport, build related institutional capacity, and foster sound transport pricing and non-price demand management practices.
2. Build sound institutions, appropriately staffed and resourced with competence in all aspects of rural transport planning including social inclusion.
3. Ensure participatory processes for stakeholder involvement and consultations in the planning and maintenance of rural roads and the planning and regulation of rural transport services, taking into consideration the special needs of women, children, older persons, people with disabilities and minority groups.
4. Combine transparent, regulatory planning with efficient service provision to meet realistic demand targets, supported by effective data collection (disaggregated for user types) and knowledge management
5. Commit appropriate funding (based on local situations) to rural road maintenance and construction.
6. Identify 'rural access' champion organisations to facilitate improved knowledge management and the development and deployment of national and international databases, and associated data gathering, relating to rural access parameters.

B. URBAN ACCESS

29. In urban areas, many people travel to work daily and require sustainable transport that is affordable and does not take too long, so allowing economic productivity and quality family life. To develop sustainable urban transport requires ensuring appropriate land-use planning, reducing travel requirements, guaranteeing reliable and affordable public transport and providing quality pedestrian infrastructure and dedicated cycle facilities. Poor people in urban areas are often further from services, employment and markets. Better access to jobs, education, and health care improves people's quality of life and helps lift them out of poverty.

30. Over one billion people live with disabilities[16]. Accessible urban transport systems that incorporate universal design not only benefit people with disabilities, they also make access in public transit and pedestrian areas easier and more convenient for all travellers who include women, children, youth and other vulnerable groups.

31. Efficient, equitable and sustainable urban transport systems are diverse as are the travel needs of people. Different modes are promoted for their comparative advantages: walking and cycling for local trips, mass public transit for longer trips, particularly on major corridors, and motorcycles, automobiles and trucks being used when necessary. This Results Framework proposes that the modal share of sustainable transport systems (public transport, cycling and

[16] WHO 2011. World report on disability. World Health Organisation (WHO) and World Bank. http://whqlibdoc.who.int/publications/2011/9789240685215_eng.pdf?ua=1

walking) will double globally by 2030. This builds on mobility projections[17] by the International Energy Agency and the International Association for Public Transport, as part of the Grow Public Transport Campaign, which show that if we were to double the market share of public transport the number of trips would need to triple and car share would fall. However, the business as usual scenario shows more trips by private vehicles and less public transport. So to double the market share of public transport urban mobility patterns will need radical change.

32. As mentioned modal share has not been used as an indicator for urban access, it is included in this results framework as an indicator for climate change. However, cities may well use the share of sustainable transport modes as an indicator of their achievements in promoting sustainable transport as well as improving urban air quality.

33. Urban transport systems, especially in many cities in the global south will combine transport operating in the formal as well as the informal sector, with the latter continuing to serve as an important source of employment.

34. Urban roads should be designed within hierarchical road and street networks and managed to favour space-efficient modes, with adequate sidewalks, cycle lanes, bus lanes and truck lanes where appropriate, with sustainable transport modes receiving priority over general automobile travel. New urban roads and facilities should favour resource efficient methods of construction and operation with appropriate climate resilience

35. Sustainable urban transport (public or collective transport, walking, cycling and other intermediate means of transport) requires spatial planning, inter-connected public transport and safe pedestrian infrastructure and cycle-ways allowing equitable access to economic opportunities, green areas and social necessities, with appropriate traffic management. Sensitive design that responds to different needs for women, children, youths, people with disabilities and disadvantaged groups is required.

36. Improved pricing of transport is needed focusing on private vehicle users so that motorists perceive the full marginal social costs of the congestion and externalities they create. Awareness campaigns can promote appropriate behavioural changes among travellers to favour greater use of sustainable transport modes and active transport. Indiscriminate parking should be curbed recognising the value of street space that should first be allocated to loading zones, bus stops, pedestrian crossings. Awareness campaigns can promote appropriate behavioural changes among travellers to favour greater use of sustainable transport modes and active transport.

37. The results framework for urban access is shown in Table 4. Progress on achieving the urban access target will be measured by combining Geographic Information Systems (GIS) technologies and transport-related survey data. Data from sample surveys will be disaggregated for income, gender and disadvantaged groups to monitor trends and ensure 'no one is left behind'. All process indicators and implementation measures are quantifiable today, with further improved measurement techniques anticipated within three years.

[17] See http://growpublictransport.org/the-campaign/urban-mobility-scenarios-by-2025

Table 4: Results Framework on Urban Access

Target: Secure universal access by sustainable transport for urban populations by 2030.

Process Indicators (2030 compared to 2010 baseline):

- **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).**
- **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).**
- Proportion of households within 500 metres of good quality affordable public transport accessible by dedicated walking and/or cycling facilities (desired achievement: 100%).

Implementation measures:

1. Develop integrated, equitable and accessible public transport systems suitable for all travellers (who include women, children, youth, older persons, people with disabilities and minority groups), complemented by 'active transport' facilities (walking and cycling) for all cities over 100,000 people by 2030.
2. Develop hierarchical road and street networks with inclusive 'complete' street design allowing their safe use by cars but also pedestrians, cyclists and public transport, thus benefiting all groups in society, while providing for efficient land use and access for all cities over 100,000 people by 2030.
3. Price transport so that travellers and firms perceive the full social costs of their travel (on average) and on a temporal and spatial basis by 2020, thus facilitating shifts to resource efficient modes such as public transport systems and 'active transport' for people and rail for freight.
4. Adopt Transit Oriented Development Standards to manage development within market area of high capacity public transportation in all cities over 100,000 people by 2020.
5. Implement non-price demand management measures comprehensive traffic and parking management in all cities over 100,000 people by 2020.
6. Ensure that all new transport infrastructure and transport services and prioritised 'at risk' existing facilities are climate resilient and are resource efficient.

Enabling Measures:

1. Develop national transport programs for sustainable transport, build related institutional capacity, and foster sound transport pricing and non-price demand management practices, coordinated with land use.
2. Build sound institutions, appropriately funded, staffed and resourced with competence in all aspects of sustainable transport planning, integration with land use, and for traffic management
3. Develop land-use plans integrated with transport facilities and other infrastructure that encourage efficient land utilisation and minimize the need for the movement of goods and persons by motorised transport.
4. Develop policies and standards to promote inclusion of cycle routes and pedestrian facilities as part of all major urban road and traffic management initiatives and new urban developments combined with polices and standards to ensure high-quality public transport systems.
5. Ensure participatory processes for stakeholder involvement and consultations in the planning and regulation of integrated transport systems
6. Combine transparent, regulatory planning with efficient service provision to meet realistic demand targets, supported by effective data collection and knowledge management.

C. NATIONAL ACCESS AND REGIONAL CONNECTIVITY

38. Efficient freight logistics is necessary to support the transport of farm produce to markets as well as the distribution of manufactured goods and other essential supplies within nations. Efficient and sustainable passenger travel between towns and cities is also needed to support national integration. Enhanced cross-border freight logistics and passenger travel is also vital to support efforts on regional economic cooperation. Care needs to be taken to ensure improve transport services are both responsive to market needs and sustainable. Traditionally national transport systems were oriented to internal needs and did not necessarily facilitate efficient cross-border, regional passenger and freight movements.

39. Passenger and freight railways are able to provide competitive services where the corridors are capable of generating sufficient demand and where the haul length tends to be over 300 to 500 km. At these distances, even moderate speed passenger railways travelling can be competitive with airline and road transport. Passenger railways are enjoying renewed interest in different parts of Europe and Asia.Very high-speed rail (VHS) has dramatically changed inter-modal competition, allowing rail to compete directly with air transport on medium distances (e.g. on the Madrid-Sevilla line, rail modal share grew from 19 to 53% after the opening of the VHS line). In many cases this also engenders a decrease in energy consumption, air pollution and CO2 emissions. Furthermore, cost-efficient and safe quality bus services can deliver competitive connections and serve as backbone of national passenger transport in many countries worldwide. Bulk freight railways and waterways are being upgraded to serve resource industries in all continents.

40. Reliable logistics systems can address food security concerns and assisting in times of emergency relief. Long distance passenger transport services provided by train, buses and private car travel will also benefit from the investments in rail and roads and supporting intra-urban distribution systems.

41. Long distance carriage of containers from production zones to seaports by rail where infrastructure and services are efficient and appropriate can compete with road on price and time and with lower energy use, and fewer fatalities and injuries and emissions than road. Rail freight where possible should be separated from passenger rail traffic for mutual efficiency.

42. In East Asia over half of the logistics cost for goods bound for international markets are between port and hinterland in East Asia.[18]A similar situation is likely to exist in other developing regions. Despite improvements in infrastructure, and cross-border procedures, the logistics performance of approximately one third of the countries surveyed by the World Bank's Logistics Performance Index logistics declined from 2009 to 2012[19.] Addressing the barriers that constrain efficient transport and trade facilitation, and improving a nation's international competiveness, require a systematic approach that combines the provision of appropriate transport infrastructure and services with sorting out of unnecessary legal and administrative cross border procedures. Where countries are land-locked it is even more critical they have efficient transport to ensure their economies can enjoy the benefits of regional integration.

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[18]Asian Development Bank, Japan Bank for International Cooperation & the World Bank (2005) "Connecting East Asia: A New Framework for Infrastructure."

[19] World Bank (2013) states "Logistics Performance Index 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://data.worldbank.org/indicator/LP.LPI.OVRL.XQ] accessed on 23 January 2014.

43. The results framework for national access and regional connectivity is shown in Table 5. The targets for logistics and for land passenger transport are measurable today through the process indicators and implementation measures.

Table 5: Results Framework on National Access and Regional Connectivity

Target: Facilitate national inclusion and regional connectivity by sustainable multi-modal freight and passenger services by 2030.

Process Indicators (2030 compared to 2010, except where indicated):

- **Logistics Performance Index for all countries (desired achievement: 80% of countries to achieve a rating of 3.5[20])**
- **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).**
- 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 achievement: 50% reduction).

Implementation measures:

1. Develop high quality rail passenger and freight railways to meet market demands in priority national and regional corridors where the investments are economically justified and environmentally sustainable by 2030.
2. Develop high quality road infrastructure connecting to ports and international gateways to segregate truck traffic from intra-urban and rural arterial road networks where economically justified and environmentally sustainable by 2030.
3. Develop complementary shorter-distance passenger transport and goods distribution systems in urban areas, resource hinterland regions and economic zones by 2030 that reduce exposure of the population to air and noise pollution.
4. Harmonise cross-border customs, immigration, advance warning of shipment arrivals at borders, and sanitary and phytosanitary procedures by 2030.
5. Phase-out all motor vehicle fossil fuel subsidies by 2020.
6. Price transport so that travellers and firms perceive the full social costs of their travel (on average) and on a temporal and spatial basis by 2020, thus facilitating shifts to resource efficient modes.
7. Promote green freight initiatives to improve energy efficiency of supply chains in all nations by 2020 with implementation of best practice in 80% of nations by 2030.

Enabling measures:

1. Build capacity in government in national freight and passenger transport planning by 2020 and develop national freight and passenger transport plans in all countries by 2030.
2. Build capacity for efficient cross border goods and passenger processing.
3. Remove regulatory barriers to entrant of new logistics firms including international firms.
4. Strengthen institutional capacity to monitor compliance of logistics firms and truck operators with operational, safety and environmental standards.
5. Combine transparent, regulatory planning with efficient service provision to meet realistic demand targets, supported by effective data collection and knowledge management.

[20] 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)

D. ROAD SAFETY

44. Globally, the World Health Organisation (WHO) estimates that 1.24 million people died on roads in 2010.[21]Half of the traffic deaths occur among motorcyclists (23%), pedestrians (22%), and cyclists (5%), with 32% among car occupants and the remaining 19% among unspecified road users[22]. Road traffic crashes are also a leading cause of non-fatal injury and disability and premature death predominately impacting the young. Up to 50 million people are injured each year, with permanent disability a frequent outcome. Road traffic crashes are estimated to be the ninth leading cause of death globally and are forecast to rise to become the seventh leading cause of death by 2030[23]. Road traffic crashes inflict a similar burden of mortality to other communicable diseases, such as tuberculosis[24]. In some countries, 75% of hospital capacity for treating head trauma is taken up by road crash victims[25]. Males represent more than 50% of fatalities in all countries and regions in the world reflecting exposure and possibly risk taking.

45. Road crashes are estimated to cost more than US$1,800 billion or 3% of Gross Domestic Product (GDP) globally with the economic losses in low- and middle-income countries equivalent to 5% of GDP or US$1,000 billion per year[26]. Road crash costs in these countries often well exceed the total development aid received, while also diverting valuable health and social support resources from other development priorities. In low- and middle-income countries in particular, the death or serious injury of a family member can lead to direct financial hardship for the family and exclusion from economic, social and education opportunities that counter poverty reduction efforts.

46. Traffic-related fatalities and serious injuries are rising in urban areas due to growth in cities and their vehicle fleet. Research by EMBARQ, a program of the World Resources Institute in Washington, D.C. USA, indicates that globally 40-50% of traffic fatalities occur in urban areas. In the USA up to 73% of fatalities occur in cities. Traffic fatalities in cities in low income nations are typically five times that in cities in high income nations[27].In many cities the inadequate provision of a safe walking, cycling and driving environment and poor quality public transport exacerbates the risk of being injured or killed. Improvements in road and street design to include adequate footpaths and street crossings as well as good quality public transport can reduce the crash risk by reducing traffic activity and directly reducing crash exposure.

47. The UN Secretary General, Ban Ki-moon, highlighted the need for global action on an unprecedented scale when recommending the need to "reduce the burden of …road accidents" in his post 2015 UN General Assembly report[28] "A life of dignity for all". The United Nations earlier launched the Decade of Action for Road Safety (2011-2020) supported by the Global

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[21]WHO (2013) "Global Status Report on Road Safety 2013 – Supporting a Decade of Action," page 4

[22]WHO (2013), op. cit. pages 4-6.

[23]http://www.who.int/healthinfo/global_burden_disease/projections/en/index.html&http://www.who.int/healthinfo/global_burden_disease/en/ accessed 19/12/2013

[24]Institute for Health Metrics and Evaluation (2013), "The Global Burden of Disease: generating evidence, guiding policy." Seattle, WA, USA, page 12.

[25] RAC Foundation (2011) "Saving Lives, Saving Money: The costs and benefits of achieving safe roads" London, UK

[26]iRAP (2013) "The business case for investment in road safety" London, UK

[27]Holger Dalkmann (2014), "Is Your City Safer by Design." Presentation made at Transforming Transportation, Washington, January 17.

[28] United Nations (2013) "A life of dignity for all: accelerating progress towards the Millennium Development Goals and advancing the United Nations development agenda beyond 2015" A/68/202

Plan[29]promoting proven cost effective solutions for making roads safer through: (i) road safety management; (ii) safer roads and mobility; (iii) safer vehicles; (iv) safer road users; and (v) improved post-crash response and hospital care.

48. Successful achievement of the SDG target for road safety will save an estimated 100 million fatalities and serious injuries and more than US$10,000 billion in economic costs between 2010 and 2030[30.] Secure funding at the required scale is needed to implement the proven road safety actions on a sustained basis to 2030. Building on the 'Decade of Action for Road Safety' a results framework for road safety is provided in Table 6. The target, process indicators and implementation measures can all be measured and verified by established methods on a two to three year cycle as currently done for reporting on implementation on the Decade of Action for Road Safety (2011-2020).

Table 6: Results Framework on Road Safety

Target: Halve road traffic deaths by 2030 compared to 2010.

Process Indicators (2030 compared to 2010 baseline):

- **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).**
- **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).**
- 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).

Desired achievement levels by 2030 by country income cluster are:

- Fatality rates
  - < 4 per 100,000 population in high-income countries (baseline of 8.7 in 2010)
  - < 7 per 100,000 population in middle-income countries (baseline of 20.1 in 2010)
  - < 12 per 100,000 population in low-income countries (baseline of 18.3 in 2010)
- Serious injury rates:
  - < 40 per 100,000 population in high-income countries (baseline of 87 in 2010)
  - < 70 per 100,000 population in middle-income countries (baseline of 201 in 2010)
  - < 120 per 100,000 population in low-income countries (baseline of 183 in 2010)
- Economic cost of crashes:
  - < 1% of GDP per year in high-income countries (baseline of 2% in 2010)
  - < 2.5% of GDP per year in middle-income countries (baseline of 5% in 2010)

Implementation measures:

In the Post-2015 context, recommended implementation measures include:

1. Increase the safety of road infrastructure around the world by eliminating 1 and 2 star rated unsafe roads by 2030 as defined by International Road Assessment Program for all road users.
2. Ensure all transport infrastructure designs include non-motorised transport statements explaining how the needs of pedestrians and cyclists have been incorporated into the designs, including the adequacy of road 'hard shoulders' and inclusion of sidewalks and cycle lanes where warranted.
3. Build all roads funded by multi-lateral development banks to a minimum 3-star safety levels for all road users, with highway authorities worldwide encouraged to adopt the same minimum safety

[29] WHO (2011) "Global Plan for the Decade of Action of Road Safety" Geneva, Switzerland

[30]iRAP (2013) "The business case for investment in road safety" London, UK

standards.

4. Increase the proportion of vehicles manufactured each year that meet the minimum safety standards set by the United Nations to 100% from the 2010 figure of approximately two-thirds.
5. Increase the proportion of countries with comprehensive legislation on 5 key risk factors (speed, distracted driving, drink-driving, the use of motorcycle helmets, seat-belts and child restraints) to 80% by 2030.
6. Increase global front and rear seat-belt wearing rates to over 80% in all countries by 2030 (baseline of 65%).
7. Strengthen and adequately resource improved crash response systems and post-crash medical care by 2030 by 2030.
8. Increase global motorcycle rider and passenger helmet wearing rates to over 80% in all countries by 2030 (baseline of 57%).
9. Develop integrated, equitable and accessible public transport systems complemented by 'active transport' facilities (walking and cycling) for all cities over 100,000 people by 2030.
10. Develop hierarchical road and street networks with inclusive 'complete' street design enhancing conditions for pedestrians, cyclists and public transport, while providing for efficient land use utilisation and access for all cities over 100,000 people by 2030.

Enabling measures:

1. Develop institutional capacity and mechanisms to support and finance the establishment of lead agencies and national road safety strategies including the implementation of the associated action plans.
2. Benchmark the safety of infrastructure and invest >0.1% of GDP in targeted road infrastructure improvements that maximise the return on investment through deaths and serious injuries saved.
3. To reduce injury and fatality as a result of vehicle crashes, create the consumer and industry demand for safer vehicles through the promotion and dissemination of national and/or regional New Car Assessment Programme (NCAP) star ratings for vehicles or equivalent.
4. Set best practice road safety legislation and provide sufficient resources for effective enforcement. Measures include: Set and seek compliance with speed limits and evidence-based standards and rules to reduce speed-related crashes and injuries; set and seek compliance with drink–driving laws and evidence-based standards and rules to reduce alcohol-related crashes and injuries; set and seek compliance with laws and evidence-based standards and rules for motorcycle helmets to reduce head-injuries; Set and seek compliance with laws and evidence-based standards and rules for seat-belts and child restraints to reduce crash injuries.
5. Increase responsiveness to post-crash emergencies and improve the ability of health and other systems to provide appropriate emergency treatment and longer term rehabilitation for victims. This includes access to safe, effective and quality affordable essential surgical care and anaesthesia.
6. Establish effective crash data systems and analyses along with monitoring and evaluation mechanisms to inform policy and measure progress.
7. Ensure participatory processes for stakeholder involvement and consultations in the planning and regulation of safe roads and associated pedestrian and cycle infrastructure.

E. ENVIRONMENT AND HUMAN HEALTH

1. AIR POLLUTION AND HUMAN HEALTH

49. WHO has identified ambient (outdoor) air pollution as one of the top global risk factors for premature death, responsible for more than 3.2 million early deaths in 2010.[31] Worldwide, urban air pollution is estimated to cause about 9% of the lung cancer deaths, 5% of cardiopulmonary deaths and about 1% of respiratory infection deaths.[32] These findings are confirmed by the latest 2014 Transport for Health Study commissioned by the World Bank's Global Road Safety facility[33] quantifies both the burden of disease attributable to road injury and the burden linked to air pollution from vehicles for the first time. The study found that exposure to pollution from vehicles, in terms of particulate matter pollution resulted in 184,000 deaths globally in 2010.

50. Air pollution is an environmental health problem that affects people worldwide. Transport related air pollution, often representing from 20% to 50% of outdoor air pollution, is often expressed through particulate matter pollution. Middle-income countries disproportionately experience this burden because of their rapid motorisation and their generally less demanding vehicle emissions and fuel quality standards.

51. Air pollution is estimated to have economic losses equivalent to about 2% of GDP[34]. Health damage may contribute up to 70% of these economic losses[35]. Other adverse impacts include reduced visibility, material damage, crop losses and soiling. Because the extent and severity of health damage caused by air pollution depends on the extent of human exposure, transport related air pollution is primarily an urban issue. Key transport related air pollutant is Particulate Matter (PM); the finer the diameter of the particles the more harmful is the impact on human health. Currently many countries are measuring and regulating PM_{10} (less than 10 micrometers in diameter) but increasingly this is shifting towards $PM_{2.5}$ (less than 2.5 micrometers in diameter).[36] This is why a process indicator is proposed which can measure PM_{10}, $PM_{2.5}$, or both.

52. Advances in vehicle emission controls can cut air pollution from light and heavy-duty vehicles by almost 70% by 2030 compared to 2010. To realize these technological improvements in vehicle emission levels it is key to reduce sulphur levels in fuel to 50ppm and preferably go to less than 10ppm.

53. In countries with growing affluence the incidence of obesity and heart disease is rising. Providing safe public transport, and making it more attractive for people to walk and cycle leads to increased levels of physical activity and reduced private vehicle use, thereby boosting physical

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[31] Lim, S et al. (2010). A Comparative Risk Assessment of Burden of Disease and Injury Attributable to 67 Risk Factors and Risk Factor Clusters in 21 Regions, 1990–2010: A Systematic Analysis for the Global Burden of Disease Study 2010." The Lancet 380, no. 9859 (December 15): pages 2224–60.

[32] WHO (2013), "Mortality and Burden of Disease of Outdoor Air Pollution." Refer web site [http://www.who.int/gho/phe/outdoor_air_pollution/burden_text/en/index.html] accessed 15 November.

[33] 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] accessed April 1, 2014.

[34] World Bank (2006), "Vulnerability to Air Pollution in Latin America and the Caribbean Region," Sustainable Development Working Paper No. 28, the World Bank Latin America and the Caribbean Region Environmentally and Socially Sustainable Development Department. Page vii.

[35] Ibid. Page vii.

[36] See http://airnow.gov/index.cfm?action=aqibasics.particle

fitness and cutting obesity, both of which are becoming increasingly a problem as motorisation rates are increasing.

54. The proposed results framework for air pollution and human health is provided in Table 7. It is important to address the overall public health performance of a transport system or investment, including levels of air pollution and noise, and promotion of physical activity. The impact of road crashes listed as a separate target is directly linked as well. All these health risks associated with transport, cause a high burden of disease and influence livelihoods, estimates external costs as well as sustainability. This target is proposed to be measured by Global Burden of Disease Study Methods[37].

Table 7: Results Framework – Air Pollution and Human Health

Target: Halve premature deaths from road related air pollution by 2030 compared to 2010.

Process Indicators (2030 compared to 2010):

- **Premature deaths from air pollution (desired achievement: 50% reduction compared to 2010 baseline of 184,000).**
- **PM_{10} and/or $PM_{2.5}$ air pollution from passenger and freight vehicles (desired achievement: 70% reduction**).
- Travel share of public transport, cycling, walking and other sustainable modes (desired achievement: double the global share by 2030).
- Proportion of urban dwellers engaging in adequate outdoor physical exercise (desired achievement: to be developed)

Implementation measures:

1. Implement Euro vehicle emission standards in all countries by 2030 reaching Euro 5 or equivalent vehicle emission standards in the Middle East and Africa and Euro 6 or equivalent in the rest of the world (desired achievement: 100%).
2. Increase the proportion of transportation fuel (gasoline and diesel) that is ultra-low sulphur (50ppm with an ultimate goal of 10ppm or less) by 2030 (desired achievement: 90%).
3. Price transport so that travellers and firms perceive the full social costs of their travel (on average) and on a temporal and spatial basis by 2020, thus facilitating shifts to resource efficient modes.
4. Implement non-price demand management measures, including comprehensive traffic and parking management in all cities over 100,000 people by 2030.
5. Develop integrated, equitable and accessible public transport systems complemented by 'active transport' facilities (walking and cycling) for all cities over 100,000 people by 2030.
6. Promote the benefits of adequate physical exercise for health and as a mode of transport in all cities (desired achievement: 100% of cities).
7. Increase the proportion of in-use passenger and commercial and freight vehicles are covered by regular Inspection and Maintenance Programs and renewable motor vehicle registration requirements by 2030 (desired achievement: 80% passenger vehicles; 100% commercial and freight vehicles).

Enabling measures:

1. Build sound institutions, appropriately staffed and resourced with competence in all aspects of sustainable transport planning, integration with land use, public transport system planning and operations, urban traffic management, bicycle and pedestrian planning, and minimisation of air quality impacts of transport

[37] For example, World Bank (2014), Op Cit. page 23.

2. Develop land-use plans integrated with transport facilities and other infrastructure that encourage efficient land utilisation and minimise the need for the movement of goods and persons by motorised transport.
3. Build technical capacity in air quality management, vehicle inspection, motor vehicle registration systems.
4. Develop comprehensive data bases on in-use vehicles, their age and technology levels, and their emissions characteristics
5. Conduct awareness programs on the benefits of physical exercise
6. Ensure participatory processes for stakeholder involvement and consultations in the regulation and monitoring of air quality.

2. GREENHOUSE GAS EMISSIONS

55. Transport contributed about one quarter of energy-related global GHG emissions and about one fifth of energy use in 2009.[38] Land transport represents 70% of transport related energy use and GHG emissions. Under a 'Business as Usual' scenario, energy use and GHG emissions are projected to rise by nearly 50% by 2030 and by more than 80% by 2050 (from 2009). Responsible for this rapid growth in transport related GHGs is the projected doubling or even tripling of the current global stock of one billion vehicles by 2050.[39]

56. While transport activity will need to increase in support of economic and social development it is important to avoid unnecessary movement of goods and persons by motorised transport through better land use planning and logistics planning as well as the use of appropriate Information and Communication Technologies. Travel demand management can also reduce the need for motorised transport. It is important to shift the movement of goods and persons to the most energy efficient mode, which in the case of passenger transport is usually public transport, walking and cycling and in the case of freight transport rail or inland waterways.

57. Many nations have historically advantaged road transport operations compared to other modes by subsidising diesel fuel and tolerating aged and polluting truck fleets. While the distortionary effects of these direct and indirect subsidies are well recognised, many governments find these policies difficult to abandon due to their appeal to vested interests. Approximately 40 countries, approximately 20% of all countries surveyed, were assessed by GIZ in 2010/ 2011 as having very high diesel fuel price subsidies[40.] Many billions of dollars are provided in subsidies thereby encouraging unsustainable energy consumption practices that have clear negative effects in terms of GHG emissions and air pollution.

58. Energy saving fuel economy improvements that make use of proven existing technologies can provide nearly half of the reduction in transport related GHG emissions needed by 2050[41] to

[38] International Energy Agency (2011), "Energy Technology Perspectives". Page 423.
[39] International Energy Agency (2009), "Transport, Energy and CO2: Moving toward Sustainability." Page 451.
[40] GIZ (2011), "International Fuel Prices 2010/ 2011." Seventh Edition. August. Page 64.
[41] 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. Pages 2-3.These energy efficiency measures go beyond the 30% improvement in efficiency of new vehicles in the baseline.

contain warming to a maximum 2° rise with the other half coming from 'avoid' or 'shift' related measures. Fuel economy improvements are assessed as being able to achieve a 50% reduction in fuel use per kilometre for new Light Duty cars by 2030 in line with targets of the Global Fuel Economy Initiative (GFEI) and projections of the International Energy Agency. Energy saving fuel economy improvements are also required for heavy duty vehicles. Unlike for Light Duty Vehicles there is no commonly agreed roadmap in place that could serve as basis for its integration in the Results Framework.

59. Shifts to non-petroleum fuels would also play an important role, particularly after 2030. To spur the introduction of Zero Emission Vehicles (ZEVs), and increase their market share to half of sales of light duty vehicles, requires aggressive policies to introduce them on a wide scale. The focus should be on light weight low speed 2- and 4-wheel vehicles for urban use. Although ZEVs would draw their power from normal electricity production GHG emissions per unit of electricity generated are expected to steadily decline from now until 2050. ZEVs would also contribute to a cut in urban air pollution.

60. In developing a results framework for GHG emissions from transport it is important to realise that there is also a need for the transport sector to adapt to climate change by strengthening the climate resilience of transport infrastructure and services provided to improve urban and rural access.

61. The proposed results framework for GHG emissions from transport is provided in Table 8. By calling out the voluntary emission reduction potential of the transport sector rather than focusing on a cross-sectoral emission reduction target, it seeks to contribute to and inspire the on-going negotiations on a global climate change agreement, not prejudging the outcome of these negotiations.

62. The aim is for countries and other sector stakeholders to voluntarily manage transport-related emissions so they peak by 2020 and thereafter begin to decline at approximately 2% per annum. By 2050, transport-related emissions[42]could be approximately 50% below 2010 levels and consistent with a maximum 2° Celsius rise in global temperature by that time. This projection is broadly in line with modelling by the International Energy Agency that indicates compliance with a maximum 2° Celsius rise in temperature requires global transport emissions by 2050 to be at or below 2000 levels. Achievement of such reductions in transport-related emissions would use least-cost strategies aligned with sustainable development.

63. GHGs from transport are monitored and modelled on an on-going basis by the International Energy Agency and others. The process indicators and implementation measures are all measurable today.

Table 8: Results Framework Greenhouse Gas Emissions

Target: 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
Process Indicators (compared to 2010 except where indicated): • **Fuel economy in all new Light Duty Vehicles by 2030, and in all Light Duty Vehicles by 2050 both**

[42] Emissions from land transport are targeted here but it is clear that aviation and shipping sub-sectors must also reduce emissions.

from a base year of 2005 (desired achievement: double fuel economy).

- **Motor vehicle fossil fuel subsidies by 2020 (desired achievement: 100% phase-out).**
- Black carbon emissions from transport by 2030 (desired achievement: 60% reduction).
- Zero Emission Vehicle share of light-duty 4-wheel and motorised 2-wheel vehicle sales worldwide by 2030 (desired achievement: 20%).

Implementation measures:

1. Develop integrated, equitable and accessible public transport systems complemented by 'active transport' facilities (walking and cycling) for all cities over 100,000 people by 2030.
2. Price transport so that travellers and firms perceive the full social costs of their travel (on average) and on a temporal and spatial basis by 2020, thus facilitating shifts to resource efficient modes.
3. Adopt fuel economy policies in all countries by 2020 with increase in new fleet fuel economy of 50% by 2030 compared to 2010.
4. Implement non-price demand management measures, including comprehensive traffic and parking management in all cities over 100,000 people by 2030.
5. Adopt Transit Oriented Development Standards to manage development within market area of high capacity public transportation in all cities over 100,000 people by 2020.
6. Promote green freight initiatives to improve energy efficiency of supply chains in all nations by 2020 with implementation of best practice in 80% of nations by 2030.
7. Ensure participatory processes for stakeholder involvement and consultations in the planning, regulation and monitoring of emissions from transport systems.

Enabling measures:

1. Build Institutional capacity in transport-related climate change mitigation and adaptation linked to urban and regional economic and development planning.
2. Monitor passenger and freight travel activity by mode, trip and user type, including time and cost attributes, service levels and attributes, and traveller demand patterns, to support policy making in all cities and countries, employing emerging information, communication, and mapping technologies.
3. Develop transport specific climate change adaptation action plans at city and national level or ensure that transport is well integrated in economy wide climate change action plans.
4. Remove barriers to introduction and dissemination of new low carbon technologies for vehicles with aim of lowering costs to users.
5. Develop a Roadmap for Heavy Duty Fuel Economy standards.
6. Develop comprehensive data bases on in-use vehicles, their age and technology levels, and their emissions characteristics

VII. TARGET DIFFERENTIATION, MEASUREMENT AND VERIFICATION

A. TARGET DIFFERENTIATION

64. Differentiation of the global targets will need to be done to ensure their proposer implementation. This can be on the basis of geographic region, or by individual country circumstance, if necessary. It is proposed that the system of classification follow the existing system of country income and geographic clusters adopted for other SDGs that would likely be based on that defined by United Nations' World Development Indicators.

B. MEASUREMENT AND VERIFICATION

65. All six targets are either measurable and verifiable today or will be in the near future using: (i) existing data collation and estimation efforts that are comprehensive; (ii) existing proven data collection methods but data sets are not available for all locations and countries but with effort could be made more comprehensive; and (iii) using existing methods enhanced by new technologies such as satellite imaging which is done routinely for specific purposes and could be scaled-up quickly. Challenges do exist in scaling-up measurement to be regular and comprehensive but these are financial, institutional or skill related and not technical[43].

66. It is important to consider differentiation in target accomplishment within countries. In line with the 'no one is left behind' notion it is especially important to assess whether the lowest quintile by income and persons with disabilities are part of progress made in target accomplishment.

67. *Urban and rural access.* Geographical Information System (GIS) techniques that are relatively inexpensive are used increasingly in transport planning and monitoring. Cell phones and GPS monitors provide an increasingly available means of observing travel activity and transport service patterns at a low cost. GIS databases of populations, transport infrastructure and transport movements will be used in the baselines and achievement measurements for both urban and rural access. Household surveys can be disaggregated for gender and disadvantaged groups and provide a richer source of information on actual travel time, costs and trip behaviour. They tend to be more costly than using GIS alone. There is scope for devising a hybrid approach using both GIS and sample surveys that focus on transport issues.

68. Improved, standardised and more regular surveys implemented by national transport programs should provide more accurate and disaggregated data, to help measure achievements. This will allow the monitoring of the lowest population quintiles by income and remoteness and persons with disabilities to ensure 'no one is left behind'. A useful model is the system of road injury data compilation, standardisation and interpretation coordinated by WHO in support of the United Nations' Decade of Action on Road Safety (as described below). With vigorous effort, representative baseline measurements could be established within three years.

69. Comprehensive measurement of access across all global human settlements will require new approaches combining Meta Data with traditional data sources. A layered approach is envisaged where the marriage of mobile phone data to geo-spatial information would be the minimum basis for acquired information for all human settlements to which other data sources could be joined. The joining up of Meta Data initiatives across sectors is essential and would show the high dependence on health, education and other sectors on transport.

70. The thresholds for rural access and the standards of transport services will be defined at local and national levels to take account of transport demand, the degree of remoteness, and transport types. In many countries intermediate means of transport (e.g., motorcycles and three-wheelers) and water transport should be included in transport assessments, along with para-transit systems, as these can provide vital, appropriate, and sustainable mobility services. The local measurements of access will incorporate common principles, but reflect different local needs and priorities.

[43] A more detailed assessment of the measurability of targets and indicators is included in Appendix B.

71. *National access and regional connectivity.* The targets for logistics and for land passenger transport are measurable today. World Bank's Logistics Performance Index is updated annually and average speeds of cross border passenger services can be monitored from timetables or simple surveys. Process indicators can be measured based on the results of country and transport corridor specific studies taking into account baseline performance and realistic forecasts of what can be desirably be achieved in terms of performance improvement. In many important transport corridors such studies are carried out periodically. Implementation measures are easily monitored.

72. *Road safety.* WHO developed and applies a standardised methodology for systematically collecting road-related injury data in each country, coordinated by a National Data Coordinator. At the country level, knowledgeable experts were sourced each of whom completed a self-administered questionnaire with information on key variables, from which they were required to come to a consensus. Point estimates were made for total fatalities (and the 95% confidence interval estimated) and the distribution of fatalities enumerated for drivers/ passengers of 4-wheeled vehicles; drivers/ passengers of motorised 2 and 3-wheeled vehicles; motorcyclists, pedestrians, cyclists; and other or unspecified road users. This work is supported by a systematic country profiling of related statistics on relevant laws, regulations, vehicle fleets and other key variables. To date, the survey has been undertaken in 2009 and 2011 (for 2010 estimation) and will be progressively carried out every two to three years if funding is available.

73. *Air Pollution and Human Health.* The target metric of reduction in premature deaths from road related air pollution can be measured using the methods as recently applied by World Bank (2014)[44]. Appropriate funding support would be needed for regular updating and improvement of estimates. Air pollution from motor vehicles at regional and global level is modelled by the International Energy Agency (IEA), the International Council on Clean Transportation (ICCT) and others using analytical models that include historical and projected data on land transport vehicle fleets, and their fuel, technology and emission characteristics, plus rail, aviation and shipping. Information on travel shares using public transport and other sustainable modes is routinely collected but needs to be done on a more comprehensive basis. That is, the key process indicators are all measurable today. Further, monitoring of the proportion of persons undertaking adequate physical exercise would be needed.

74. *Greenhouse Gas Emissions*. IEA's Statistics Department produces regular data on transport related energy use and GHG emissions for 18 countries and regions, with projections to 2050[45]. This information is based on reported consumption of liquid and other energy sources for transport and other sectors. It is understood that similar data are available for many more individual countries than reported. Modelling of future transport and GHG scenarios is carried out with their Mobility Model.

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44 World Bank (2014), op. cit.

[45]Divided by OECD and non OECD members and groups: (i) OECD members: Americas with United States also separately reported; Europe; Asia Oceania, Japan; and (ii) Non-OECD: Eastern Europe/ Eurasia; with Russia also separately reported; Asia with China and India separately reported; Middle East; Africa, Latin America with Brazil which is also separately reported.

VIII. PROVIDING THE MEANS FOR IMPLEMENTATION

75. The targets proposed in this Results Framework, are ambitious out of necessity. They will require large resources to be implemented successfully by 2030, but a major share of these globally will involve a reallocation of current and planned funding for the development of transport infrastructure and services by local and national governments as well as by international organizations supporting transport in developing countries. These changes have started but will need to be accelerated to realize the ambitious targets proposed. Reallocation of subsidies and more realistic pricing of transport and its impacts, and the manner, in which costs and benefits of transport are evaluated, will help to realize the proposed targets.

76. Such policy changes will help to ensure that currently available and tested sustainable, low carbon transport technologies and policies are adopted. This can result in cost savings of $50 trillion related to infrastructure, vehicles, and fuel by 2050 based on a recent International Energy Agency study.

77. The SLoCaT Partnership, which represents a broad array or organisations, offers to play a major role in creating the Means of Implementation for the proposed Results Framework on Sustainable Transport.

78. The SLoCaT Partnership took a lead role in the development of voluntary commitments on sustainable transport at the Rio+20 Conference on Sustainable Development in June 2012 including the unprecedented US$175 billion Voluntary Commitment for more sustainable transport by the world's eight larger Multilateral Development Banks. According to Secretary General Ban Ki-moon this Voluntary Commitment "has helped to make sustainable transport a significant feature of discussions on the post-2015 development agenda". The effectiveness of the SLoCaT Partnership in mobilising change for sustainable development was also highlighted in the recent Stakeholder Forum and Natural Resources Defence Council's first year review of the Rio+20 Voluntary Commitments: "The SLoCaT network is a model for other action networks because of its strategic vision and leadership that resulted in the major commitments on sustainable transportation at Rio+20".

79. The SLoCaT Partnership will continue to monitor the existing Voluntary Commitments on sustainable transport made in 2012 and those made on the first anniversary of the Rio+20 conference in June 2013 with a number of new Voluntary Commitments to be announced before or at the SG Climate Summit in September 2014. Together the voluntary commitments represent the collective resolve of the transport sector for concrete action.

80. The SLoCaT Partnership has also initiated the development of a Financing Framework on Sustainable Transport that aims to provide a framework on how the 2030 vision on sustainable transport outlined in the Results Framework can be financed.

81. The ultimate success of this Results Framework will be determined by its implementation. It will be important to have periodic updates on the status of Sustainable Transport as defined by the targets and indicators in this Results Framework. As is explained in this document and Annex B, most of the targets and indicators proposed are measurable now already. Work is required for some of the targets and indicators such as rural access. The SLoCaT Partnership will promote the development of additional information collection methodologies as part of the two yearly reporting on Sustainable Transport and its integration in the SDGs.

APPENDIX A: ORGANISATIONS CONSULTED

The preparation of the proposal for a sustainable development goal for transport and draft results framework has involved extensive consultation with the leading groups that have a stake in the dimensions of transport covered by each target as shown in the table below. In the case of road safety, air pollution and health, and GHG emissions, where the leading global stakeholders already had on going programs and coordination mechanisms these were enlisted to actively shape the goal statement and results framework.

Target	Stakeholder
Access (Urban/Rural)	African Association of Public Transport (UATP); Asian Development Bank; Centre for Poverty Analysis, Sri Lanka; Department for International Development (DFID); Despacio, Colombia; Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ); European Institute for Sustainable Transport (EURIST); Institute for Transportation and Development Policy (ITDP); The International Association of Public Transport (UITP); International Forum for Rural Transport and Development (IFRTD); Overseas Development Institute (ODI); Stockholm Environment Institute; Sub-Saharan Africa Transport Policy Program (SSATP); TRL (Transport Research Laboratory); UN-Habitat; UNIFE - the European Rail Industry; Victoria Transport Policy Institute (VTPI); the World Bank
National Access and Regional Connectivity	Asian Development Bank, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
Road Safety	FIA Foundation; International Road Assessment Programme (iRAP); Alan Ross, road safety specialist; the World Bank; World Health Organisation;
Environment and Human Health	FIA Foundation; Clean Air Asia; Partnership on Clean Fuels, Health Effects Institute; International Council on Clean Transportation; International Energy Agency; World Health Organisation; Institute for Transportation and Development Policy (ITDP); Institute of Transportation Studies at UC Davis (ITS-Davis).

APPENDIX B: MEASUREMENT OF TARGETS AND PROCESS INDICATORS

81. This section of the report provides the teams assessment of the measurability or targets and process indicators and the steps that need to be taken in future to enable full measurability.

I. RURAL ACCESS

A. CURRENT DATA AVAILABILITY AND INSTITUTIONS

82. The proposed rural access target is 'secure universal access by sustainable transport for rural populations by 2030'. This will be monitored through the use of three process indicators:

- Proportion of the rural population living within two kilometres 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).
- 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).
- 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).

83. The first process indicator (proximity to roads) measures the provision of basic infrastructure. It is based on the World Bank's Rural Access Index[46] (RAI) developed between 2004 and 2006 as an IDA indicator as discussed below.

84. The second process indicator (proximity to appropriate transport services) complements the first one by including an assessment of the transport services available on the nearby roads. While the first indicator measures proximity to infrastructure, the second indicator measures 'access' in terms of the rural passenger and freight services available. This indicator is needed because:

- Most rural people in LICs do not own their own motorised transport and they depend on transport services to access markets, health facilities, education and economic opportunities.
- The RAI indicator only measures all-season 'passability' and does not respond to improving rural access by better maintenance and upgrading roads: the transport services indicator will respond to better infrastructure and services and will be a more responsive and effective planning tool.

85. The third process indicator (travel time to towns/services for the poorest quintile) provides the most accurate assessment of rural access, as travel time will take into account proximity to

[46] Roberts P, Shyam K C and Rastogi C, 2006. Rural access index: a key development indicator. Transport Sector Board Transport Papers Tp-10. Washington DC. World Bank. 49p. Available at: [http://www.worldbank.org/transport/transportresults/headline/rural-access/tp-10-final.pdf].

infrastructure, access to means of transport (public or private) and proximity to services. It is both a poverty-related indicator and one that can be used in countries where personal vehicles and/or transport services may be very important for rural access.

86. The first indicator (RAI) measures the proportion of the rural population within 2 km (about 30 minutes' walk) of an all-season road. All-season roads are roads that are motorable all year round by the prevailing means of rural transport. The design standards may allow for the roads being unavailable for short periods during inclement weather (e.g. heavy rainfall) particularly on low volume roads. Periods of interruption should not normally be longer than 24 hours and roads should be available for 95% of the year. The World Bank team that defined the RAI specifically used the phrase 'all-season road' rather than 'all-weather road'. All-weather roads are paved or unpaved roads that are motorable all year round in all normal weather conditions. The design standards and the costs of construction and maintenance for 'all-weather roads' are higher than for 'all-season roads'. An 'all-season road' is allowed to be temporarily closed due to weather. For example, some countries use rain barrier systems to temporary close mud-prone roads to protect them. On low-volume roads another low-cost option is to use 'drifts' or fords that allow streams or rivers to flow across the road after heavy rainfall making them temporarily impassable. Unfortunately, there has been some confusion in the use of 'all-season' and 'all-weather' (including on the World Bank's website[47]). It is therefore suggested the terminology used is 'year-round access' which provides LICs with more affordable investment options, without restricting the option to provide all-weather access.

87. Since 2006, all IDA recipient countries[48] have been required to provide estimates of the RAI. It was initially intended that the data for the RAI would come from demographic surveys. In practice, it appears that few countries have yet collected the necessary data through demographic surveys. Some countries have estimated their RAI using GIS technologies which are increasingly available in all countries. It is proposed that GIS technologies will be used to estimate the baselines and subsequently to measure progress for both the first process indicator (RAI) and the second indicator as detailed below.

88. The data requirements for the first process indicator (the RAI) are straightforward:

- Rural population data available as a GIS layer, preferably at the resolution of individual villages. The population data exists in all countries, through the authorities responsible for national census data. It is increasingly available in GIS form at both national and local levels.
- GIS map of the road network, going down to the level of motorable trails (if unavailable this can be created using GPS devices or by using satellite images). Information on the national road network is available in all countries, through cartography departments and/or the national transport ministries. Information on the smallest rural roads may be available at the level of decentralised authorities responsible for them.

[47] [http://www.worldbank.org/transport/transportresults/headline/rural-access.html].

[48] There are 82 countries that qualify for IDA funding, including most LICs.

- GIS map of the road network including the condition of the road. For normal planning purposes this information should be available on a wide-ranging scale. For the purposes of the indicator, all that is required is whether or not the road is motorable all-season: therefore any updates for the purposes of the indicator need only consider those marginal roads on the interface of this condition. Up-to-date assessments on road condition may be available within national road authorities and/or devolved road authorities. Where recent assessments are unavailable, they could be collected easily by the devolved authorities, particularly as full-condition mapping is not required for this indicator.

89. The second indicator will require an assessment of transport services. The IFRTD, with support from AFCAP/DFID has developed indicators for transport services for individual roads[49]. The IFRTD indicators include small and medium freight services. There will be a need to develop systems for obtaining indicator data rapidly and consolidating this into district-level and national-level indicators. This information can then be included as a GIS layer which, together with the population and road layers described above, will allow the automatic calculation of the indicator baseline and achievement levels. National transport authorities in collaboration with devolved rural authorities will be able to collect the required data, provided international and national frameworks are provided to facilitate this.

90. The third indicator will come from demographic survey data. It is likely that the basic data already exists in many countries, but it will need to be extracted from national databases and presented in a systematic and uniform way. The national organisations responsible for statistics and planning should (with appropriate international and national guidance) be able to extract/collect the necessary indicator data provided international and national frameworks are provided to facilitate this.

91. Rural isolation is a key poverty-related issue, particularly in LICs. In order to monitor the progress towards the targets, it will be necessary to disaggregate statistics for the poorest rural people and the remotest communities. This can be done by correlating stratified transport-related surveys, national demographic survey data and the GIS maps used for the first indicator (RAI).

B. FUTURE DIRECTIONS

92. The Road Safety sector has shown how it is possible to achieve credible and widely accepted national and international statistics. It required an international lead organisation (WHO in the case of road safety), agreed international/national frameworks and consistent methodologies for capturing data, calculating statistics, agglomerating results and reporting findings (see Section 0). With clear guidelines and the designation of National Data Coordinators it was possible to achieve recognised and consistent national datasets within two to three years. Therefore, it not unreasonable to assume that similar rapid progress could be achieved if there were a suitable international organisation to take the lead and to champion, facilitate and monitor the processes.

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[49] Starkey P, Njenga P, Kemtsop G, Willilo S, Opiyo R and Hine J, 2013. "Rural transport services indicators: Final Report" August 2013. International Forum for Rural Transport and Development (IFRTD), London, UK for Crown Agents, Sutton, UK. 158p. Available at: [http://www.ruraltransport.info/RTSi/resources/project_outputs.php].

93. It will be necessary to identify one or more 'rural access' champion organisation willing and able to facilitate the development and deployment of national and international databases, and associated data gathering, relating to rural access parameters. The champion organisation should help to build capacity in rural transport planning and participatory processes within national authorities responsible for planning and regulating rural transport services.

94. Organisations with the capacity, resources and experience include the MDBs (notably World Bank and ADB). FAO and IFAD have been involved in rural transport (roads and marketing) and could be involved if there were a 'Rural Development' goal with a rural transport target. A DFID-funded, $40 million, six-year AFCAP2/ASCAP programme will start in 2014 and will promote research, capacity building and knowledge management in various countries in Africa and Asia. DFID has indicated that this would probably be able to fund initiatives to develop and pilot (in its programme countries) systems for effectively determining the rural access indicators using GIS and other appropriate technologies. The IFRTD is a south-driven network promoting rural access and this would be very interested to help facilitate the processes.

95. The national authorities responsible for rural access (rural roads and rural transport services) in LICs tend to be under-resourced. National governments will have to commit personnel and resources at national and devolved levels to ensure effective data collection and compilation of the rural access indicators.

II. URBAN ACCESS

A. CURRENT DATA AVAILABILITY AND INSTITUTIONS

96. The proposed urban access target is 'secure universal access by sustainable transport for urban populations by 2030'. This will be monitored through the use of three process indicators:

- **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).**
    - 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).
    - Proportion of households within 500 metres of good quality affordable public transport accessible by dedicated walking and/or cycling facilities (desired achievement: 100%).

97. The data required for the first two indicators (mean travel time and proportion of income spent on transport) will have to come from appropriately stratified sample surveys. These could be urban demographic surveys or specific targeted transport-related surveys. Targeted transport surveys are the preferred option, as they can be very simple and 'light' to collect the required information in a rapid and timely way.

98. Home Interview Surveys undertaken as part of transport masterplan studies that collect data on household, person and trip characteristics are already available in the majority of cities in HICs, and many major cities of MICs and LICs. Although these surveys are comprehensive, due to

the periodic need for a masterplan and the cost, the studies and associated surveys may only be carried out at up to 10 year intervals. However, they represent a significant resource of existing data on travel times and travel expenditure that should be collated as part of any measurement effort.

99. The data required for the third indicator will require GIS technologies with urban maps with layers representing population, public transport routes and dedicated walking and/or cycling facilities. Depending on the system of transport services regulation, the public transport layers may have to have data on prices charged (to determine affordability) and quality assessments. These are the types of planning information that all cities with transport planning/regulating authorities would either already have or would aspire to obtain for their GIS planning tools. The GIS data can be cross-referenced with information from transport-related sample surveys.

100. Mean travel time to work (commuting time) is a statistic that is already widely collected in cities and towns in HICs, and is also available in the major cities of MICs and LICs. The data collection in HICs is often delegated to polling or market research organisations. For the purposes of a global indicator, there would need to be agreement on defining what constitutes a journey and the extent to which outlying suburbs, satellite towns and peri-urban settlements are included in the surveys. The draft indicator definition allows for a variety of journeys (for the purposes of gender equity and to include travel to schools). In some cities in LICs, there are informal settlements beyond formal city limits. For people travelling into the city for employment, journey times (and costs) can be very high, but for people engaging in local enterprises, journey times may be low. For the indicator to be useful, such issues, and their implications, must be addressed.

101. The use of large data sets may provide new ways of measuring or estimating mean journey times. For example, people are increasingly carrying mobile phones as they travel and analysing the movements of 'populations' of mobile phones within cities may provide new ways of measuring mean journey times. This is a topic that is being investigated by organisations such as UN Global Pulse, and in the medium term such information will complement data from traditional surveys.

102. Travel costs as a proportion of income represent a more complex statistic, but one that is widely collected in demographic surveys. In many countries, national statistical surveys include questions on transport expenditure, as well as household income and other expenditure. It is also normal practice to disaggregate data by income level, and so the pro-poor monitoring of the lowest income quintile should be straightforward. However, urban transport authorities can supplement these longer-term surveys with more targeted transport-related sample surveys. These can be cross-referenced with the demographic survey data and will allow more rapid assessment of changes due to improved transport and urban planning. In planning for, and interpreting, the indicators, attention will have to be paid to anomalous situations where transport expenditure of the poorest quintile is actually low due to their inability to afford public transport fares.

103. The organisations that can provide baseline and progress measurements will be the statistical and/or transport departments of urban authorities as well as the national statistical

services. While many already have some appropriate statistics, there will be a need to harmonise and standardise the statistics that will be used for the indicators.

B. FUTURE DIRECTIONS

104. As noted in relation to rural access, the achievements of the Road Safety sector have shown that it is possible to move within a few years to an organised international system of standardised data collection and compilation. It required an international champion organisation and commitment from national authorities and their devolved services. With these, it was possible to agree the appropriate statistics to compile and the norms for data collection and verification.

105. As the UN agency concerned with cities and human settlements, UN-Habitat would appear the obvious lead agency to initiate and facilitate the various processes. This would involve testing and validating methods of data collection and statistical compilations (at the levels of individual cities/towns and at national level). The population size and the geographical extent of the human settlements to be included in the data collection processes would have to be agreed. Subject to discussion, inclusion of towns and their acknowledged limits for the purposes of statistics could depend on national level aspirations for the target, and possibly linked to country clusters. Collation of existing travel data for cities from multiple sources should be a first step in any measurement effort.

106. Depending on the final SDG goals and targets, the urban access indicators could be developed in association with other related indicators. One of the most relevant to be collected and compiled in association with the access indicators would be one of the greenhouse gas indicators (urban travel share by public transport, cycling and walking).

III. NATIONAL ACCESS AND REGIONAL CONNECTIVITY

A. CURRENT DATA AVAILABILITY AND INSTITUTIONS

107. By 2030, the target of “facilitate national inclusion and regional connectivity by sustainable multi-modal freight and passenger services by 2030” would be measured by the four chosen process indicators. Four addressed logistics and freight covering: (i) logistics performance; (ii) fuel subsidies – most often subsidies of diesel fuel used by trucks; (iii) cost of bulk freight per tonne-km; and (iv) proportion of empty freight miles. One addresses passenger travel: “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).”

108. The targets encompasses national and regional (cross border) land passenger and freight travel. Data on these 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.

109. 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.

110. 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. Again, where governments collect such data it tends to be done on a limited basis.

111. 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.

112. 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.

113. Given the difficulties in reliable measurement of freight movements, the target's freight logistics component is proposed to be measured by the World Bank's Logistics Performance Index (LPI) that is produced every two years since 2007 (2007, 2010 and 2012). 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://data.worldbank.org/indicator/LP.LPI.OVRL.XQ] accessed on 23 January 2014]. 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, competiveness and quality of logistics services would be relevant to domestic including rural freight movements (national but general level).

114. 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.

115. The 2012 LPI report[50] shows that despite improvements in infrastructure, and cross-border procedures, the logistics performance of approximately one third of the countries surveyed declined from 2009 to 2012. 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. Consequently, the desired LPI achievement level was set as '80% of countries to be a rating of 3.5'.

116. The extent of action to remove fuel subsidies by country and region can be measured by GIZ's "International Fuel Prices" survey that shows crude oil price and retail prices per litre of gasoline and diesel fuel with very small differences between the crude oil price and retail price indicating the presence of subsidy.

B. FEASIBILITY OF MEASUREMENT AT NATIONAL, REGIONAL AND GLOBAL LEVELS

117. Provided the LPI surveys continue to be carried out the LPI process indicator can be measured on a routine basis and differentiated by region and country. Logistics indicators like the cost of bulk-freight per tonne-km and proportion of freight miles can be measured by having agreed definitions and collating this information from key industry bodies. Progress with implementation measures can also be monitored using similar mechanisms[51].

118. Measurement of the share of passenger-kilometre shares by land public transport (rail and bus) in major national and regional corridors requires knowledge of private vehicle and public transport passenger movements. As discussed, the data are not available on a comprehensive basis. However, proxy data is currently collected by National Customs and Immigration agencies on border crossing vehicle and passenger volumes but on a partial and inconsistent basis. Consequently, the regional component of this indicator can be partially measured today using the existing count data. In regards to the national component of indicator this could be measured initially on a proxy basis using count data on vehicle and passenger volumes in key long distance corridors within countries.

119. The status of fuel subsidies, can be monitored using GIZ's regular "International Fuel Prices" survey.

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[50] World Bank (2012), "Connecting to Compete: Trade Logistics in the Global Economy".

[51] The implementation measures address the barriers that constrain efficient transport and trade facilitation such as (i) upgrading of roads, freight railways and sea and air ports, (ii) ratifying international protocols (iii) making progress with exchange of traffic rights to facilitate movement of goods to final destinations; and (iv) improving customs clearance, immigration and sanitary and phytosanitary procedures. A range of relevant indicators that measure progress with implementation could also be developed if necessary. Similarly, the extent of action to remove fuel subsidies can be measured by GIZ's "International Fuel Prices" survey.

C. FUTURE DIRECTION

120. As described progress with national and regional freight logistics infrastructure and services can be measured using the LPI and associated data collected from industry bodies. A key requirement is that a single body be charged with the responsibility for collation and reporting of this information. One possibility is that these data are collated by the World Bank and published in conjunction with the LPI report.

121. The measurement of passenger travel presents challenges. It would be possible for relevant agencies (e.g. MDBs and Regional Economic Groupings) to prioritise the key regional passenger corridors in nations and regions. It is not known how many corridors would be classified as important but in the authors' judgement the number could lie in the range 100-500 . The steps necessary to determine the feasibility of data collection rely on: (i) making an inventory of what survey data exists; (ii) what information is regularly collected; and (iii) then identifying the scope and cost of new surveys.

122. For the Asia-Pacific, UN-ESCAP would seem suited for this role provided they are supported by sufficient resources. Other organisations would be needed for other regions. However, overall central coordination would be necessary.

123. While it may be found that it is very challenging to measure the national component of the two passenger related process indicators, a simpler proxy indicator could be initially adopted being "proportion of passenger flows by public transport of total person flows" as measured at national land borders and intermittently in important national corridors using classified vehicle and passenger occupancy counts that are cheap and simple. Customs/ immigration authorities in each nation could be enlisted to: (i) enhance and standardise their current definitions of vehicles and how they account for passengers; (ii) collect the data; and (iii) analyse the data: and (iv) report on an annual basis by border crossing.

IV. ROAD SAFETY

A. CURRENT DATA AVAILABILITY AND INSTITUTIONS

124. Despite the preventable nature of many road traffic injuries, road safety had been neglected by global health and development agendas[52]. Until 2007, road crash data was collected by agencies, typically the police within individual countries and in many cases collated at national level. Rarely was it matched to hospital admission records. With the support of 200 countries, the UN 'Decade of Action for Road Safety' was launched through a UN General Assembly resolution in 2010.

[52] WHO (2013,) "Global Status Report on Road Safety 2013 – Supporting a Decade of Action," page 2. It was developed with the involvement of all stakeholders in global road safety (governments, IFIs, NGOs, UN Regional Commissions).

125. In support of the Decade, **t**he UN Road Safety Collaboration[53] proposed five pillars of activity to address the road safety challenge: (i) road safety management; (ii) safer roads and mobility; (iii) safer vehicles; (iv) safer road users; and (v) improved post-crash response and hospital care. The WHO as a key member of the Collaboration, devised a methodology to improve crash and injury data and make it more comprehensive across some 200 countries.

126. The WHO report states that "non-fatal crash injuries are poorly recorded. For every road fatality at least 20 people sustain non-fatal injuries[54]." With limited use of injury information systems particularly in most-low and middle-income countries "the ability to accurately count the number of non-fatal injuries world-wide thus remains a challenge".

127. Due to the remoteness of many small, rural roads, many serious injuries and even deaths in many low income countries may not be reported at all. Police are main source of data in 71% of countries and tend to have a higher rate of underreporting than health sector data. Different definitions of deaths prevail – WHO recommends 30 days following the crash.[55]

B. IMPROVED DATA COLLECTION AND MEASUREMENT

128. In recognition of these constraints, WHO developed a standardised methodology for systematically collecting data in each country, coordinated by a National Data Coordinator. At the country level, knowledgeable experts were sourced each of whom completed a self-administered questionnaire with information on key variables, from which they were required to come to a consensus. Point estimates were made for total fatalities (and the 95% confidence interval estimated) and the distribution of fatalities enumerated for drivers/ passengers of 4-wheeled vehicles; drivers/ passengers of motorised 2 and 3-wheeled vehicles; motorcyclists, pedestrians, cyclists; and other or unspecified road users. This work is supported by a systematic profiling country of related statistics on relevant laws, regulations, vehicle fleets and other key variables[56]. To date, the survey has been undertaken in 2009 and 2011 (for 2010 estimation).

129. WHO's work on improving crash and injury data builds on their global system of reporting of disease in each nation through national Ministries of Health and hospitals. There is no new data generated just better and more comprehensive national collation and reconciliation of hospital and crash data.

130. WHO have prepared two status reports on implementation of the 'Decade of Action on Road Safety': 2010 (for 2007) and 2013 (for 2010). They are expected to be updated every two to three years. WHO's standardised methodology for systematically collecting data in each country

[53] Currently there are 70 members including United Nations and associated agencies, governments, MDBs. Foundations, academic institutes, nongovernmental organisations and private companies.

[54] World Health Organisation (2013), op.cit., page 7.

[55] Ibid., pages 7 and 8.

[56] The country profiles contained in the Global Status Report on Road Safety 2013.

overcomes many of the problems with underreporting of road crash data and comparability between countries.

C. FEASIBILITY OF MEASUREMENT AT NATIONAL, REGIONAL AND GLOBAL LEVELS

131. WHO's information is provided for all countries and summarised for the six regions (i) Africa; (ii) Eastern Mediterranean; (iii) Western Pacific; (iv) South East Asia; (v) Americas; and (vi) Europe. These regional definitions from definitions used for other UN purposes[57] and those used by World Bank for reporting of World Bank Development Indicators. However, classification of countries by income level used the World Bank method of using Gross National Income per capita in 2010: (i) Low-income USD1,005 or less; (ii) middle-income USD1,006 to USD12,275; and (iii) high-income USD 12,276.

132. Road traffic deaths expressed per 100,000 population are available as a single number for the period for almost all countries for the period 2007-2011 distributed amongst the same categories of road users used by WHO. Fatalities in this data set appear to be the same as reported in the country profiles provided by WHO using official data[58], but are in general significantly lower than the WHO's best estimate of total fatalities. These data are also summarised according to the regional classification system used by other UN agencies.

133. Crash, fatality and injury rates can be expressed at country, regional and global levels. Analysis of these data is the basis for the differentiated achievement levels by 2030 for each process indicator. With the aim of specifically supporting action planning for the 'Decade of Action on Road Safety' the WHO work provides comprehensive and fairly accurate baseline data and indicates regions where much more rapid progress is desirable.

134. WHO's method of data collection and enumeration provides a relevant model for what could be done for other targets. Further improvements in data quality are possible as is a broadening of the scope of data collection to include measurement of progress with implementation of the five pillars.

D. FUTURE DIRECTION

135. Funding to support the decade of action including enhanced data collection has depended on variety of individual sources including: the road safety fund established by the FIA Foundation, the Global Road Safety Facility established by the World Bank, programs of the MDB's, and Bloomberg Philanthropies which at USD125million overshadows the other sources. More secure funding is needed to implement road safety actions at the needed level, and monitoring, on a sustained basis to 2030. In recognition of the need for major funding, the eight major leading

[57] For example, UN-Habitat 2013, Planning and Design for Sustainable Urban Mobility. Global Report on Human Settlements 2013. Statistical Annex.

[58] Official data may sometimes provide information on fatalities by gender.

Multi-lateral Development Banks (MDBs) are investigating the feasibility of a creation of a road safety incentive fund that could support road safety programs through MDB lending programs.

IV. AIR POLLUTION AND HUMAN HEALTH

136. The target metric is a halving of premature deaths from road related air pollution proposed in the standalone Results Framework prepared by SLoCaT. This formulation would be very useful in focusing attention on the health burden road related air pollution imposes.

137. As transport-related emissions are not the sole source of air pollution, and as the target is proposed to sit within the proposed 'health' SDG it is not necessary to separately distinguish air pollution from transport or from other sectors within the SDG framework. The lower level indicators for the air pollution target within the health SDG need to show how each sector will contribute to achievement of the target. The standalone Results Framework does this for transport.

138. Because the extent and severity of health damage caused by air pollution depends on the extent of human exposure, air pollution is primarily an urban issue. Airborne fine particulate matter (PM) is a principal cause of respiratory illness and premature death especially on sensitive persons with existing respiratory disease and is relevant to be chosen as they key indicator of urban pollution.

139. Very fine particulate matter (under 10 microns in diameter PM_{10}, with a smaller fraction known as 2.5 microns in diameter, $PM_{2.5}$) mainly originates from diesel fuels and may penetrate deep into the lungs of the exposed population. They can cause cancer, respiratory disease and premature death.

A. CURRENT DATA AVAILABILITY AND INSTITUTIONS

140. The target metric of reduction in premature deaths from road related air pollution can be measured using Burden of Disease methods. The latest Global Burden of Disease Study commissioned by the World Bank's Global Road Safety facility[59] quantifies both the burden of disease attributable to road injury and the burden linked to air pollution from vehicles for the first time. The study found that deaths from road transport exceed those from HIV, tuberculosis, or malaria. Injuries and pollution from vehicles contribute to six of the top 10 causes of death globally[60.] In regards to disease from air pollution, the study "developed a database of geo-referenced, annual average $PM_{2.5}$ measurements from surface monitors in 2005, combined with estimates of $PM_{2.5}$ derived from satellite-based observations and estimates of $PM_{2.5}$ from a global

[59] 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 [http://documents.worldbank.org/curated/en/2014/01/19308007/transport-health-global-burden-disease-motorized-road-transport] accessed April 1, 2014.

[60] Ibid., page 15.

atmospheric chemical transport model … $PM_{2.5}$ levels …were estimated… at a grid resolution of 10 x 10 square kilometres across the globe for the year 2005 and extrapolated it to 1990 and 2010 based on observed trends[61]". The contribution of road transport to overall $PM_{2.5}$ for 2010 in all countries using a global air quality source-receptor model was estimated as well as human exposure and the resultant burden of disease. Estimates of deaths due to air pollution and road crashes are presented for 180 countries as well as the burden of disease estimates using the following standard health metrics: Years of life lost (YLLs); Years lived with disability (YLDs), years of life lived with any short-term or long-term health loss, adjusted for severity; and Disability-adjusted life years (DALYs). This study compared its results of the burden of disease attributed to air pollution to the recent estimates made by the ICCT and found they were similar.

141. Appropriate funding support would be needed for regular updating and improvement of estimates.

142. Air Pollution Data for Supporting Measurement of the Target. WHO's 2005 air quality guidelines[62] presents guideline values for the four most common air pollutants, particulate matter, ozone, nitrogen dioxide and sulphur dioxide, based on a review of the accumulated scientific evidence. In addition to guideline values, interim targets are given for levels of particulate matter, ozone and sulphur dioxide. These are proposed as incremental steps in a progressive reduction of air pollution, and are intended for use in areas where pollution is high. The guidelines and interim targets are set out in Table 6 of the WHO report.

143. WHO (2005)[63] recommend guidelines and interim targets for both PM_{10} and $PM_{2.5}$. The document states "…this is because coarse PM (the fraction between 10 and 2.5 microns) cannot be considered harmless, and having a $PM_{2.5}$ guideline alone would provide no protection against harmful effects of coarse particulate matter. At the same time, the quantitative evidence on coarse PM is considered insufficient to provide separate guidelines. In contrast, there is a large literature on short-term effects of PM_{10}, which has been used as a basis for the development of the WHO air quality guidelines and interim targets."

144. WHO's data base on air pollution contains data on outdoor air pollution monitoring from almost 1,100 cities in 91 countries. Compiled from publicly available sources, air quality is represented by the annual mean concentration of PM_{10} and $PM_{2.5}$. "The database aims to be representative for human exposure, and therefore primarily captures measurements from monitoring stations located in urban background, urban traffic, residential, commercial and mixed areas." Compared with WHO's guideline annual average standard of 20μg/m3 for PM_{10} measured values ranged from 21 to 142 μg/m3, with the world's average being 71 μg/m3 indicating that the

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[61] Ibid., pages 20 and 21.

[62] World Health Organisation 2005, "WHO Air Quality Guidelines for Particulate Matter, Ozone, Nitrogen Dioxide and Sulfur Dioxide." Global update 2005.

[63] Ibid., page 278.

standard was universally exceeded. Despite the setting of standards, there is little evidence to indicate there is a safe threshold below which no adverse health effects would be anticipated[64].

145. WHO (2005), referring to an earlier version of their data base, described in considerable detail the potential reasons to be cautious of attributing great accuracy to the measurements given their collection by different agencies, using different methods, at sites representative of different environments, particular localities (urban / rural), proximity to major roads or industry, and variable proximity of exposed populations. WHO (2005) described the information as "indicative" of the air quality to be expected in different urban areas, in different regions and on different continents.

146. Despite covering 1,100 small and large cities, WHO's data on urban air pollution only represents approximately 25% of the estimated 4,000 cities with more than 150,000 people world-wide. In India there were 388 cities with less than 1 million people in 2000 that represented 69% of the total urban population. There were a further 4,738 towns with a population of less than 100,000 people.[65] In Asia, it has been found likely that there is limited air quality measurement in these below-metro sized cities and the few monitoring sites may not be located to accurately reflect the air quality to which the population is exposed. In regional cities, where automatic measurements of air quality are undertaken, the monitoring stations may be located in areas primarily chosen because of the availability of a secure power supply and the security of the location to avoid theft or vandalism[66.] World Bank's study of 100 cities in South America and the Caribbean found that in half of the cities no air quality monitoring was carried out at all and in the other half monitoring was generally poor.

147. Measuring air pollution from passenger and freight vehicles. The first process indicator calls for a "70% reduction in PM_{10} and/or $PM_{2.5}$[67] air pollution from passenger and freight vehicles by 2030 (compared to 2010)". Motor vehicles are a growing contributor to emissions that cause air pollution. They account for most direct emissions of CO, NOx, and hydrocarbons, while sulphur oxides tend to be emitted directly by fixed sources. Diesel vehicles, mainly trucks and buses, accounted for more than 80% of the fine particulate matter emitted from mobile sources in 2010.

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[64] World Health Organisation 2005, op. cit., page 9.

[65] InfoChange, Urban India, (2013), information from 2000 Census. Refer web site: [http://infochangeindia.org/urban-india/cityscapes/indias-small-towns-symbols-of-urban-blight.html] accessed 15 November 2013.

[66] Information provided by GIZ's Clean Air for Small and Medium Sized Cities Project 2012 undertaken in eleven cities in ASEAN for the ASEAN Land Transport Working Group.

[67] PM_{10} is routinely measured today and $PM_{2.5}$ that is regarded as a more relevant measure of particulate matter is increasingly being measured. By 2020, it is expected that $PM_{2.5}$ would be universally measured.

148. Vehicles have been found in South America and the Caribbean to contribute from 30% to 50% of fine particulate matter that has a critical impact on health outcomes[68]. In 1998, in Bangkok Thailand up to 20% of particulate matter emissions were generated by vehicles, principally by trucks and buses[69].

149. In small cities, without major industry, transport would usually contribute the majority of all emissions. Exceptions are cities in close proximity to rural areas where burning of crop waste and forest fires may cause periodic but substantial pollution. Mobile sources play a significant role in the formation of secondary particulates and ozone because they account for an important share of emissions of NOx and VOCs.

150. Reliable attribution of pollutants to vehicles, depends on the presence of comprehensive emission inventories that do not exist in most cities.

151. An alternative approach is to use simulate vehicle fleet, their emission characteristics combined with estimates of human exposure. A recent report released by the International Council for Clean Transportation (ICCT) demonstrates the value of rapid policy analysis through using integrated simulation modelling[70]. ICCT's simulation calculated road vehicle emissions under a baseline scenario that assumes prevailing emission and fuel quality standards. The alternative policy scenario assumed increasingly stringent emission control policies are implemented worldwide.[71] The health effects of each scenario were quantified and contrasted. Urban vehicle emissions for each region were estimated using ICCT's Global Transportation Roadmap model through which: (i) vehicle activity was simulated by quantifying and characterising regional vehicle fleets[72] in terms of their level of emissions technology and fuel efficiency and their travel activity apportioned between urban and other areas; (ii) emissions of key pollutants that impact on human health were quantified using emission factors and assumptions on driving conditions as well as short lived short-lived climate pollutants that cause near-term warming effects; (iii) approximate concentrations of urban air quality were estimated by region; and (iv) health impacts. The 16 regions included the EU-28, the United States, Canada, Japan, Australia, South Korea, China, India, Brazil, Mexico, the Latin America–31 (excluding Brazil and Mexico), Russia, non-EU Europe, the Asia-Pacific-40 (excluding China, India, Japan, Australia, and South Korea),

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[68] World Bank (2006), "Vulnerability to Air Pollution in Latin America and the Caribbean Region," Sustainable Development Working Paper No. 28, the World Bank Latin America and the Caribbean Region Environmentally and Socially Sustainable Development Department, Regional Table 3, page 6.

[69] World Bank (2002), "Thailand Air Quality Monitor".

[70] 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.

[71] In the Accelerated Policy scenario, all regions are assumed to progress toward Euro 6/VI–equivalent new vehicle emission limits and fuel quality by 2030.

[72] Seven on-road modes were simulated encompassing light-duty vehicles, two-wheeled vehicles, three-wheeled vehicles, light, medium, and heavy heavy-duty trucks, and buses.

Africa, and the Middle East. The Roadmap model is similar to IEA's MoMo model described below in connection to greenhouse gas emissions that also simulates key air pollutant emissions from vehicles and will do so for an increasing number of individual countries and regions. Irrespective of the utility provided by the models described, it is essential that individual countries should also seek to improve their own data bases on vehicles and their emissions, improve their policy making and ability to reduce vehicle emissions from their in-use vehicle fleets and in turn provide this information to IEA and ICCT and similar bodies.

152. The process indicator on share of urban daily travel by public transport, walking, cycling and other sustainable transport modes, differs from other indicators in that it tends to measure the outcome of a variety of measures on travel behaviour. It would be best addressed as part of the work on improving measurement of urban access. Other process indicators tend to measure the direct outcome of a particular initiative or implementation measure. Hitherto, this indicator would be measured using the results of periodic travel surveys carried out in urban areas which measure travel on a 'linked trip' basis from origin to destination. For example, a journey from O to D whose main mode of use is public transport would be counted as one linked public transport linked trip even though access may have been made by walking or another mode. A journey from O to D involving use of two bus trips would be counted as one linked public transport trip. On the other hand, a journey by private vehicle would tend to involve a single linked trip from O to D that would be equivalent to an unlinked trip since walking at origin or destination is normally quite short. Accordingly, estimates of travel on public transport made, for example, using ticket sales where non-integrated ticket systems are present tend to represent unlinked trips. Integrated ticket systems may permit unlimited travel in particular time periods making the identification of specific trips and their length complicated or impossible. An even more precise and useful formulation would be obtained by measuring the passenger-km travelled by each mode in a jurisdiction over a day and within specific shorter time periods. Such data are hard to come by although they are simulated by comprehensive, computer-based, urban transport models for their base year (usually the year/ period of the survey collection). Where smart card, integrated, ticket systems record passenger travel based on entry and exit points to the public transport system, then passenger-km may be derivable for each public transport mode, but not of course for other feeder modes. It would be possible by using a variety of methods according to data availability to measure shares of urban daily travel by sustainable transport modes.

153. The process indicator for targets for zero emission vehicles would be monitorable using existing industry reporting mechanisms.

154. The third and final process indicators seeks an increase in the "proportion of urban dwellers engaging in adequate outdoor physical exercise according to WHO." No 2030 achievement level has been set to date and will depend on baseline assessments. Current WHO guidelines on physical activity[73] cover: (i) children 5-17 years old; (ii) adults 18-64 years old; and (iii) those aged 65 or older. For 18-64 year old adults the principal guidelines calls for at least 150 minutes of moderate-intensity aerobic physical activity throughout the week." Periodic sample surveys

[73] WHO (2010), "Global Recommendations on Physical Activity for Health."

undertaken by national Ministries of Health within the WHO network would be the appropriate source of this information to both set the baseline by nation, region and for the world and the to measure progressive improvement in response to programs promoting the benefits of physical activity.

B. FEASIBILITY OF MEASUREMENT AT NATIONAL, REGIONAL AND GLOBAL LEVELS

155. Improved and consistent estimates of premature death and illness from air pollution can be made by Burden of Disease Studies. Such studies would be supported by improved air quality data, source apportionment and estimates of human exposure. Despite limitations of current data the air quality data on large cities (say above 5 million) in most countries of the world would be available and expected to be able to be measured on a consistent basis using current information by WHO.

156. The process indicator on particulate matter air pollution from passenger and freight vehicles by major country and region can be reliably simulated today by IEA and ICCT using their models.

157. The process indicator on share of travel by public transport, walking, cycling and other sustainable transport modes, can only be addressed on a partial basis at present but would be addressed as part of the work on improving measurement of urban access. The process indicator for targets for zero emission vehicles would be monitorable using existing industry reporting mechanisms.

158. A physical fitness baseline and regular survey may need to be initiated by WHO via national Ministries of Health to measure the third process indicator.

C. FUTURE DIRECTION

159. Using on ground measurements coupled with satellite imagery and standardised source apportionment methods, the WHO is expected to be soon be in a position to provide baseline measurements, and monitor achievement of, outdoor air pollution and exposed populations[74]. Appropriate funding support would be needed. WHO are using a similar approach to track the water and sanitation indicators measuring progress towards Millennium Development Goal 7 "Ensure Environmental Sustainability." Such information would underpin and strengthen the estimation of Burden of Disease Studies.

160. Baseline measurements and differentiation by countries and regions cannot be established immediately but will need progressive refinement to ensure coverage of the air pollution information covers all cities to a consistent level of detail. Process indicators can be measured as described above.

[74] Advice of WHO's Carlos Dora indicates that the air pollution target is measurable in the very short term with adequate funding support.

161. Other process indicators would be measurable on a partial basis in the very near future.

VI. GREENHOUSE GAS EMISSIONS

A. CURRENT DATA AVAILABILITY AND INSTITUTIONS

162. The most reliable data on transport related energy use and GHG emissions on a geographic basis is that developed by IEA's Statistics Department. As part of its Annual World Energy Outlook report IEA reports current energy consumption by sector, including transport, and GHG emissions for the world and 18 countries and regions with projections to 2050[75]. This information is based on reported consumption of liquid and other energy sources. It is understood that similar data are available for many more individual countries than reported.

163. The contribution of land transport to GHG emissions is separately identified in the text of the report. IEA have developed a Mobility Model (MoMo)[76] that simulates global transport, energy use, emissions, safety and materials use. It analyses and provides projections for alternative scenarios to 2050 based on hypotheses on GDP and population growth, vehicle fuel economy, fuel costs, travel demand, and vehicle and fuel market shares by applying the ASIF framework[77]: Activity (travel demand) x Structure (travel by mode, load factors) x energy Intensity = Fuel use. It provides projections for 29 regions including the following specific countries USA, Canada, Mexico, Brazil, France, Germany, Italy, United Kingdom, Japan, Korea, China, and India. It includes historical data on land transport vehicle fleets, and their fuel, technology and emission characteristics, plus rail, aviation and shipping. The same model is used by IEA for other policy analysis. The International Council on Clean Transportation (ICCT) also recently used their similar Roadmap model[78] for their analysis of the effect on air pollution and human health (as described in the section on air pollution and health).

164. MoMo currently includes, or will soon include, the following modes and vehicle types: (i) 2-3 wheelers; (ii) light duty vehicles; (a) spark ignition (SI) Internal Combustion Engines (ICEs), (b) compression ignition (CI) ICEs, (c) SI hybrid ICEs (including plug-ins), (d) CI hybrid ICEs (including

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[75] Divided by OECD and non OECD members and groups: (i) OECD members: Americas with United States also separately reported; Europe; Asia Oceania, Japan; and (ii) Non-OECD: Eastern Europe/ Eurasia; with Russia also separately reported; Asia with China and India separately reported; Middle East; Africa, Latin America with Brazil which is also separately reported.

[76] 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] accessed March 17, 2014.

[77] Schipper L and Marie-Lilliu C (1999), "Transportation and CO2 Emissions: Flexing the Link – A Path for the World Bank"- "Activity, Share, Intensity, Fuel Mix."

[78] ICCT (2013), Op. cit., page 62.

plug-ins), (e) hydrogen ICE hybrids (including plug-ins), (f) fuel cell vehicles, and (g) electric vehicles; (iii) heavy duty vehicles; (a) minibuses, (b) buses and BRT systems, (c) medium freight trucks, and heavy freight trucks; (iii) rail (intercity, high-Speed and freight); (iv) air (passenger, new module under development); and water transport (freight, new module under development). Further, it permits the following fuel types: (i) liquid petroleum fuels; (a) gasoline, and (b) diesel (high- and low-sulphur); (ii) biofuels; (a) ethanol (grain, sugar cane, and advanced technologies [lignocellulose]); and (b) biodiesel (conventional [fatty acid methyl esters, FAME or biodiesel obtained from hydrogenation of vegetable oil in refineries] and advanced processes [BTL, fast pyrolysis, hydrothermal upgrade]); (iii) synthetic fuels: gas-to-liquids (GTL) and coal-to-liquids (CTL); (iv) gas: compressed natural gas (CNG), liquefied petroleum gas (LPG) and biogas; (v) electricity: treated separately for electric vehicles (EVs) and plug-in hybrid electric vehicles (PHEVs) and other modes, by generation mix and region; and (vi) hydrogen.

165. Following the ASIF structure, the following outputs are simulated and projected to 2050 for all modes: (i) LDVs and freight trucks; (a) stock and sales; (b) activity, intensity and energy use; (c) CO2 emissions are calculated (well-to-wheel and tank-to-wheel); (d) pollutant emissions (CO, VOCs, PM, lead and NOx) estimated; and (e) vehicle and fuel costs; (ii) buses and 2/3 wheelers: MoMo tracks stock, stock efficiency, travel, energy use and emissions; (iii) rail and air: total travel activity, energy intensities, energy use and emissions; and (iv) shipping: sectorial energy use and emissions.

166. To date, 33 countries have been extracted as individual historic data files with 68 individual countries planned to be pulled out. MoMo fuel use, applying the ASIF structure, is compared to official IEA energy balance statistics to ensure data quality. This is applied to all country and regional assessments in the MoMo historic database.

B. THE CHALLENGE OF MEASURING A TARGET FOR GHG

167. GHG emissions are highly correlated with liquid fuel use which is the main motive source for land transport today. Conceptually, a target could be expressed in several ways including: (i) normalised energy use/GHG emissions (e.g. per 100,000 population); (ii) energy/ GHG intensity per unit of GDP (or other output); (iii) cumulative reduction by 2030; (iv) absolute energy/GHG emissions; (v) shape of emissions trajectory; (vi) improvement in efficiency; and (vii) rate of improvement in efficiency. The target would be set to be achieved by 2030 but in view of analysis of the Intergovernmental Panel on Climate Change on limiting global temperature rises, 2050 would make a suitable year for an ambition level.

168. Developed countries consume most of the global land transport-related energy. Low and middle income countries have many impediments to improving their vehicles and transport systems. But they can with time be overcome. The rate and level of achievement of a targeted improvement in energy and fuel efficiency by 2030 should vary by regional and country circumstance and associated differentiated responsibilities. But it is premature to attempt to specify what differentiation is required as it would tend to pre-judge the outcomes of future climate talks.

169. A previous draft of the results framework (December 23, 2013) opted for the following absolute target "Realise least-cost transportation GHG mitigation potential consistent with a 2-degree warming scenario, achieving at least 1.6 to 2.5 GtCO2e reduction by 2020[79]." The choice of this target was based on analysis undertaken by the ICCT and reported in UNEP's "Bridging the Emissions Gap,[80]" where the potential and need to reduce emissions from the transportation sector by about 1.6 GtCO2e[81] (excluding aviation and shipping) was shown by 2020. The composition of this total was distributed as follows: (i) on-road, 0.4 GtCO2e; (ii) biofuels, 0.15 GtCO2e; (iii) modal shift, 0.8 GtCO2e; and (iv) travel activity reduction, 0.25 GtCO2e.

170. In discussions, undertaken at the Ford Foundation on January 8, 2014, several drawbacks with the target as formulated were recognised: (i) it requires considerable immediate effective action to reduce GHG emissions by 2020 which is unlikely; (ii) there was no target set for 2030; and (iii) there is no guarantee that even if modelling by IEA shows that a particular target reduction due to specific measures has occurred relative to a dynamic baseline, there is no guarantee that the baseline would not be higher (or lower) than previously anticipated. This problem would be common to all sectors when undertaking incremental assessments of GHG emissions due to individual or a package of interventions.

171. Consequently, it was proposed that the target be re-formulated to: "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". This is the current target and measures the shape of the estimated emissions trajectory. It is able to be estimated and is therefore measurable using IEA's MoMo model. As for any absolute global formulation of the target, this formulation presses the case for action and permits different countries and regions, and technologies and solutions, to contribute as needed.

172. Additionally, a process indicator that is a widely accepted target for fuel economy improvement by members of the Partnership for Clean Fuels and Vehicles[82] was adopted, with the addition reference to Heavy Duty Vehicles also, as follows: "Double fuel economy in all new Light and Heavy Duty Vehicles by 2030, and in all Light and Heavy Duty Vehicles by 2050 from a base year of 2005". This indicator is a type of efficiency indicator on an individual vehicle basis.

173. The Black Carbon process indicator can also be simulated using IEA's model or ICCT's Roadmap model. The UNEP Transport Unit and the ICCT work together this topic.

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[79] Compared to 2010.

[80] UNEP (2013). "The Emissions Gap Report 2013: A UNEP Synthesis Report": November. It explains to decision-makers and stakeholders the range of potential options available to close the emissions gap in 2020. Chapter 3.

[81] Reported as 1.7 GtCO2e in The Emissions Gap Report but in some tables due to rounding the total added to 1.6 GtCO2e.

[82] Including UNEP, ICCT and FIA Foundation.

C. FUTURE DIRECTION

174. Although there is a high degree of collaboration between IEA and ICCT to facilitate timely and consistent measurement it would be desirable to nominate a single agency for reporting of all indicators. It is envisaged that IEA would continue to model GHG emissions and other parameters and ICCT would continue to model black carbon and their other parameters. Strengthened harmonisation on regional definitions and of particular countries that are modelled, current vehicle fleet characterisation, fleet growth and vintaging would appear to be beneficial. The MoMo and Roadmap models would be assumed to be progressively developed and improved. Hence, data on vehicle sales including number of ZEVs and changes in fleet fuel economy by particular types of vehicle and region would be automatically collected.

VII. CONCLUSION

175. Based on the above discussion by target the following general steps are required to measure and verify the baseline values for targets and process indicators and to monitor their achievement:

- a single body be charged with the responsibility for measurement and verification of each target and preferably all relevant process indicators;
- Where data are incomplete and not regularly reported the following basic steps need to be performed by the responsible agency:
    - Collation of available data from responsible agencies based on what is regularly or in an ad-hoc manner collected;
    - Identify data gaps;
    - Prioritise gaps by content, country and region;
    - Identify where proxy indicators can be developed in the absence of desirable data (e.g. shares of passenger flows by mode based on counts instead of more complicated formulation of modal demand shares);
    - Identify mechanisms to ensure the data pool is regularly refreshed through establishing information arrangements;
    - Identify new data collection methods to improve measurement; and
    - Identify how inputs and advice from experts in each country can be facilitated using national panels to advise on data quality and coverage and provide interim estimates based on partial evidence where comprehensive data does not yet exist.

176. Table 5.1 summarises the current and near term of measurability of the targets and process indicators by nation, region and therefore the globe.

Table 5.1: Summary Assessment of Measurability of Targets and Process Indicators

Target/ Process Indicator	Is baseline measurable now or in immediate future?	Current Data Source	Data gap	What needs to be done
Rural access				
Target: ***Secure universal access by sustainable transport for rural populations by 2030***.	Partially via processes indicators	See below under process indicators	See below under process indicators	See below under process indicators
Process indicators: ***Proportion of the rural population living within two km of a road, motorable trail or other appropriate infrastructure providing all-year access for sustainable transport (desired achievement*** *by 2030****:100% achievement of local access targets, monitoring the poorest and remotest quintiles).***	Yes. This indicator is a required IDA indicator and many countries have baseline estimates. The measurement methodology can be improved and simplified using GIS	In IDA countries, national ministries (transport or planning) have existing estimates. Most other countries would have the necessary GIS road and population data layers to allow rapid measurement of the indictors	Most countries will have the required data, but some may need to convert existing datasets into high resolution GIS 'layers'. Some LIC countries lack up-to-data assessments of prevailing condition of rural roads. This can be obtained rapidly by the local authorities when required	Designate international coordination body and national coordination bodies (e.g. transport or planning authorities). Agree and test simplified methodology based on GIS technologies for more rapid measurements/estimations. The DFID AFCAP2/ASCAP programme has indicated interest in facilitating the rapid development and testing of the required data collection/measuring systems
Proportion of rural population living within 30 minutes' walk of appropriate formal or informal transport services (desired achievement *by 2030****: 100% achievement of local access targets, monitoring remotest quintile).***	Yes. Measurable through HH survey or rapid stratified transport survey	National planning ministries and transport authorities.	Not all HH surveys include relevant questions and so rapid stratified transport surveys are suggested to obtain required data	As above. Agree and test the required stratified transport survey methodology to allow timely data collection
Travel time, including walking, from villages to local towns with markets and medical facilities for the poorest rural income quintile (desired achievement *by 2030****:100% achievement of local travel-time targets)***.	Yes. Measurable through HH survey or rapid stratified transport survey	National planning ministries and transport authorities	Not all HH surveys include relevant questions and so rapid stratified transport surveys are proposed to obtain required data	As above. Agree and test the required stratified transport survey methodology to allow timely data collection.
Urban access				
Target: ***Secure universal access by sustainable transport for urban***	Partially via processes indicators	See below under process indicators	See below under process indicators	See below under process indicators

Target/ Process Indicator	Is baseline measurable now or in immediate future?	Current Data Source	Data gap	What needs to be done
populations by 2030.				
Process Indicators: ***Mean daily travel time budget for women, men and children using sustainable transport (desired achievement*** *by 2030****: 90 minutes or less travel time per individual per day, including return or multipurpose trips for employment, education, health and community services)***.	Yes. Measurable through HH survey and/or transport survey. Partial data exists already in many major cities of HICs, MICs and LICs.	City authorities and their household and/or transport surveys.	Not all cities have systematically collected relevant data (particularly smaller cities/towns in LICs).	Designate international coordination body and national coordination bodies (e.g. city authorities and national transport authorities). Agreement on basic datasets and methodologies for determining and using process indicators.
Proportion of income spent by urban families on transport to reach employment, education, health and community services (desired achievement *by 2030****: less than 20% of household income for poorest quintile).***	Yes. Measurable through HH survey.	City authorities and their household and/or transport surveys.	Not all cities have systematically collected relevant data (particularly smaller cities/towns in LICs).	As above
Proportion of households within 500 metres of good quality affordable public transport accessible by dedicated walking and/or cycling facilities (desired achievement *by 2030****: 100%).***	Yes. Measurable through GIS with data from HH surveys, transport surveys and family income and expenditure surveys	City authorities and their GIS maps and their household and/or transport surveys.	Not all cities (particularly smaller cities/towns in LICs) have the GIS planning tools with data layers with systematically collected relevant data	As above
National access & regional connectivity				
Target: ***Facilitate national inclusion and regional connectivity by sustainable multi-modal freight and passenger services by 2030.***	Partially via processes indicators	See below	See below	See below
Process Indicators: ***Logistics Performance Index for all countries*** *(desired achievement by 2030:* ***80% of countries***	Yes: in 2012, only 17% of countries had an LPI of 3.5. Available by	World Bank's Logistics Performance Index	Nil	Nil

Target/ Process Indicator	Is baseline measurable now or in immediate future?	Current Data Source	Data gap	What needs to be done
***to** achieve **rating of 3.5**).*	country			
Passenger-kilometre shares by public transport in major national and regional corridors (desired achievement by 2030: an increase, based on baseline forecasts to be developed, in specific corridors by nation and region).	Partially today by nation and region via classified traffic counts collected at national borders and in national corridors	Customs and Immigration authorities; highway departments	Comprehensiveness and consistency by nation. Stratification of demand by trip length and mode to measure indicator not widely available. Proxy classified traffic data may be all that is feasible.	Single agency (as for World Bank for LPI) needs to be designated. Existing data needs to be collated first, and then supplemented, via effective ongoing mechanism by nation and then centrally analysed and reported; priorities for national and regional corridors need to be established and surveys organised to fill gaps. Provide funding.
Cost of national and regional bulk freight per tonne-km (desired achievement** by 2030: **80% of best international practice for relevant commodities, in specific corridors by nation and region).	Yes	Logistics industry data	Data needs to be collated for major bulk commodities by nation on regular basis	Single agency (as for World Bank for LPI) arranges for logistics industry to report in agreed format
Empty freight land transport distance travelled (desired achievement by 2030: 50% reduction by 2030).	Yes	As above	Data needs to be collated for major commodities by nation on regular basis	As above
Road safety				
Target: ***Halve road traffic** deaths by **2030 compared to 2010.***	Yes, by country, region & globe	WHO and UN Road Safety Collaboration data collation for "Decade of Road Safety"	Nil	Maintain and increase funding & extend UN road safety focus to 2030.
Process Indicators: ***Fatalities due to road crashes (desired achievement: by 2030, reduce by half the number of fatalities due to road crashes compared with 2010 baseline of 1.24 million per year).***	As above	As above	Nil	As above
Serious injuries due to road crashes (desired achievement: by 2030, reduce by half	As above	As above	Nil	As above

Target/ Process Indicator	Is baseline measurable now or in immediate future?	Current Data Source	Data gap	What needs to be done
the number of serious injuries due to road crashes compared with 2010 baseline of 12.4 million per year).				
Economic impact due to road crashes (desired achievement: by 2030, reduce by half the economic impact of road crashes compared with 2010 baseline of 3% of GDP per year).	As above	As above	Nil	As above
Air pollution & health				
Target: ***Halve premature deaths from road related air pollution by 2030 compared to 2010.***	Yes, using Global Burden of Disease Study Methods	Supported by WHO's other data based	Data on small and medium cities and data consistency.	Continual improvement and use of new estimation technologies being developed by WHO and others
Process Indicators: ***Premature deaths from air pollution*** *by 2030* ***(desired achievement: 50% reduction compared to 2010 baseline of 184,000 as estimated by Global Burden of Disease Studies).***	As above	As above	As above	As above
PM_{10} and/or $PM_{2.5}$ air pollution from passenger and freight vehicles (desired achievement *by 2030****: 70% reduction compared to 2010).***	Yes for major countries, regions for the globe	Able to be estimated by ICCT using their Roadmap model or IEA using their MoMo model	More refinement of inputs and numbers of countries separately identified, separately individual countries should improve their own data bases and policy making	Continuous improvement & collaboration between IEA and ICCT
Travel share of public transport, cycling, walking *& other sustainable modes (****desired achievement*** *by 2030****: double the global share by 2030).***	Yes, measurable at city level through conventional transport surveys	Data obtained from city-based transport surveys. Major cities worldwide have routine transport surveys.	Smaller towns may not carry out surveys, especially in LICs. Need to agree the specific data required to ensure compatible statistics.	Assign bodies to be responsible for national and international data coordination. Agree which city-level datasets on walking, cycling and public transport should be used. Agree methodology for relating city-level data to national achievements/compliance.

Target/ Process Indicator	Is baseline measurable now or in immediate future?	Current Data Source	Data gap	What needs to be done
Proportion of urban dwellers engaging in adequate outdoor physical exercise according to WHO *(desired achievement: to be developed).*	Not known	WHO global reporting mechanism and national Ministries of health	Not known. Standardised sample surveys may need to be developed	WHO to determine
Greenhouse gas emissions				
Target: ***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.***	Yes	WHO MoMo model and input data on fleets etc. for major countries, regions for the globe	More refinement of inputs and numbers of countries separately identified	Continuous improvement & collaboration with ICCT
Process Indicators: ***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).*	Yes for major countries, regions for the globe	As above	As above	As above
Motor vehicle fossil fuel subsidies by 2020 *(desired achievement: 100% phase-out)****.***	Yes for major countries, regions for the globe	GIZ Fuel Prices Survey estimates countries with high fuel price subsidies and tracks them over time	Nil	Continue the survey every two years as current
Black carbon emissions from transport (desired achievement *by 2030****: 60% reduction).***	Yes for major countries, regions for the globe	Estimated by ICCT using their Roadmap model for major countries, regions for the globe	More refinement of inputs and numbers of countries separately identified	Continuous improvement & collaboration between IEA and ICCT
Zero Emission Vehicle share of light-duty 4-wheel and motorised 2-wheel vehicle sales worldwide (desired achievement *by 2030****: 20%).***	Yes for major countries, regions for the globe	Industry vehicle sales data by nation and fleet class	Data needs to be collated and reported at a central level	Responsible agency required