

## **International Association of Public Transport (UITP) - non-Party stakeholder inputs for the Talanoa Dialogue**

UITP is the only worldwide network to bring together all public transport stakeholders and all sustainable transport modes, including the transport business supply industry. UITP has over 1,500 members in 96 countries and represents the key players needed for low carbon urban mobility.

### **Where are we?**

**UITP's Declaration on Climate Leadership**, launched at the UN Secretary General's 2014 Climate Summit and a recognised non-Party stakeholder initiative under the Marrakech Partnership for Global Climate Action, is the public transport sector's commitment to tackling climate change in support of the Paris Agreement and responding to one of the biggest economic opportunities of the 21<sup>st</sup> century.

The Declaration pledged to deliver over **350 projects to climate action from over 110 members of the international public transport community in over 80 global cities**. Projects aim at giving a greater role to public transport in urban mobility - such as new bus, tram and metro lines - which will decrease regional carbon footprints. Projects also aim at reducing corporate carbon footprints, through improved vehicle and building efficiency. **Implementation can now be seen in nearly all of the 80 cities, covering 73% of the 350+ projects. Stories that show action on the ground can be seen in the following report: [2017 UITP Climate Action Report on Implementation](#).**

### **Where do we want to go?**

The Declaration's commitments and goals aim to **double the market share of public transport by 2025 (PTx2)**. In doing so, it would allow us to cater for ever increasing demand for urban transport while **decreasing per capita urban transport emissions by 25%** (global average). This would ensure that we would move the transport sector in the direction of the COP 21 Paris Agreement but also the Sustainable Development Goals, notably target 11.2 which calls on expanding public transport.

Importantly, **public transport projects are the most frequently transport interventions proposed in around 60 Nationally Determined Commitments (NDC)**. UITP's members will be required to deliver on these public transport projects and UITP can help build partnerships need to deliver quality national interventions.

### **How to get there?**

UITP's Declaration is also a commitment to support governments at all levels to provide them with **technical support and capacity building through lessons learned from delivering action on the ground as the projects being implemented under the UITP Declaration reflect those proposed in the NDCs**. Promoting these lessons to Parties will be key because many of the NDC which include public transport interventions are dependent not just on financial support but also technical support and capacity building which UITP can provide. **Parties to the Convention need to be made aware of this**. Attached are the sort of lessons learned from implementing our commitments on low emission bus systems – the most frequently identified transport intervention in NDC's and the most common form of public transport in the world today.

**By making this type of material available to Parties, notably through Technical Expert Meetings, and by working in collaboration, UITP can help the provision of partnership development, technology transfer and capacity building support which can achieve significant progress in quick start implementation and to ensure that interventions are of quality, helping to raise the level of climate ambition and achieve our PTx2 goal.**



ADVANCING  
PUBLIC  
TRANSPORT

# LOW EMISSIONS BUS SYSTEMS

SUPPORTING NATIONAL IMPLEMENTATION  
ON CLIMATE ACTION



## What this guide covers

- Key insights based on the experience of implementing projects made under the International Association of Public Transport's (UITP) 'Declaration of Climate Leadership' which can help achieve quick start implementation on national, local climate plans and national determined commitments (NDCs).
- A range of low emissions technologies and fuels on offer and practical factors that should be taken into consideration when developing a low emissions bus strategy.
- Basic procurement process which covers the key factors that should be factored in when purchasing and tendering low emissions buses.

## Why we need this guide

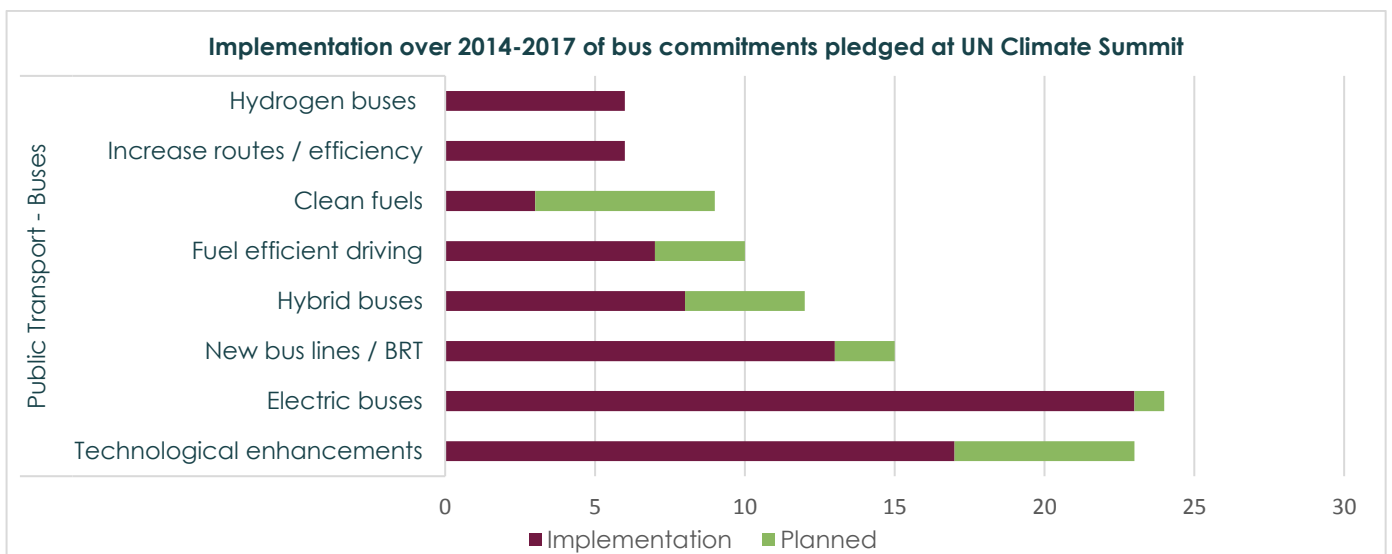
Of the 70% of countries under the Paris Climate Agreement which identified transport as an area to address, over 30 identified specific bus public transport projects and interventions. Pledges were made to implement Bus Rapid Transit (BRT) projects (e.g. Bangladesh, Brunei, Guatemala, Jordan, Mongolia, Senegal, and Sri Lanka), expand bus fleets (e.g. Brunei, Eritrea, Ghana), increase bus mode share (e.g. China, Israel, Jordan, Egypt, Lao, Thailand) and scale up the deployment of cleaner buses and fuels (e.g. Nigeria, Palau, Sri Lanka, Vietnam). This guide is intended to equip these national governments with relevant purchasing decisions and information to enable them to develop the types of low emissions bus systems envisaged in their NDCs.

## What UITP can do help

UITP is a non-profit international association. As a passionate champion of sustainable mobility, UITP is internationally recognised for its work in advancing the development of this critical policy agenda. UITP has 1,500 member companies from 96 countries. Our members are public transport authorities and operators, policy decision-makers, research institutes and the public transport supply and service industry. UITP inspires excellence and innovation by sharing cutting-edge knowledge and expertise with its members. UITP is the global centre of knowledge and know-how on the sustainable mobility of today and tomorrow. This wealth of information, best practices and statistics related to sustainable mobility worldwide developed by UITP Expert Groups can help support the delivery of NDCs, particularly low emissions bus systems. UITP actively supports the identification and the introduction of innovations capable to grow quality and market share of the sector. In this context, UITP leads a collaborative initiative under the UNFCCC with the objective to support local and national mitigation and adaptation efforts in the urban sustainable transport sector.

## UITP Declaration of Climate Leadership

Launched at the 2014 UN Climate Summit, UITP's Declaration is one of the 12 non-Party stakeholder collaborative initiatives included in the Global Action Agenda. It is a commitment from members of the international public transport community to double the market share of public transport by 2025 and to share knowledge and experience from delivering action on the ground. Over 350 projects were pledged in support of the Declaration aimed at reducing operational emissions but also enhancing mobility systems in over 80 cities. Over 100 projects aimed at enhancing low emissions bus systems and reflect many of the low emissions bus interventions outlined in NDCs. As of 2017, around 80% of the actions pledged related to buses have or are being delivered as seen below.





## Why we need low emissions bus systems

With around 450 billion bus journeys per year worldwide, buses are a significant part of any public transport system and are the only public transport mode in many cities. As public transport emissions only account for 3-4% of transport emissions in most cities, the largest gain in reducing emissions is not at the vehicle level but at the system level. This approach can result in significant reduction in city and regional transport emissions. For example, the public transport system in New York, USA, prevents around 17 million metric tonnes of CO<sub>2</sub> each year while only emitting 2 million tonnes.



Denser environments built around public transport help avoid unnecessary polluting travel, encourages a shift low carbon transport choices such as public transport, walking and cycling while also improving the efficiency of the entire transport system through reduced congestion. This is typically known as transit avoided carbon. When coupled with improved business performance and cleaner low emissions public transport vehicles, the full benefits can be realised.

## Defining low emissions vehicles

Efforts to decarbonise the transport sector will need a modal shift to public transport and to embrace innovations and support new technologies. At the same time, retrofitting and replacing older diesel vehicles in the most cost effective way today and embracing existing, reliable technologies can make significant gains in reducing emissions and air pollutants. Additional measures can also be taken such as eco-driving (which can reduce energy consumption and emissions by 5%) and giving buses priority at traffic lights and reserved corridors. It can allow for an increase of 5km/hr of commercial speed on a busy line, leading to 20% less consumption.

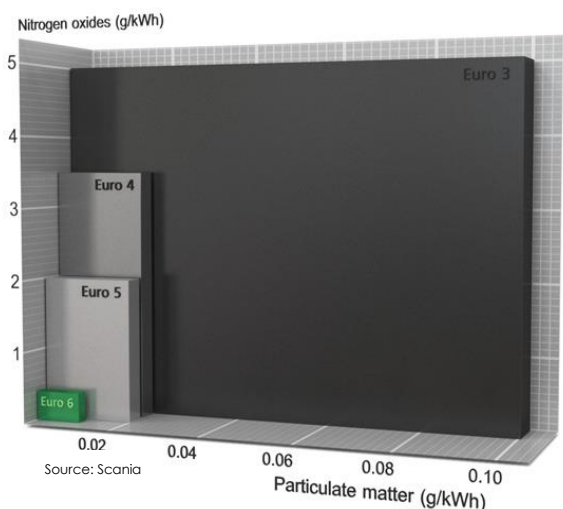
Given the urgent need to reduce air pollutants in our cities - such as Oxides of Nitrogen (NO<sub>x</sub>) and Particulate Matter (PM) - the cleanest diesel vehicles can play an important role. In Europe, as seen opposite, the latest engine emissions standard (Euro VI) has led to a dramatic reduction in local emissions and a 99.8% reduction in black carbon which is the second largest contributor to climate change after CO<sub>2</sub>. Meaning that progress can be made on reducing CO<sub>2</sub> emissions at the same time as improving air quality.

The risks from air pollution are now far greater than previously thought or understood, particularly for heart disease and strokes. Few risks have a greater impact on global health today than air pollution; the evidence signals the need for concerted action to clean up the air we all breathe. Healthier strategies in the transport sector will be more economical in the long term due to health-care cost savings as well as climate gains.

In order to assess the full environmental and climate impact of vehicles, UITP recommends to either assess them "from well to wheel", i.e. to consider also how climate-friendly the fuel is generated and transported. In the case of electric vehicles, the national electricity mix determines the amount of CO<sub>2</sub> emitted per vehicle. Considering the CO<sub>2</sub> balance from "well to wheel" is important as CO<sub>2</sub> is not a local pollutant, but a global one. The "tank to wheel" approach is the base for benchmarks, driving industry investments to support environmental targets and operational costs.

A "clean" bus fleet should therefore be defined as one causing "near-to-zero emissions", i.e. a fleet composed of equivalent Euro VI, electric and alternatively fuelled buses. Some of the electric and alternatively-fuelled buses are currently still significantly more expensive than diesel buses. However, it is important to look at the life-cycle costs of these vehicles and some new technologies will require the installation of local charging infrastructure.

## Vehicle technology overview



### Hybrid Buses

A hybrid bus typically retains a diesel engine but uses additional propulsion equipment to drive the bus when needed. There are many types of hybrid system currently in operation. On a conventional bus, when the driver brakes, the kinetic energy of the moving bus is dissipated as heat in the brakes or retarder. The bus slows down, but the energy is lost. On a hybrid bus when the driver brakes, the hybrid system captures kinetic energy and stores for use later when it is required for propulsion. The next time the bus accelerates, the stored energy is fed back to the driving wheels, reducing the load on the engine thereby saving fuel and reducing CO<sub>2</sub> emissions by 30% compared to a diesel vehicle. Plug in electric hybrid bus, which is somewhere between a regular diesel hybrid and an electric bus, can cut fuel consumption and CO<sub>2</sub> emissions by 75-80% compared with conventional buses.

### Alternatively fuelled buses

Buses powered by alternative fuels have been available for more than 10 years and have gained popularity in recent times due to their advantageous CO<sub>2</sub> balance, which can see up to 90% reductions in emissions. On the one hand, there are proven and reliable technologies, such as biofuels (i.e. bio diesel, bio gas and bio ethanol) and natural gas (CNG); on the other, new experimental technologies, such as second generation biofuels, bio-waste, etc. are emerging.

### Hydrogen buses

A hydrogen bus uses a hydrogen fuel cell to power an electric motor that provides propulsion. The fuel cell converts the chemical energy from hydrogen into electrical energy and releases only water vapour so has zero tailpipe emissions. Hydrogen fuel cell buses have an electric range of around 250-400km. Hydrogen is stored in cylinders on the roof of the bus. To achieve sufficient electrical power to propel a vehicle, multiple cells have to be compiled. Recent hydrogen fuel cell buses are equipped with hybrid technology to improve the fuel efficiency and electric range of the vehicle.

### Electric buses

More modern electric buses operate using an electric motor powered by a battery for propulsion. Electricity from the grid is used to recharge the battery, with various strategies in existence for recharging. Electric buses are ideally suited for city centre routes due to their electric operating capabilities and zero tail-pipe emission operation. The operating range of an electric bus is influenced by its battery capacity and charging strategy and operational environment. Electric bus manufacturers propose battery capacities that allow customers to match a compromise between range and passenger capacity (weight) and battery capacities currently vary. The range of an electric bus will be influenced by route topography, in particular hills, and ancillaries such as heating and cooling systems, as well as driving style. Manufacturers are able to provide predictions of the energy consumption and any cell deterioration rate for their batteries so that their suitability for a particular route operation can be assessed throughout the life of the vehicle. The SORT project ('Standardised On-Road Test cycles'), an initiative of UITP, provides the bus sector with a standardised means of comparing the energy consumption (kWh/km) of different buses and has recently expanded to include electric buses.

### Trolley buses

They are an integral part of the generic electric bus family although it is a singular niche technology with overhead contact wires and substations comparable with tramways infrastructure but without rails.

## Procurement

Some key principles for the public procurement of clean vehicles are:

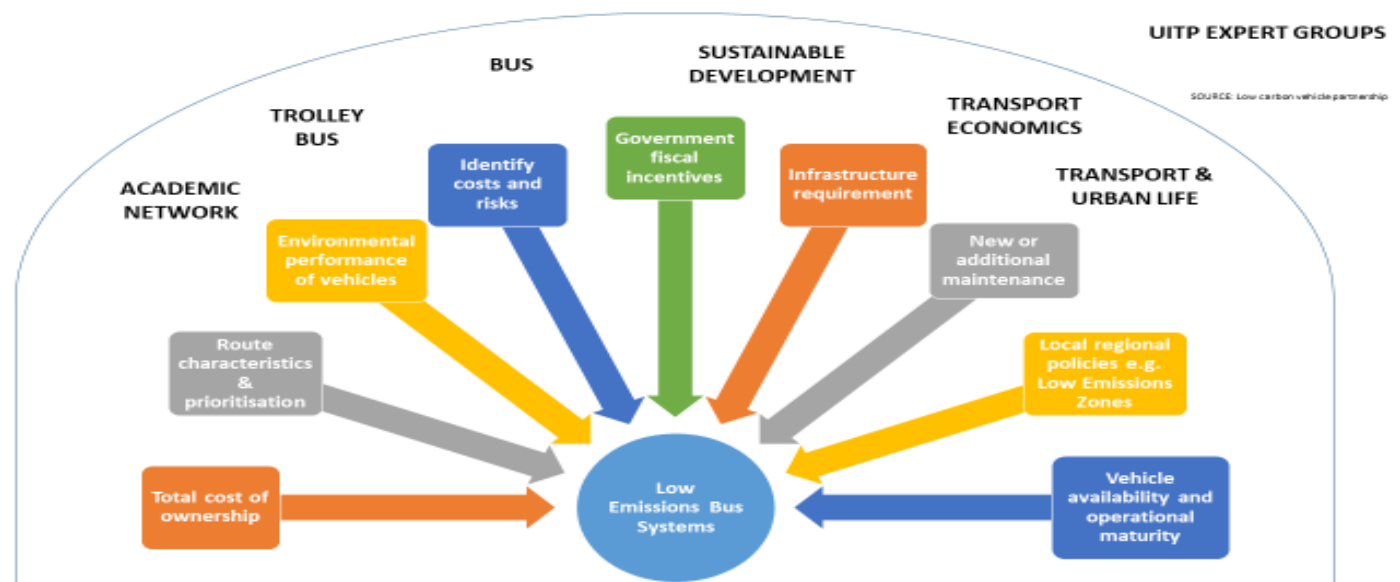
- Provide a clear long-term orientation through appropriate sustainable urban mobility planning - with clear and tangible targets (e.g. mode shift) and indicators (e.g. per passenger / km) including for CO<sub>2</sub> and air pollutants.
- Fully plan the decision and implementation process - decided on early with sufficient support and roll-out.
- Early dialogue with stakeholders - these can vary depending on the technology chosen. Stakeholders include bus manufacturer, bus operator, local planning authority, local transport authority, infrastructure supplier, fuel supplier, local gas or electricity network operator and technology provider.
- Define a clear strategy for risk mitigation and benefit sharing – both at the technical and operational level, allocation of costs and benefits and timeline.
- Procure full system solutions and where possible, align procurement along common principles and criteria.

Bus operators compete for contracts to provide specified services in cities for a select number of years. Their role is crucial to the current and future success of bus transport systems. The tendering and contracting arrangements are designed to deliver value for money, balancing the expectations of passengers against the costs of improvements. The system has been emulated in countries around the world. It is essential that environmental provisions (e.g. emissions, noise, recycling (end of life), prevention of liquid loss (oil, diesel, coolant etc.)) are included in tender documents. Annex A outlines UITP recommendations on how this can be integrated into a tender structure document for the procurement of low emissions buses and related services. As a guiding principle, the total cost of ownership are in the long-term much more important

than the price of acquiring the bus, and as a consequence all other related operational costs should have the same importance.

## Deploying low emissions buses

There are a range of factors that should be taken into account when developing a strategy to purchase a particular type of low emission bus technology. The diagram below highlights the most essential parameters and the UITP Expert Groups that can provide the essential technical support to account for them. For bus operators, the main question when starting to use alternatively-fuelled and electric buses is how to integrate them into the network and timetable without causing delays or interruptions of service. In terms of human resources, the introduction of new technologies into a bus fleet requires the development of the appropriate skills in the employees. Both drivers and the maintenance and repair staff need to get familiar with the new technologies prior to their introduction. The purchase of more alternatively-fuelled or electric buses should not lead to a reduction of overall service due to budgetary restraints. Instead, the key strategy to reduce CO<sub>2</sub> emissions in cities should be to make more people shift from individual to public transport. Bus operators should identify relevant partners early on in the procurement process and ensure advice is obtained on low emission buses, and where relevant, infrastructure options which also will need to be factored into purchasing decisions.



## Government incentives and funding

A number of governmental incentives exist that offer cost saving to public transport authorities and operators. These tax incentives and subsidies vary for different low emissions fuels and vehicles and it is essential that they are taken advantage of when available as they have proved very successful to the scaling up of low emissions bus systems. Some NDC's (e.g. Benin and Mauritania) have outlined their intention to develop incentives schemes (e.g. tax exemptions) to support the deployment public transport vehicles. UITP is of the view that those governments that have outlined bus interventions in their NDC's should endeavour to set up similar systems and that the Green Climate Fund should earmark funding to support public transport NDC interventions.

It is important to highlight that green bonds have opened a new finance flow that will be essential to confronting climate change. They are providing green investment opportunity for an ever wider investor group, including those who wish to divest and diversify from fossil fuel-intensive portfolios, and they have proven that a stream of investor capital exists for green assets, including for low emissions buses. Issuers range from development banks to states, cities and corporates. Globally, total green bonds issuance stood at \$21.76 billion during the first quarter of 2017.

## Conclusions

The technical knowledge of UITP Expert Groups and from implementing commitments pledged under the UITP Declaration can provide essential insight for the effective delivery of national governments pledges linked to the Paris Climate Agreement. This guide can help ensure that interventions are of quality helping to raise the level of climate ambition needed to deliver on the Paris Agreement.

# UITP TENDER STRUCTURE – for clean buses and related service





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This is an official **Report** of UITP, the International Association of Public Transport. UITP has over 1,400 members in 96 countries throughout the world and represents the interests of key players in this sector. Its membership includes transport authorities, operators, both private and public, in all modes of collective passenger transport, and the industry. UITP addresses the economic, technical, organisation and management aspects of passenger transport, as well as the development of policy for mobility and public transport world-wide.



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