Most global scenarios assume a relatively low mitigation potential and high abatement cost for the transport sector, resulting in relatively modest carbon reductions by 2050. In the absence of further action, transport emissions could outpace projections and become a roadblock to avoiding irreversible climate change. However, recent research suggests greater mitigation potential for transport than previously assumed, and if countries collectively implement low-carbon solutions, the sector could achieve reductions approaching a 1.5-degree Celsius scenario, as called for in the Paris Agreement on climate change (United Nations 2015a).

Achieving full mitigation potential for transport will require a balanced implementation of low carbon policies that 'Avoid' the need for transport trips; promote a 'Shift' towards more efficient travel modes; and 'Improve' the efficiency of vehicles and fuels. The chances that such a comprehensive approach is taken will increase if countries, cities and companies actively integrate development objectives in their policies on transport and climate change consistent with the 2030 Sustainable Development Goals (SDGs) (United Nations 2015b). Thus, there is a need for ambitious national and subnational transport targets in NDCs and other plans, coupled with immediate actions based on feasible decarbonisation pathways (Gota et al. n.d.).

I. Mitigation Requirements for Transport under the Paris Agreement

A. Paris Agreement Requires Substantial Emission Reductions

The Paris Agreement on climate change is the first international climate agreement that refers to the need for net-zero emissions by achieving a balance between greenhouse gas (GHG) emissions by sources and removals by sinks. In the Paris Agreement, 195 countries agreed to limit global warming to "well below 2°C above pre-industrial levels, and to aim for a temperature increase of not more than 1.5°C" (United Nations 2015, p. 3). This can be interpreted as a call for transformational global climate action across the economy, including in the transport sector.

These Paris Agreement commitments must be transformed into tangible actions across multiple sectors. However, if one sector does not make optimal reductions, other sectors must make additional reductions to compensate, thereby causing ripple effects. Thus, effective mitigation will not be achieved if individual sectors advance their own interests independently (Intergovernmental Panel on Climate Change (IPCC) 2014a).

B. Transport Must Contribute a Proportional Share of Reductions

Transport sector emissions are growing more rapidly than most other sectors due to demographic, behavioural and economy-driven transformations, which are leading to large increases in transport demand, especially in developing countries (Creutzig et al. 2015). Since transport infrastructure related decisions lock in transport demand for decades to come, public policy in the next five to ten years will determine whether we are set on a course for a high or low-carbon transport future (Gota et al. 2015).

Different sectors have different approaches to reducing CO2 emissions, and allocation of emission reduction targets to different sectors (i.e. national ‘burden-sharing’) is based on a combination of factors (e.g. local priorities, cost effectiveness, marginal costs, growth projections, mitigation potential, co-benefits) (Keating 2014). Based on a ‘proportional emission reduction share’ among sectors, global transport emissions should be 70% below 2010 levels and about 90% below BAU projections by 2050 to achieve a 1.5DS (Figure 1).
II. Mitigation Potential of Transport to Achieve a 1.5 Degree Scenario

A. Business-as-usual transport sector emissions could rise significantly

Novel research suggests that 2050 transport BAU emissions could be between 13 and 27 GtCO2-eq, with an average of about 18 GtCO2-eq. These figures are higher than existing projections, primarily due to higher growth assumptions on economic development and vehicle use in country studies compared to aggregated global/regional studies. This increase would mainly stem from emissions growth in middle-income countries, although per capita emissions in high-income countries would still be three times as high (Gota, et al. n.d.).

B. Low carbon scenarios for transport offer potential for deep reductions

An aggregation of country low-carbon trajectories yields global transport mitigation scenarios ranging from 2.5 to 9.2 Gt in 2050, with an average of 5.4 Gt. These range from a 60% decrease to a 31% increase in transport emissions compared to 2010 levels.

Both average and optimistic scenarios suggest a higher emission reduction potential than is traditionally assumed in models, with the optimistic scenario being close to what is needed in a 1.5DS. Per capita emissions for high and middle-income countries are expected to converge by mid-century.

C. Resolving the gap between commitments and reduction targets requires urgent action

Although the average and optimistic low-carbon scenarios are feasible from a technical viewpoint, current trends reveal considerable delays in action during the 2010-2017 period, which increases the intensity at which mitigation must take place in the next 30-year window. Thus, a key factor to determining the likelihood that potential mitigation ambition in the transport sector materializes is vertically-integrated political leadership from countries and cities, which must be closely aligned with broad private sector commitments to decarbonising the sector.
III. Implications of Transport Targets for NDC Development

A. Implementation of first generation NDCs is behind the curve

The Paris Agreement encourages countries to raise mitigation ambition through Nationally Determined Contributions (NDCs) through the formulation of long-term low greenhouse gas emission development strategies. Among the 160 NDCs submitted as of August 1, 2016, 75% explicitly identify the transport among targeted mitigation sectors, and more than 63% of NDCs propose transport sector-specific mitigation measures (Gota et al. 2016). However, only about 9% of NDCs include a specific transport sector emission reduction target, and only about 12% of NDCs include assessments of country-level transport mitigation potential, suggesting a general lack of focus on transport mitigation potential.

The full mitigation potential of the transport sector can only be realized if low carbon policies optimize the use of ‘Avoid,’ ‘Shift,’ and ‘Improve’ Strategies (as described in opening box). NDCs are currently skewed toward ‘Improve’ measures, and thus a more balanced set of transport measures should be included in forthcoming NDC revisions to increase mitigation potential and development benefits. For example, supporting greater use of public transport can reduce GHG emissions, but also has the potential to reduce diesel-related air pollution, reduce urban road congestion, and improve access and mobility.

Overall, implementation of the first generation of NDCs would lead to lower emission growth rates when compared with pre-NDC trajectories. However, the NDCs currently in place still significantly exceed a 2-degree Celsius scenario (2DS) and would likely result in warming of about 2.8°C above pre-industrial levels (Climate Action Tracker 2016). To date, however implementation efforts lag behind stated ambition in NDCs and there is a need for immediate actions in addition to the NDC process (Gota et al. n.d.).

NDC Implementation Best-Practice: Norway

Decarbonisation of the transport sector has major implications for 2050 emission levels, and Norway has used policy instruments to promote market deployment of electric vehicles (EVs) and charging stations. Norwegian EV policy aims for 100% of new passenger cars to be zero emission by 2025, which is to be accomplished through a series of incentives (e.g. tax exemptions, free access to toll roads, public parking, and public charging stations, and use of bus priority lanes), coupled with relatively high fossil fuel taxes. The share of EVs among new vehicle sales has reached 20 per cent (Karlsen 2017), and Norway seeks to continue the promotion of low-emission vehicles by expanding the use of policy instruments to other vehicle types (e.g. buses, construction equipment, ferries) (Norwegian Environment Agency 2014).

Spurring immediate action are 21 transport initiatives of the Marrakech Partnership for Global Climate Action (MP-GCA) which include both passenger and freight transport for a range of sub-sectors and modes: from roads to rail, from air to waterborne transport, and from motorized vehicles to cycling. They address both mitigation of, and adaptation to, climate change. Collectively these initiatives, if widely supported by state-and non-state actors, and implemented at scale, can reduce the carbon footprint of an estimated half of all the passenger and freight trips made by 2025 (SLoCaT Partnership 2017). In addition, transport “quick wins” can help to ratchet up pre-2020 implementation action in conjunction with NDC commitments (PPMC 2017b).

B. Defining pathways for second generation NDCs is essential

While transport has gained momentum with the formulation of the first NDCs, there are no clear pathways defined for achieving a transformation in the sector. The NDC cycle with the facilitative dialogue in 2018 and submission of updated contributions every five years provides an excellent opportunity for countries to engage with all transport stakeholders to develop a clear and ambitious vision for the sector. This vision could be translated into clear and transparent targets for the sector to strengthen the position of national governments in taking advanced domestic action (GIZ 2017a).
IV. Implications for Long Term Emission Reduction Strategies

A. Long-term emissions roadmaps are needed for transport

The Paris Agreement states: “All Parties should strive to formulate and communicate long-term low GHG emission development strategies…taking into account… common but differentiated responsibilities and… capabilities, in light of different national circumstances.” Setting mid-term policy implementation milestones can help to spur transport mitigation action, and creating long-term transport roadmaps within an elaborated transparency framework can help define feasible long-term decarbonisation pathways.

In this context, it is noted that the overall purpose of transport is to ensure the mobility of people and goods, and that climate protection requires that mobility is achieved using minimal energy while achieving desired ends (i.e. through ‘Avoid’ and ‘Shift’ strategies). The remaining energy needs to be supplied by low-carbon energy sources (e.g. through ‘Improve’ strategies fuelled by a low-carbon power sector). Transport decarbonisation is only possible if both areas are addressed (Agora Verkehrswende 2017).

The PPMC global macro roadmap is an example of a transport decarbonization pathway in development, built around eight components with associated targets. The roadmap emphasizes the need for explicit country reduction targets and financing strategies (based on regional roadmap variants) (PPMC 2017a).

B. Long-term plans can establish more sustainable emissions trajectories

As a response to the Paris Agreement target, a range of stakeholders (e.g. national governments, cities, companies) are formulating ambitious long-term transport sector transformation plans to contribute to a 1.5-degree Celsius scenario (1.5-DS). For example, countries such as France (French Government 2016), Germany (BMUB 2016), Sweden (Swedish Government 2017), and the United Kingdom (Committee on Climate Change 2016) have committed to radical transformation of their respective transport sectors. A growing number of cities and companies have also adopted policies that set ambitious targets for the reduction of transport sector emissions by 2050, including cities such as London, Seattle, Stockholm, and Sydney, and companies such as Alstom, DHL, and Michelin. Many cities are also joining the “80x50” plan for reducing community-wide GHG emissions at least 80% by 2050 (Carbon Neutral Cities Alliance 2015).

C. Transformational change for transport is urgently needed to meet Paris Agreement targets

A marginal progression of current transport mitigation policies will not be sufficient to reach a 2DS, and limiting climate change to 1.5DS means nothing short of de-carbonizing transport around mid-century (Gota et al. n.d.). Thus, more transformational changes in the transport sector are required which include the following elements (GIZ 2017a).

- Increase ambition based on an integrated vision for transport
  It is clear that more ambition is needed in the sector to achieve the objectives of the Paris Agreement. This can only be accomplished with an enhanced vision of a low-carbon, climate-resilient transport system that takes into account needed structural changes on all levels: governance, technological solutions, business models, and financing infrastructures, including internalization of external costs.

- Ensure technical support for project development, implementation and transparency
  Information should be the essential basis for decision-making, and availability of high quality data is scarce, particularly in developing countries. Ongoing efforts to improve the availability and quality of transport data and information should be supported and expanded to provide policy-makers a sound basis for their decisions.

- Strengthen collaboration
  More integrated approaches to land use and transport planning (see MobiliseYourCity Initiative 2017), increasing electrification and introducing synthetic fuels requires the engagement of many actors across sectoral borders. Countries should harness their combined knowledge in concert with international partnerships such as the Transport Decarbonization Alliance, the NDC Partnership, and the Sustainable Mobility for All Initiative or one of the transport initiatives of the MP-GCA (see References) to further align decarbonization and SDGs.

The Partnership on Sustainable, Low Carbon Transport (SLoCaT) is the largest multi-stakeholder partnership working on sustainable transport with more than 80 member organizations including multilateral development banks, bilateral development agencies, transport operators, civil society, the private sector, and academe. Please contact Karl Peet (karl.peet@slocatpartnership.org) for more information.

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