The transport sector presently contributes 23 percent of global energy-related greenhouse gas (GHG) emissions and 18 percent of man-made global economy-wide emissions. In 2012, transport was the largest energy consuming sector in 40 percent of countries worldwide, and the second-largest energy consuming sector in most remaining countries. Transport sector emissions growth in developed (Annex I) countries averaged 0.5 percent from 1990 to 2012, while growth in developing (non-Annex I) countries averaged 4.8 percent. It is likely that transport emissions from non-Annex I countries will exceed those from Annex I countries at the end of 2017.

The Paris Agreement calls for global carbon dioxide reductions to hold warming to a ‘well-below-2-degrees’ Celsius target, which is typically taken as a 1.5-degree C target. For the transport sector, the goal is to largely decarbonize and move from 7.7-gigatonne (Gt) emissions/year down to 2-3 Gt by mid-century, instead of a business-as-usual (BAU) scenario, which would see emissions increase to 13–15 Gt by 2050. Transport will be part of a “net-zero emission” economy, in which remaining emissions from specific sectors will need to be sequestered or offset through other means. (Figure 1)

Transformative changes are needed in the transport sector, and though it is acknowledged that the bulk of reductions will come after 2030, it is essential to establish policies and take actions now to make the post-2030 impact possible.
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Figure 1: Projected and Targeted Transport Emissions Curves

Figure 2: Transport in NDCs

Nationally determined contributions (NDCs) and long-term emission reduction strategies have a key role to play in shaping the transformation of the transport sector, especially in developing countries, where emissions are projected to grow the most. Transformative change in the transport sector undertaken in support of climate objectives should at the same time also enable prosperity and economic growth in countries in support of the Sustainable Development Goals (SDGs).

WHAT ARE THE TRANSPORT-RELATED MITIGATION AND ADAPTATION ELEMENTS THAT HAVE BEEN INCLUDED IN NDCS?

As of August 1, 2016, 160 NDCs representing 187 countries were submitted to the United Nations Framework Convention on Climate Change, which represent about 96 percent of economy-wide GHG emissions (Note that ‘INDCs’ technically become ‘NDCs’ upon country ratification of the Paris Agreement, and that some NDCs span multiple countries).

Among the NDCs investigated, 75 percent explicitly identify the transport sector as a mitigation source, as shown in Figure 2. A further 18 percent include transport as a component of the energy sector. While about 63 percent of NDCs propose specific transport sector mitigation measures, a much smaller share (9 percent) have proposed a transport sector emission reduction target, representing countries with only about 3 percent of global transport emissions.
Transport modes covered by the NDCs are heavily skewed towards passenger transport, which is included in 91 percent of NDCs identifying specific transport modes. Urban transport is mentioned in 74 percent of passenger transport measures, followed by measures on heavy rail and inland waterways. In contrast, high-speed rail (2 percent), aviation (5 percent), and walking and cycling (14 percent) receive much less attention among passenger modes. Freight transport is relatively neglected across NDCs, and is included in just 29 percent of NDCs identifying specific transport modes, though current freight mode share is more than 40 percent in terms of energy consumption (with the balance from passenger transport), which would justify a much greater emphasis on freight-related measures in NDCs (Figure 3).

Countries at all levels of development have proposed a range of complementary transport measures in NDCs to increase their overall mitigation potential, as shown in the following illustrative examples:

- **Bangladesh** (lower middle-income) has proposed modal shift from road to rail (including metro and bus rapid transit systems in urban areas), and reduced congestion and improved running of traffic (through building expressways and increasing public transport measures).

- **Ivory Coast** (lower middle-income) has proposed to use territorial planning to promote smart development and reduce travel demand; advance urban transport plan development (e.g. Abidjan urban train); and facilitate purchase of low-emission vehicles/scraping of high-emission vehicles through standards, incentives, or obligations.

- **Japan** (high-income) has proposed transport measures which include promoting mode shift to public transport and railways, promoting next-generation automobiles, improving traffic flow, promoting eco-driving and car sharing, and introducing low-carbon aviation and maritime strategies.
Jordan (upper middle-income) has proposed transport measures which include increasing public transport mode share from 13 percent to 25 percent by 2025; reducing vehicle fuel consumption and emissions; and reducing motorized vehicle travel, particularly in densely populated areas, with distinct targets by type of vehicle (i.e. car, light goods vehicle, and heavy goods vehicle).

But in addition to mitigation, adaptation in the transport sector is necessary for both developed and developing countries, as transport systems worldwide are vulnerable to increasing weather impacts. Sustainable transport systems must also adapt to climate change to maintain reliability and increase ridership, thus achieving their full mitigation potential. However, adaptation has received substantially less attention than mitigation in NDCs.

Although adaptation is mentioned in an economy-wide scope in 86 percent of NDCs, the transport sector is mentioned in general terms among climate adaptation measures in only 16 percent of NDCs, and only 4 percent of countries identify specific transport adaptation strategies, which focus mainly on vulnerability assessments (e.g. Belize, Moldova) and infrastructure planning (e.g. Bangladesh, Gambia, and Maldives).

Raising the profile of transport adaptation measures in the detailed implementation plans of current NDCs (as well as in future iterations of NDCs) can help ensure the long-term success of mitigation investments (e.g. by making initial investments in public transport more resilient to increase service reliability and attractiveness, while decreasing operating costs). This can be achieved by incorporating in NDCs the growing number of transport adaptation and resilience efforts underway at national and regional levels (e.g. Maldives is implementing coastal protection measures for the shoreline of Hulhule, the island containing Ibrahim Nasir International Airport, as well as for other air and seaports), thus setting positive examples to be emulated in the NDCs of peer countries.

Transport sector climate adaptation tools and methodologies

A number of climate adaptation tools and methodologies have been proposed which include transport in their sectorial scope, which can help support the inclusion of adaptation in NDCs. These tools include the following:

- Climate Change Project Screening Criteria, Nordic Development Fund (NDF), 2011. NDF’s detailed climate change adaptation screening of projects has helped identify areas where weaknesses could cause cost overruns, delays, and costly conflicts between funders and clients (from the unpublished How Climate Change Adaptation Support Can Contribute In A SLoCaT Context: The NDF Approach and Experience. Hansen, Stein, 2015).

- Tracking Research on Adaptation to Climate Change Consortium, TRAC3, 2014. This tool aims to facilitate collaborations that address conceptual, methodological, and practical issues with tracking progress on climate adaptation as related to public health, urban development, and other areas.

- Urban Adaptation Support Tool, Covenant of Mayors, 2015. This tool consists of more than 40 questions for self-assessment, a database of 70 country case studies, and an adaptation measures database covering a wide number of climate impacts in various sectors.

WHAT ARE THE VARIOUS TYPES OF MITIGATION MEASURES NEEDED TO MAXIMIZE THE CONTRIBUTION OF THE TRANSPORT SECTOR TO ACHIEVING NDC TARGETS?

Low-carbon transport interventions can generally be categorized using the ‘Avoid-Shift-Improve’ (A-S-I) typology. ‘Avoid’ strategies describe measures to reduce motorized trips and trip length; ‘Shift’ strategies transfer travel activity to more energy-efficient modes; and ‘Improve’ strategies focus on increasing vehicle energy efficiency and decarbonizing energy sources.
The IPCC Fifth Assessment Report (AR5), suggests that an integrated and balanced set of ‘Avoid’ and ‘Shift’ strategies (e.g. urban development and investment, or more compact urban form to support cycling and walking), to complement ‘Improve’ measures could potentially reduce GHG intensity in the transport sector by 20–50 percent by 2050, below a 2010 baseline. Such balanced mitigation strategies are well reflected in a number of NDCs, including the submission from Jordan, which includes ‘Avoid’ strategies (e.g. vehicle restrictions), ‘Shift’ strategies (e.g. public transport improvements), and ‘Improve’ strategies (e.g. e-mobility).

A 2015–2016 comprehensive review of mitigation potential documented in peer reviewed studies by the SLoCaT Partnership indicates that the actual mitigation potential in the global transport sector is likely to be even higher. Rapid technological progress in e-mobility and the increasing willingness of national and local governments to reduce trips by individual motorized transport makes this more likely, especially considering that promoting only cleaner personal vehicles will ultimately lead to more induced traffic and potentially more emissions.

Yet, the majority of NDC transport mitigation measures (about 63 percent of more than 300 proposed measures) represent ‘Improve’ strategies (Figure 4). This disproportionate focus on technological measures helps to explain that current NDCs do not optimize the full mitigation potential of transport.

In high-income countries, nearly 50 percent of NDC mitigation strategies are directly related to fuel efficiency improvement or decarbonizing fuel (i.e. ‘Improve’ strategies), while middle and low-income countries tend to rely more heavily on public transport improvements (i.e. ‘Shift’ strategies), which account for about 25 percent of planned transport mitigation measures. Middle-income countries also prioritize NDC improvements in inspection and maintenance, fuel quality and vehicle emission standards, along with green freight measures to shift goods transport from roads to more efficient railways and waterways.

A direct link also exists between transport-related measures in the NDCs and the health sector. Several NDC transport measures can reduce GHGs and improve local air quality by reducing black carbon emissions, thus improving both climate and health outcomes. For example, some low- and middle-income countries prioritize import restrictions based on vehicle age (e.g. Gabon) along with instruments to improve fleet fuel
efficiency (e.g. eco-driving in Cambodia, or fuel efficient vehicle incentives in Cameroon and Grenada). Other countries prioritize improvements in inspection and maintenance, fuel quality, and vehicle emission standards (e.g. Rwanda). All of these serve a dual role of reducing climate impacts and improving public health, which is a key development co-benefit in many developing countries.

Other sectors, such as urban development, show room for improvement in establishing a transport nexus. As noted in Figure 4 above, ‘Avoid’ measures account for less than 10 percent of transport mitigation measures in NDCs. This reflects the fact that measures related to transport demand management (e.g. compact urban form, or parking reform strategies) account for a very modest share of proposed transport measures (e.g. Macedonia), and that mobility plans (which often include key ‘Avoid’ strategies) account for only a slightly higher share (e.g. Cameroon). This underscores the need to increase the prevalence of NDC measures over time in order to manage transport demand through compact urban development, and thus to optimize transport’s mitigation potential while saving lives through improved road safety.

HOW TO BEST RAISE THE PROFILE OF TRANSPORT IN NDCS?

In addition to broad co-ordination between relevant national government departments (energy, transport, planning, environment, industry, emergency response, etc.) it is essential that cities and other local governments are engaged in developing the transport section of NDCs, as they both have the needed expertise and bear the direct impacts of on-the-ground implementation to realize these plans.

An expansion of public transport, walking and cycling in cities could yield a 40 percent reduction of urban passenger transport emissions by 2050. This also requires a solid understanding of the drivers of transport demand for public and private freight and passengers; as well as societal, commercial, and technology trends. Collecting and analyzing more comprehensive, high-quality transport data at the national level will also help to further increase the scope of transport sector measures in NDCs.

Mitigation measures also need to account for other key national development priorities such as road safety, air quality, and tackling congestion. These other objectives may have a determining impact on the types of mitigation measures selected (e.g. mode shift from cars to public transport, or technology improvements from petrol/diesel cars to electric cars). Finally, the key role of the private sector as a provider of transport services (e.g. road freight transport, or bus services and as cargo owner/controllers) needs to be fully recognized.

WHAT ROLE CAN THE NDC PARTNERSHIP PLAY IN HELPING COUNTRIES INCREASE TRANSPORT MITIGATION AND ADAPTATION AMBITION IN NDCS GOING FORWARD?

The NDC Partnership (NDCP) can optimize the role of sustainable low carbon transport in NDCs and national climate action strategies in a number of ways.

- First, the NDCP can provide leadership and help raise awareness on both the mitigation potential and adaptation needs of the transport sector by making the transport sector a key part of its activities and by disseminating key messages through communities of practice. To do so, the NDCP can link with the rapidly growing international effort to promote scaling up sustainable, low carbon transport as embodied for example in the Paris Process on Mobility and Climate (PPMC).

- Second, the NDCP can support country strategies to build local capacity and provide technical assistance to quickly scale up short-term mitigation measures, and develop long-term regional and national decarbonization roadmaps. This can be achieved by partnering with initiatives promoting low-carbon transport (e.g. the Advancing Transport Climate Strategies project, funded by the German Ministry of Environment and implemented by the Germany Federal Enterprise for International Cooperation, which helps countries develop climate related institutions in Ministries of
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Transport and supports transport data collection and scenario development to raise NDC ambition. The NDCP could specifically focus on countries where these efforts are not yet being supported by other development partners and could closely coordinate with ongoing efforts in those countries.

- Third, the NDCP can make use of the vision put forward in a Global Macro-Roadmap for the Decarbonization of Transport and the growing knowledge base on transport and climate change. This includes contributions from development cooperation agencies, MDBs, think tanks, and others; and draws upon the experiences from NAMA development, in which transport sector projects have played a prominent role. These efforts have led to the development of 20 quick win actions to accelerate momentum on transport, climate change, and sustainable development; and are complemented by linking to other existing initiatives for directly decarbonizing the transport sector at a country level (e.g. Decarbonization of Transport project by ITF).

- Fourth, the NDCP can provide support for the development, testing, revision and dissemination of tested methodologies for preparing NDCs. The NDCP can also help prepare model transport sector NDCs (i.e. those with balanced A-S-I, passenger-freight and mitigation-adaptation strategies) and decision support tools, and can facilitate peer-to-peer learning (especially through South-South collaboration with incentives from developed countries and multilateral development banks) to strengthen the quality and raise the ambition of transport measures in NDCs.

- Finally, the NDCP can facilitate greater financial support for the implementation of transport components of NDCs, and to strengthen institutional integration to delivering on both NDCs and Sustainable Development Goals. The NDCP can also use its convening power to help ensure more equitable access for transport to climate finance facilities. For instance, the NDCP could promote a “transport window” in the Green Climate Fund, to ensure that the facility emulates NAMAs (in which transport has been relatively successful) rather than the Clean Development Mechanism (in which transport has been vastly underrepresented). Such measures can help provide more balanced funding for mitigation and adaptation measures for passenger and freight transport.

Guidance on Defining Transport Aspects of NDCs

A successful set of transport measures in NDCs is likely to include the following elements:

- **Process elements**
  - Incorporate broad inputs from transport, energy, environment and urban ministries
  - Ensure buy-in on proposed measures from sub-national governments, private sector
  - Conduct citizen outreach to test acceptance/facilitate uptake of behavioral measures

- **Short-term transport measures**
  - Prioritize tested solutions to be deployed at scale (e.g. drawn from transport quick wins)
  - Adopt a subset of quick wins that reflect country-specific circumstances and means
  - Include balance of Avoid-Shift-Improve measures to create ‘diversified portfolio’

- **Medium- to long-term transport measures (e.g. drawn from global macro roadmap)**
  - Transform urban transport to create prosperous cities and healthy, inclusive lifestyles
  - Provide low-carbon solutions for rural (non-urban) transport
  - Incorporate low-carbon energy supply strategy into transport solutions
  - Avoid vehicle kilometers for commuting, shopping and accessing services
  - Improve modal and system efficiencies
  - De-fragment and shorten supply chains to manage freight transport emissions
  - Accelerate action on adaptation in the transport sector
  - Deploy economic instruments to assign a value to carbon and catalyze transformation
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