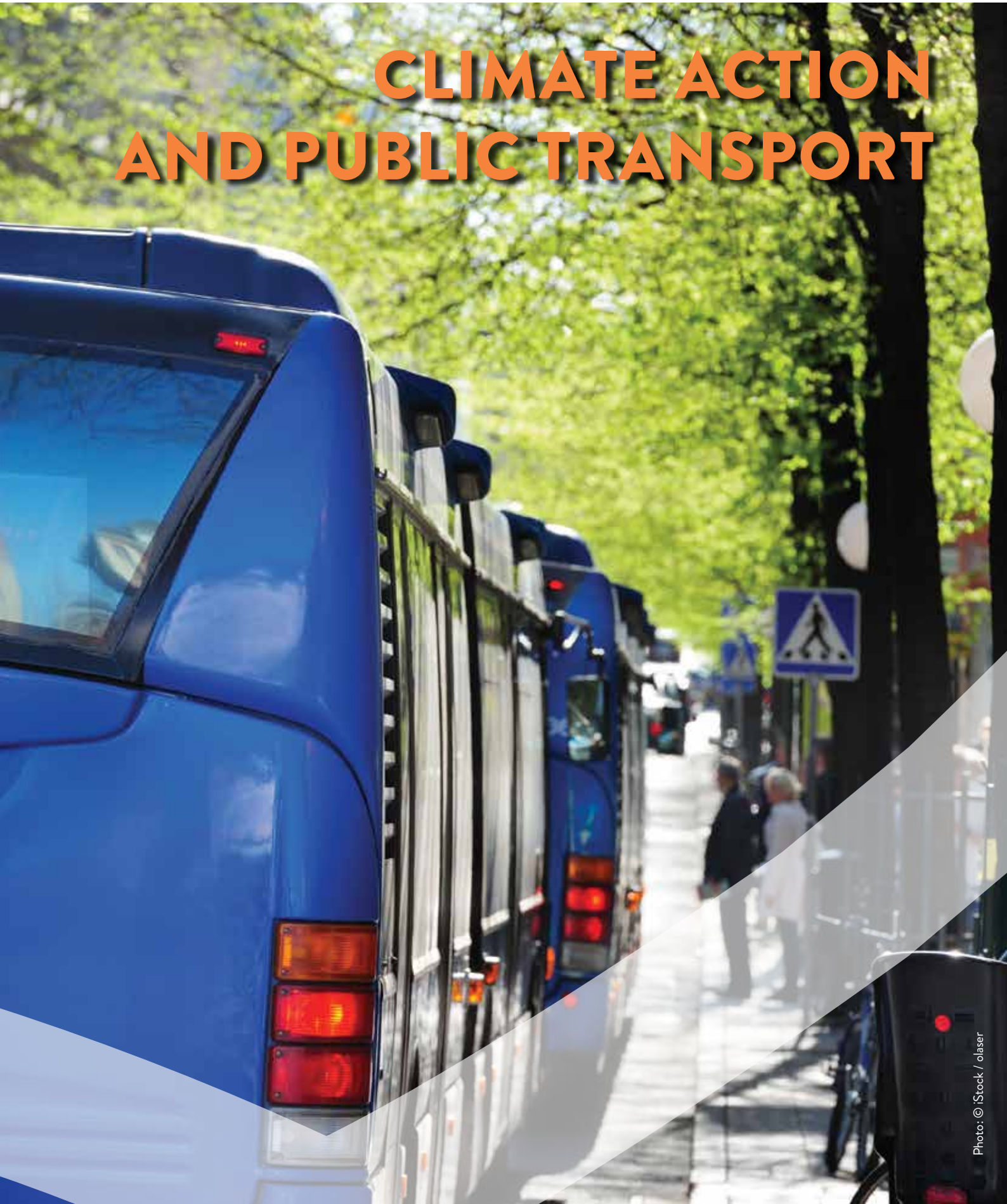
UITP
ADVANCING
PUBLIC
TRANSPORT

CLIMATE ACTION AND PUBLIC TRANSPORT



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UITP 2014

CLIMATE ACTION AND PUBLIC TRANSPORT

Analysis of planned actions

The International Association of Public Transport (UITP) is the international network for public transport authorities and operators, policy decision makers, scientific institutes and the public transport supply and service industry. UITP brings together 1,300 member organisations from 92 countries around the globe.

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FOREWORD

Public transport is a vital weapon in the fight against climate change. By investing in low-carbon mobility models and doubling the market share of public transport, cities and governments can prevent the emission of 550 million tonnes of carbon dioxide (CO_2) equivalent by the year 2025, making our cities better places to live, work and visit.

On the occasion of the UN Climate Summit on 23 September 2014, the public transport sector has come together under the banner of UITP's Declaration of Climate Leadership to demonstrate to heads of state and government that our sector is responding to one of the biggest economic opportunities of the 21st century.

This study contains an analysis of some of the more than 350 actions pledged by over 110 public transport organisations in cities around the world. These pledges are designed to reduce carbon emissions for the benefit of urban areas and citizens.

This baseline study clearly shows that the public transport sector is willing to act, has the competence to do so and is ready to make a difference.

These actions are just the tip of the iceberg when it comes to what the public transport sector is doing on climate action. More than just promises for future action, they also enable UITP to identify the opportunities for exchange of knowledge and best practices between public transport organisations whose projects have significant potential to reduce carbon dioxide (CO_2) emissions. This allows these activities be replicated in other cities, helping to speed up the transformation needed to tackle climate change.

The international climate negotiations are the perfect context for showcasing these activities, and for demonstrating that the public transport sector can lead the way in tackling climate change. UITP will continue to highlight our members' efforts in the build-up to Paris 2015, and we hope that these actions will leverage wider action on sustainable low-carbon urban transport, both in the scope of the UN 2014 Climate Summit and beyond. As analysis from the International Energy Agency (IEA) shows, these actions can result in savings of USD 70 trillion by 2050.

Alain Flausch, UITP Secretary General

REPORT OVERVIEW

This section provides some of the key messages and figures extracted from this report, and the key messages of the UITP Declaration on Climate Leadership:

- Public transport is a key weapon in the fight against climate change
- The public transport sector is committed to being a climate leader
- The public transport sector is working consciously and innovatively to improve its already excellent carbon performance and enhance urban transport networks for years to come
- Public transport benefits everyone and ensures that all cities and regions can work, grow and prosper

KEY FIGURES ON PUBLIC TRANSPORT BASED ON THIS REPORT

- Number of actions: 351
- Number of cities involved: 80 +
- Number of organisations involved: 110 +
- Target: 40% emissions reduction by 2025
- Target: 86% of projects aimed at full scale implementation
- For every extra tonne of CO_2 produced, public transport saves on around 7t/CO_2 in cities such as New York and Rio
- 57 billion: approximate annual passenger journeys made by public transport in the EU in 2012
- 13 million: number of public transport employees in green jobs around the world
- 23%: transport's share of energy-related CO_2 emissions
- 31: number of pilot tests of hydrogen and electric buses
- Public transport is 4 times more efficient in terms of $C0_2$ than private vehicles
- Doubling the market share of public transport would prevent the emission of half a billion tonnes of CO_2 equivalent by the year 2025
- On a busy route, an increase of 5km/h in the commercial speed of a bus can lower energy consumption, and therefore greenhouse gas emissions, by 20%.
- There are 148 metro systems around the world

CLIMATE ACTION AND PUBLIC TRANSPORT

In a 'business as usual' scenario, energy use and greenhouse gas (GHG) emissions from the land transport sector is expected to increase by nearly 50% by 2030, compared with year-end 2009 figures. This figure is expected to increase to more than 80% by 2050. This will primarily be caused by a global surge in the number of private vehicles. In 2009, transport contributed to approximately one-quarter of energy-related global GHG emissions and was responsible for about one-fifth of energy use.

These trends are clearly unsustainable, and it's time to identify some alternatives. Ambitious and visionary strategies are essential for radically changing current mobility patterns and avoiding catastrophic climate change. Cities and governments have a crucial role to play in this; instead of continuing with the construction of new highways and encouraging car use, it must be recognised that public transport has the tools to tackle the urban mobility challenges currently faced by our cities.

Where there is a strong commitment for climate action on transport, public transport is a key solution.

UITP worked with the International Energy Agency (IEA) to develop two urban mobility scenarios for 2025.[1] These mobility projections for the year 2025 show the enormous economic, environmental and social benefits of doubling the market share of public transport worldwide. However, the figures also provide a stark warning; they illustrate the potentially disastrous impact of failing to take action on urban mobility.

THE PUBLIC TRANSPORT ADVANTAGE

Public transport's carbon footprint has an inverse relationship to the global carbon footprint. This means that the world's GHG emissions will decrease relative to public transport's footprint increase. Public transport's GHG emissions can be broken down into two categories: GHG emitted directly or indirectly by public transport operations, and GHG emissions avoided as a result of its operations in a given region. The net carbon avoided is a result of the following:

- Mode shift – avoided car trips through more use of public transport. On a per-passenger kilometre basis, emissions from single-occupancy vehicles are on average four times higher than the per-passenger kilometre emissions of public transport; these figures are even higher during peak times
- Land use – infrastructure and urban form are strongly linked to climate mitigation. As urban areas become denser and come to rely more on public transport, CO_2 emissions are reduced

Reference: MTA

- Congestion relief – reduced fossil fuel emissions as a result of reduced congestion.

There are many examples that highlight the climate benefits of more public transport:

- The MTA (Metropolitan Transportation Authority) in New York, USA, **prevents about 17 million metric tonnes of carbon** throughout the course of the year while only emitting two million tonnes[2]
- Every tonne produced by Rio Metro, Brazil, **helps avoid between 5-7.4 tonnes of CO_2**[3] in the wider region. These gains will continue as the public transport network expands
- Kings County Metro, Seattle, USA, displaces roughly four times more GHG emissions than it generates – a **net displacement of approximately 600,000 metric tonnes of CO_2** each year. They aim to increase this by at least 5% by 2015.[4]

When coupled with improved business operational efficiency, as highlighted by this report, the full benefits of carbon-avoided transport can be realised. When scaled up, it demonstrates how local-level actions can play a significant role in the global climate agenda.

Efficient mobility in cities is an essential component of economic growth. This means that good public transport infrastructure and services will help city economies to thrive. With more and better public transport, cities also foster social inclusion and reduce air pollution, a major environmental health risk that was estimated to have caused 3.7 million premature deaths worldwide in 2012.[5] Cities that embrace public transport as the backbone of their mobility system can also free up vital urban space for recreational and business purposes. Meanwhile, mobility patterns based on public transport also encourage healthier lifestyles and help to improve levels of road safety. When considered alongside these factors, the benefits of the actions outlined in this report will result in exceptional improvements to urban environments, and improved quality of life for years to come.

METHODOLOGY

Following the Abu Dhabi Ascent that took place on 4-5 May 2014 in preparation for the UN Climate Summit, UITP challenged the public transport sector to show their climate leadership by sharing their commitments for future actions. We asked them to share with us those actions that will reduce their operational emissions, or their proposed improvements in their transport networks that would bring about a shift to low-carbon transport. This report follows a similar structure to other reports that aim to quantify the breadth of climate action, such as in C40 mega cities, but aims to highlight that many public transport organisations are already taking concrete action and will continue to do so.

UITP would like to thank the participating organisations for allowing UITP to bring their efforts to the Climate Summit, especially those that provided the information at such short notice. Where necessary, the information was supplemented by information that is freely available in the public domain. A complete list of the participating organisations is attached (Annex A) and further information on their activities can be found on their corporate websites.

Quantified information has been provided and referenced in this document, where possible. In order to support the monitoring and reporting of actions at the local level, UITP has aligned its Sustainability Charter to Paragraph 47 of the Rio+20 outcome document[6] which will better enable cities and individual organisations to report their non-financial information, including climate and energy issues. UITP will continue to engage the sector and cities to help them better account for their CO_2 emissions.

OVERVIEW OF DATA

For the purposes of this study, planned actions have been split into five main clusters:

1. Public transport – buses: initiatives and actions relating to clean fuels and efficiency, including the development of new lines and low carbon buses
2. Public transport – trains, trams and metros: initiatives relating to new lines and train cars as well as initiatives designed to improve vehicle efficiency
3. Combined mobility: enhancements to walking facilities, car and bike-sharing schemes (including shared transport systems) and cycle lanes and facilities

1 UITP Mobility Scenarios 2025
2 MTA
3 Brazil, Revista Transportes, in 2013
4 Sustainability Plan
5 WHO Factsheet
6 www.uitp.org/priority-topics

4. Infrastructure: initiatives and investments that improve the efficiency of lighting (e.g. LEDs), energy production systems and use of green electricity, energy efficient buildings, stations and green procurement
5. Awareness and action: stakeholder engagement (internal and external) and development of carbon reduction strategies.

Figure 1.1 shows the breakdown of planned actions. In total, 351 individual actions have been ranked and those actions relating to public transport (buses, trains, trams and metros) account for the highest number of actions, reflecting the power of public transport operators and authorities to make a difference on the ground.

For the purposes of this report, an action is defined as a specific deliverable / project in a particular focus area. For example, if a commitment is made to deliver six electric buses in a city, this is considered one action in the appropriate category. In the case where an initiative includes a number of different actions, for example, upgrading of fleet alongside renewable generating activities, eco-driving schemes etc. these have been classed as multiple actions.

Each action has been allocated the same weighting throughout the report, though some actions have a much bigger impact than others. For example, in Brussels, Belgium, the local public transport operator has committed to 55 actions, and 22 of them represent 90% of the expected impact of their CO_2 strategy. It is also important to point out, with reference to this example, that it has not been possible to categorise certain actions that may have CO_2 reduction capabilities (e.g. water or waste efficiency) as they are considered outside the scope. As such, the total number of actions should be considered a conservative estimate.

In terms of delivery, the actions have been split into two further categories: either they are full-scale i.e. those that are full-scale / city-wide (86% of the initiatives), or those that are pilot projects (the majority of which focus on emerging technologies such as electric and hydrogen buses).

Approximately two-thirds of actions will be undertaken in Europe. The remainder will be undertaken in regions distributed relatively evenly around the globe. As many of the initiatives include multiple actions, a selection has been highlighted.

FINDINGS IN FOCUS

KEY FINDINGS

- **Public transport is vital to delivering a city's climate objectives.** For example, the city of Dresden, Germany, plans to reduce its per-capita emissions of CO_2 equivalent by 40% in 2030 compared with 2005. This represents a 1.5 million tonne reduction. The city's public transport operator is central to this goal; they currently reduce the city's annual emissions by 30,000 tonnes CO_2.[7]
- Around 51% of the planned actions concern investing in a range of sustainable transport modes in order to offer multi-modal, compact public transport-oriented cities and regions. One such example is the 2020 plan for Greater Montréal, Canada[8], which aims to increase ridership by 33% and to raise public transport's market share by 5%. To reach these objectives, there will be increased focus on providing an integrated multi-modal network by improving commuter train services, developing reserved lanes and preferential measures for buses, promoting increased use of active or public transportation, and extending the metro blue line by 2021, all of which will contribute to **reducing GHG emissions by 300,000 tonnes per year**.
- More and better public transport means big economic benefits. For example, opening in 2015, the Portland-Milwaukie,USA, light rail transit line will create up to

Figure 1.1: Public transport: action clusters

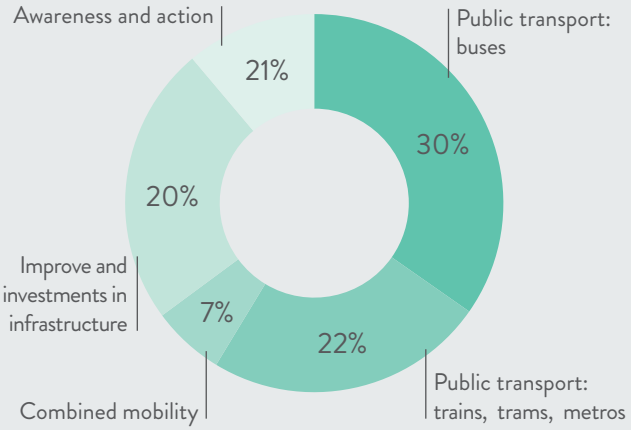
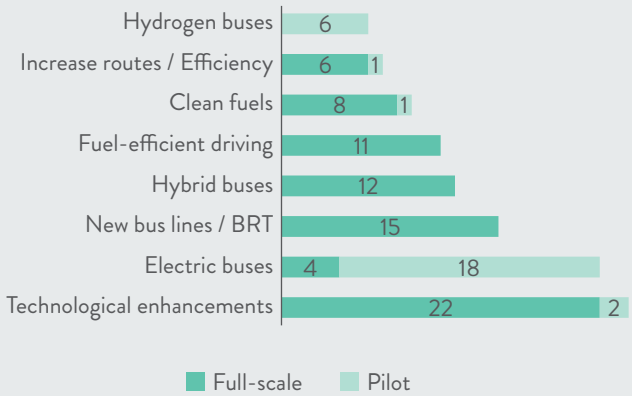


Figure 2.1: Public transport: buses



14,500 jobs and generate up to **USD 573 million** in personal earnings. This is vital to the region's strategy of managing growth and building liveable communities.[9]

1) PUBLIC TRANSPORT MODES: BUSES

Bus is the primary form of public transport both in Europe and around the world.[10] For the purposes of this research, this section will focus on actions related to bus public transport that can both reduce emissions through "shift" and "improve" mechanisms. "Shift" GHG emissions reductions may come from:

- Enticing riders to switch from private vehicles to public transport through greater, faster, more reliable, more comfortable and safer services; and ensuring that existing public transport users do not switch to private vehicles as their income increases by keeping public transport as attractive as possible
- Improving the efficiency of bus operations by reducing traffic delays and increasing travel speeds; and reducing fuel consumption by replacing older transit vehicles with newer, more efficient vehicles, even those with zero exhaust emissions.

It is also important to add that public transport modes can play a significant role in urban design and carbon avoidance. These issues will be touched upon later. Figure 2.1 provides a snapshot of the 106 planned initiatives. The majority of these actions are full-scale (86%), with pilot projects mainly focusing on electric and hydrogen buses, which is unsurprising given that these are emerging technologies. This also presents opportunities for shared learning.

1.1) LOW-CARBON BUSES AND TECHNOLOGY

There is a marked trend in the uptake of low carbon buses (including technical enhancements to vehicles) within the public transport sector, which accounted for approximately half of the actions in the cluster. Clearly, emissions reduction benefits and cost savings alongside stimulus packages are helping drive this forward. Initiatives aimed at low-carbon buses can effectively be split into two sub-categories: market-ready technology (e.g. hybrids) and emerging technologies (electric and hydrogen buses).

MARKET-READY FUELS AND TECHNOLOGY

It appears, from the sample studied, that the trend of upgrading fleets to hybrid is strongest in North America and Europe. For example London, UK, is expected to have 1,700 hybrids in operation by 2016, and its current fleet is expected to save almost 20,000 tonnes a year.[11] There are also plans to do the same in other areas, such as in Bogota, Columbia, where cleaner vehicles (once approved) are expected to reduce CO_2 emissions by 60%. In Laval, Canada[12], the local public transport undertaking will only purchase hybrid buses. Based on their bus purchase sequence, CO_2 emissions avoided will increase to 2,250 tonnes in 2023. In Washington, USA, an upgrade programme will yield a decrease in GHG emissions of 4,580 MT of CO_2e. (YF18); the network already helps to avoid **400,000 MT CO_2e per year[13] and the goal is to increase CO_2 displacement by 10% by 2025**. Even modest increases in the use of hybrids can result in carbon savings. For example, just two new hybrid buses in Liechtenstein can save around 40 tonnes of CO_2 per year.

Bus fleet renewal programmes that introduce more efficient vehicles, such as those planned in Cagliari, Italy (CTM) and Dakar, Senegal, will help reduce fuel consumption. A programme for Belgrade, Serbia, for 2015-2018 will also help to reduce emissions by 6,366 tonnes annually. Other technological enhancements include fleet optimisation platforms, retrofitting buses and innovative features such as the use of Formula 1 technology on UK buses[15], generating fuel savings of more than 20% at a significantly lower cost. Greater uptake of the best available technologies in the future will enable public transport organisations to meet their goals of providing carbon neutral transport, as is the case for the public transport authority in Denmark.

EMERGING TECHNOLOGIES

Actions relating to emerging technologies are mainly at the pilot stage, but strong pledges have been made to scale these up as the technologies evolve and mature. Initiatives that concern hydrogen buses are all at the trial stage in cities. It is important to recognise the important role that the public transport industry plays in the development of low-carbon public vehicles, innovations in energy efficiency, and in making such innovations new standards.

7 www.dvb.de
8 http://plan2020.amt.qc.ca/Home
9 Trimet factsheet
10 1 Around 50% of the vehicle-km are made by bus in EU cities with over 250,000 inhabitants, and the percentage attains around 100% in small and medium sized cities. The European average of the bus market share is estimated at 50 to 60%. Worldwide, it is 80% – source UITP
11 TfL – Environment
12 STL – Environment
13 Sustainability Strategy
14 APTA 2013 Fact Book
15 News Item

Van Hool is developing a new generation of hybrid fuel cell electric buses following their initial round of demonstration projects (which come to an end in 2016), which have led to the introduction of zero-emission fuel cell bus technology in six countries in Europe and in the US. In Norway, five hydrogen fuel cell buses in Oslo will gradually increase to full operation by 2017. The objective of the pilot is to move these demonstration vehicles towards commercialisation in Europe, starting in 2015.

Electricity as a fuel source has been identified as one of the most promising alternative fuels for transport and indeed, for addressing climate change. Its application in urban buses is gaining ground, with a number of planned pilots across all global regions: Europe (Gothenburg, Sweden[16] (2015), Münster, Germany (2015), Gdynia and Sopot, Poland (2015), Belgrade, Serbia (2015, saving 118 tonnes CO_2 annually) and Luxembourg (2016); Latin America (São Paulo, Brazil[17] and Rosario, Argentina), Asia (Bangalore, India) and North America (see below). As electric buses have zero exhaust emissions, the benefits are clear. In Hannover, Germany, a project to test e-buses with a rapid-charging facility is expected to save 200 tonnes of CO_2 per year, while in Cologne, Germany, there are plans to implement eight buses that will help save around 520 tonnes of CO_2 per year.

Pledges have also been made for further electric bus trials in the coming years. For instance, in Darmstadt, Germany, the goal is that by 2025 all buses will run without emissions, i.e. with electric drive, avoiding 11,365 tonnes of CO_2. Société de Transport de Montréal (STM) in Montréal. Canada, intends to acquire only zero emissions buses from 2025, helping boost its already excellent carbon performance. With a target of 540 million trips in 2020[18], the STM will further contribute to achieving the Québec and Montréal objectives of a **1.2 million-tonne reduction in GHG emissions in the land transport sector by 2020**. The net gain of 241,000 tonnes is equivalent to 20% of the municipal objective; clear proof of the importance of public transport in the fight against climate change.[19] Hamburg, Germany, will also only procure emissions-free buses from 2020 onwards, and the RATP (Régie Autonome des Transports Parisiens) in Paris, France, has made a similar pledge to acquire zero-emissions buses in 2025, avoiding 220,000 tonnes per year and enabling RATP to reach their more ambitious reduction target of 50% of GHG emissions. Adoption of this programme would further improve the carbon impact of the multi-modal network, whose services avoided the emission of **2.7 million tonnes of CO_2 in 2011**.[20]

These pilots and pledges will accelerate the commercial use of low-carbon vehicles, thereby scaling up CO_2 emissions reductions worldwide. UITP is in a position to drive this forward. The Zero Emission Urban Bus System (ZeEUS[21]), is a project of 40 partners (representing all categories of mobility stakeholders) coordinated by UITP that aims to extend the fully-electric solution to a wider number of European urban bus networks. Developing large-capacity electric vehicles and adequate charging infrastructure will facilitate the market renewal of electric buses in Europe and beyond. In addition, as part of the ZeEUS project, UITP will operate an Electric Bus Observatory which will closely monitor electric bus deployment and publish all collected information. This will help provide the entire stakeholder spectrum with a global picture of the worldwide electric bus market.

1.2) NEW BUS LINES / BUS RAPID TRANSIT (BRT)

New initiatives that can produce large-scale improvements include the implementation of new bus services and lines, such as BRT systems. These systems typically cost less and can be implemented much faster than other transport modes. They are especially useful for catering for rapid urbanisation, but in order to achieve maximum benefit they need to be part of an integrated sustainable transport network.

New bus lines will obviously help increase capacity and result in more frequent, more reliable and less crowded buses. For example, by the end of 2014, 40 new bus services will have been introduced alongside new multi-modal initiatives in Singapore planned for the next 10 to 15 years.[22] Improved bus services and enhancements on the Greater Bristol Bus Network will help to reduce emissions by 42,771 tonnes over the lifetime of the project. It is one of a number of sweeping changes to the multi-modal public transport system that aims to reduce by 16% per capita emissions from road transport in the region by 2020.[23]

BRT helps to improve journey efficiency, often through segregated bus lanes. New BRT projects are under way in places such as Dakar, Senegal, whose system is scheduled to begin operation in 2016, as well as in Latin America in places such as Campinas, Brazil, where at the end of 2015, two BRT lines will be up and running, helping to reduce pollution by 12%. In Rio de Janeiro, Brazil, as indicated by Fetranspor (the federation of bus passenger transport companies in the state of Rio de Janeiro), the city will have four BRT corridors: Transoeste, Trascarioca, Transolimpico and Transbrasil, with a total of 150km and 165 stations. Transbrasil have perhaps the biggest customer demand of all BRT systems deployed worldwide; it is expected to carry approximately 500,000 passengers per day. When all the corridors have been built, the city will have a network of more than 150km of high-quality BRT lines. Transoeste's impact alone is estimated to generate savings of 107,000 tonnes of CO_2 per year.[24]

1.3) INCREASED EFFICIENCY AND CLEAN FUELS

In addition to BRT systems, public transport undertakings are taking additional steps to improve the fuel efficiency of buses. Initiatives include eco-driving measures such as the data driving management system, which is already installed in 13% of buses in Lisbon, Portugal, and is planned to be extended to the rest of the fleet (752 buses[25]). This has the potential to reduce energy consumption by 15%. Other similar schemes include that of the Ruhr Area in Germany, which will save 1,060 tonnes of CO_2 from 2015 onwards. Mass training for eco-bus driving in Belgrade, Serbia, in 2016 will also lower emissions by 2,912 tonnes annually. Other initiatives can be found in Brisbane, Australia, where, starting in 2014, energy-efficient actions will focus on smart transmission functionality and fuel-efficient, low-rolling resistance tyres and eco-driving, leading to average fuel savings of 5-10%.

Other ways to improve efficiency is through giving priority to buses; research has shown that increasing the commercial speed of buses by 5km/h on busy lines can lead to 20% less consumption. A trial being introduced in autumn 2014 in Edinburgh, UK, will give buses priority, allowing them to run alongside the new tram system. Other measures to improve the speed and efficiency of Edinburgh's buses include the development of ticketing machines at bus stops and a smartphone application.[26] With regard to clean fuels, most examples were based on biodiesel bus pilots (London, UK), methane (Bergamo, Italy), CNG (Mexico) and ethanol blending with Hybrid Synergy Drive or HSD (Bangalore, India) which helps to reduce black smoke by up to 70%. With nine different actions identified in this area, there is considerable scope to increase knowledge transfer across the sector.

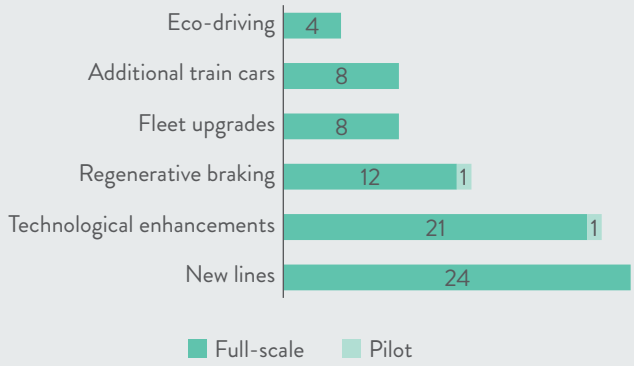
2) PUBLIC TRANSPORT MODES: TRAINS, TRAMS AND METROS

Rail-based modes of public transport can reduce emissions through both "shift" and "improve" mechanisms (both through improved efficiency and clean energy). Figure 2.2 provides a snapshot of the 80 or so initiatives that will be undertaken. The majority of these actions are full-scale.

2.1) NEW LINES AND EXTENSIONS

A number of cities / regions analysed will expand their rail networks, including Singapore, whose rail network will double to about 360km in 2030. Flanders, Belgium, will see 185 extra kilometres of new tramlines over the next 10 years, while Vienna, Austria, will see a major expansion of their metro and tramlines to encourage a modal shift to 40%.[27]

Figure 2.1: Public transport: trains, trams and metros



Tyne and Wear, UK, will renew its assets (programme to be completed in 2021), helping to avoid 15 million more local car journeys per year. Casablanca, Morocco, expects to have 80 additional kilometres of tramlines running by 2022. Moscow, Russia, will also see major expansion of its metro network with more than 160km, as well as modernisation of stations and depots. The carbon benefits of new public transport projects in this category are perhaps best illustrated by the metro system in São Paulo, Brazil, the second largest system in South America. It will expand its network from 75.1km to 225km in 2025. It is expected that demand will grow from its current level of **4.4 million boarding passengers to 6.9 million in 2018**. This is estimated to prevent the emission of more than **1.35 million tonnes of CO_2 per year in 2018** against the 820,000 tonnes per year that is currently being avoided.

Other projects will also help to encourage a modal shift; in Munich, Germany, a new 2.7km tramway[28] is expected to save 245 tonnes of CO_2 in 2016. In Dresden, Germany, new services save 23 tonnes of CO_2 per day, and in the metropolitan area of Granada, Spain, a light rail line will cater for an extra four million journeys per year, which will result in a reduction of 15% in car use and 10% fewer emissions. The expansion of the tram and regional train

16 www.goteborgelectricity.se/en
17 Prototype bus and charging system
18 383.5M in 2008
19 Sustainable Development Plan 2020
20 RATP: Climate Change
21 www.zeeus.eu
22 LTA Master Plan 2013
23 www.travelwest.info/jltp3
24 Rio BRT Analysis
25 Carris Data Sheet
26 These measures are outlined by Edinburgh City Council's: Local Transport Strategy 2014-2019
27 Wiener Linien website
28 MVG website

system of Innsbruck, Austria, will also reach completion in 2020, saving 1,405 tonnes of CO_2 emissions per year. Given the scope of projects both completed and under development worldwide, it is clear that there are great opportunities for shared learning and development.

2.2) INCREASED EFFICIENCY: TECHNOLOGICAL ENHANCEMENTS, ECO-DRIVING AND REGENERATIVE BREAKING

There are also commitments to increase the use of clean energy for traction power, such as those made by the Västra Götaland region of Sweden; they aim to provide 95% of passenger kilometres using renewable energy by the year 2025[29], alongside their efforts to reduce energy consumption by 25%. The energy efficiency of fleets must also be improved alongside reducing carbon emissions. Again, industry partners play a key role; based on achievements in energy savings introduced by Bombardier for their vehicles (at least 50% between 1990 and today), they will strive to provide technologies that will result in a further 10 to 20% efficiency gain by 2050.[30]

Plans to make Barcelona's metro system even more efficient[31] are helping to make a more sustainable public transport network in the city. Meanwhile, regenerative breaking in Guadalajara, Mexico, saves 4.5% of energy consumed per year. In the UK, a major energy recycling project on the south-western rail franchise, which is the largest in the country, is expected to save 15 million kWh of electricity per year (conservative estimate), enough to power more than 3,500 UK homes for an entire year.[32] Other enhancements include the metro system in St Petersburg, Russia, where a 'maximum permissible emissions' project has been implemented. Meanwhile, fleet upgrades in Sofia, Bulgaria, are expected to save 5,000 tonnes of pollutants annually, once delivered in 2014.

Real-time information is also helping to improve performance; operational control systems linked to innovative smart tram systems in Linz, Austria, further improve driving efficiency while reducing 85 tonnes of CO_2. In Bielefeld, Germany[33] eco-driving will lead to annual savings of 470 tonnes of CO_2. Similar initiatives in Brussels, Belgium will lead to annual savings of 3,060 tonnes of CO_2. In Gratz, Austria, the local railway provider will further improve on reductions of 3,300 tonnes of CO_2 caused by modal shift by focusing on sustainable technologies. Other successful approaches include rationalising energy consumption in the metro system in Lisbon, Portugal, leading to a reduction of 25,846 tonnes of CO_2 and economic savings of over EUR 5 million. Improvements in the effectiveness of the metro network thanks to automation, as is planned in Brussels, will also help reduce emissions. Design solutions, such as 232km of precast concrete decks (already built or under construction by Systra) for metros around the world, will help save **130,000 tonnes of CO_2 per year**.

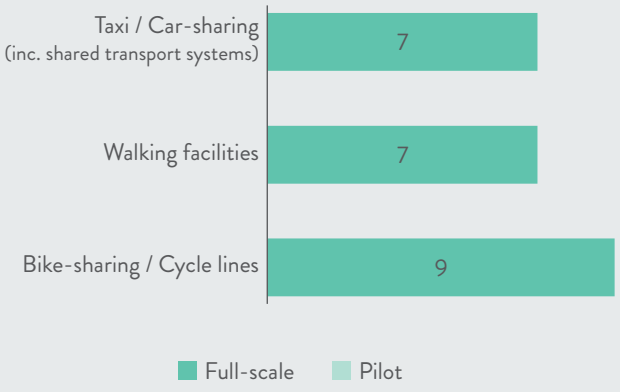
The volume of activity demonstrates the widespread opportunities that, if fully exploited, could result in significant cost and CO_2 savings. For example, if the rail sector across Britain were to fully exploit opportunities to reduce emissions and meet its 2019 targets, it could lead to savings of **one million tonnes of CO_2 and GBP 110 million by the end of 2019 in England and Wales, and 26,000 tonnes CO_2 in Scotland** over the same time period (2009/10 baseline).[34] A new public-private partnership in the European rail sector will help double rail capacity by 50% by 2020[35] alongside other measures and projects, including OSIRIS[36] of which UITP is a partner. The project aims to enable a reduction in the overall energy consumption of EU urban rail systems by 10% by 2020.

3) COMBINED MOBILITY: TAXI / CAR-SHARING, WALKING AND CYCLING

Growing concern for the environment and measures that restrict individual car use in towns and cities have bolstered the attractiveness of public transport. But public transport users are also pedestrians, cyclists and motorists. They want to be able to switch easily from one mode of transport to another at any point in their journey, travelling by metro, bus, bicycle, foot, car-sharing, carpooling or taxi. Putting combined mobility at the heart of urban transport systems means taking into account these expectations and improving the overall efficiency of transport networks.

Figure 2.3 highlights actions that have a specific focus on combined mobility services that run alongside public transport. As mentioned earlier, around half of the pledges refer to multi-modal services, and over 20 pledges include a strong focus on complementary sustainable transport

Figure 2.3: Combined mobility



systems. It is unsurprising that the number of planned initiatives focusing on combined mobility is not as high as those planned for traditional public transport modes, as the focus of the study was geared towards them. However, it does highlight the fact that major transport projects need to link with complementary modes so as to provide a complete service portfolio and to encourage a modal shift.

Initiatives can be found across the world, including Singapore, whose 2030 plan to complement their public transport network will include the construction of 200km of sheltered walkways for cyclists, resulting in a network over 700km in length. In Casablanca, Morocco, alongside the tramline extension, 10 hectares of pedestrian areas will be created and 220,000m^2 of pedestrian walkways rehabilitated. By 2015/16, the West Midlands, UK[37] will see an **increase in cycling by more than two million trips per year, and walking trips by more than 10 million** alongside enhancements to the public transport network, helping to reduce CO_2 by 10,000 tonnes by the final year of the programme.

Leipzig, Germany, also aims to transform its mobility system by means of a variety of sustainable transport modes, so that one in four trips will be made by public transport. This will mean an **increase from 142 million passengers per year today to more than 172 million passengers**. To achieve this goal, the strategy includes measures such as passenger gain beyond population growth and attractive mobility services with connections to bicycle traffic, car-sharing, long-distance trains and to new forms of electric mobility. In addition, Budapest, Hungary, will launch a public bicycle-sharing system that will make 1,100 bicycles available at 76 docking stations throughout the city. In Prague, Czech Republic, as part of their metro extension (to be launched in 2015) there will be a focus on multi-modal transport (including shared transport systems) meaning the north-western sector of the city will have a fast, more connected sustainable transport system. The same is also true for the city of El Torno, Bolivia, whose commitment to build an urban mobility system based on public transport and pedestrians will help to improve quality of life. Montreal, Canada, has focused on building a multi-modal network with public transport at its core, as mentioned in the opening of this section, that will contribute to an **annual reduction of 30,000 tonnes of CO_2**.

Modern interchanges play an important role in joining up sustainable transport modes. Moscow Metro is planning to build 90 transport interchange hubs by 2020. In addition, projects being developed by UITP such as NODES[38] will provide public transport undertakings with a toolbox to enable them to address energy and environmental issues in the planning, design, construction, upgrade and management of interchanges. The tools take into account alternative modes such as car-sharing, carpooling, and soft modes. Aspects related to the electrification of transport are also covered, as well as the energy efficiency and the environmental performance of the interchange itself.

Taxis and car-sharing can also play a key role in complementing the mobility mix. Research has shown that car-sharing customers make up a significant number of public transport users and that for every car-sharing vehicle, up to 10 privately owned vehicles are abolished. The region of Flanders, Belgium, is also looking to cooperate with and invest in car- and bike-sharing organisations, increasing the number of users by an annual minimum of 20% until 2020. In Germany, at least 60,000 new customers for station-based car-sharing services in the country are envisaged in 2014 and in 2015, helping to **save 18,000 tonnes of CO_2 per year** (existing customers will help save a further 96,000 tonnes of CO_2 per year). In Osnabrück, Germany, the aim is to develop a transport system that is completely free of emissions as well as intermodal services, such as car-sharing (including electric vehicles) to supplement their public transport network.

Technological enhancements are also helping to provide sustainable transport options; Munich's aim is to become both a multi-modal transport and service provider through an app, for example, which displays both public transport stops and locations of various car-sharing cars, with the option of booking both. Furthermore, in 2015, the addition of the new MVG (the Munich public transport operator) bike-sharing project will contribute to a further reduction of CO_2 of 308 tonnes per year. All these services support the shift towards sustainable mobility behaviour. Thanks to four new tramways in Munich, a further 650 tonnes of CO_2 emissions will be avoided per year, and the new metro line 9 in 2022 will reduce annual emissions by a further 1,000 tonnes. Other schemes in their sustainability strategy include customer-oriented projects such as welcome packs for new residents, school projects and senior citizen projects.

These initiatives demonstrate that the public transport sector is embracing complementary modes of sustainable transport in order to provide an alternative to private vehicles to ensure true eco-urban mobility. UITP has

29 Vasttrafik Environment – aim to increase the number of passengers from 300,000 in 2008 to 450,000 in 2020
30 csr.bombardier.com
31 TMB Sustainability Master Plan
32 Train Regenerative Braking Case Study
33 www.tickettokyoto.eu
34 Meeting-rails-carbon-ambition.pdf
35 www.shift2rail.org
36 www.osirisrail.eu
37 Centro Sustainability
38 Nodes

considerable scope to share these and other best practice examples within the sector and to develop new ideas and partnerships.

4) IMPROVEMENTS AND INVESTMENTS IN INFRASTRUCTURE

These are the new initiatives that concern the efficiency of lighting (e.g. LEDs), energy production systems and the use of green electricity, energy efficient buildings, stations and green procurement. These issues are often overlooked when public transport's contribution to climate action is considered. Figure 2.4 highlights the wide range of innovative efforts that will be voluntarily undertaken by the sector.

While not traditionally considered within the scope of public transport, the sector is committed to implementing smart energy efficiency initiatives in its stations and buildings. Pledges include the installation of a solar power plant in Phoenix, US[39], capable of generating 780kW of energy annually.[40] Photovoltaic systems will be installed on rail stations throughout Switzerland by 2024, saving 450 tonnes of CO_2 per year, and on a bus depot in Worblaufen, Switzerland, with more planned for the future (on properties of RBS, the public transport operator of Bern-Solothurn). The development of a large-scale power plant in Keiyo Rolling Stock Centre, Japan[41] will be capable of reducing CO_2 by 500 tonnes annually. The switch to green power in Kassel, Germany, will allow for a completely carbon-neutral fleet while in Stuttgart, Germany, a further 26,000 tonnes of CO_2 will be saved annually. By purchasing more green electricity, Knorr-Bremse[42] expects a 40% reduction in corporate emissions worldwide on top of their internal energy efficiency initiative, which has delivered a **CO_2 reduction of 16,000 tonnes per year**.

Station upgrades, such as those undertaken by the French[43] and Japanese rail systems, not only enhance multi-modality but also allow systems to generate their own energy (between 25 and 75%). The instillation on LED lighting throughout the Rio Metro will help reduce energy consumption by around 50% (compared with fluorescent lamps). In Manchester, UK, installing LED lighting is just one of their many efforts to become a zero-carbon authority by 2033. In Dublin, Ireland, actions that will help to reduce energy consumption from operations and maintenance will help further reduce emissions by 15%. In Rotterdam, Holland, pledged actions over the next five years will focus on efficient lighting and heating of buildings alongside other measures which will help save 1,335 tonnes of CO_2.[44] LED lighting and renewable power is also being used in ticket vending and travel information kiosks in New York, US.

In addition to infrastructure and programme investments, Metrolinx in Canada is demonstrating leadership by looking for energy and greenhouse gas savings opportunities within its own operations. The savings in energy, emissions and costs resulting from these activities will be reported when the data become available. Green procurement initiatives, such as the example in Provincie Gelderland, the Netherlands, can be used to reduce emissions. This was proven through its tender procedure for public transport, lowering emissions from 20 to 40%. In Flanders, Belgium, commitments will see environmental and social criteria in every purchasing decision from 2020 onwards.

Corporate buildings are also getting more efficient. In Hong Kong, initiatives implemented in 2013 are expected to **save over 30,000 tonnes of CO_2 over the next five years**. In addition, the organisation will undertake a carbon baseline and reduction targets in their property portfolio.[45] Other initiatives concerning the efficiency of buildings include working towards building standards certification, such as the US Green Building Council's LEED standard (Leadership in Energy & Environmental Design).

Figure 2.4: Improvements and investments in infrastructure

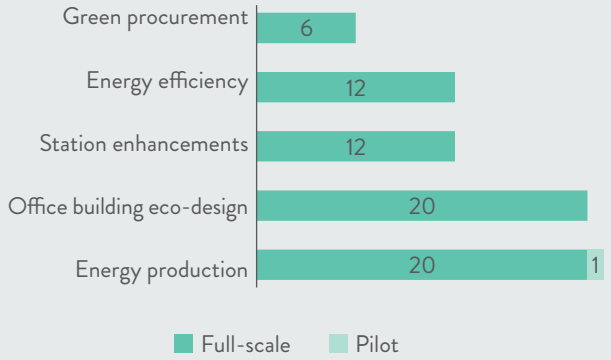
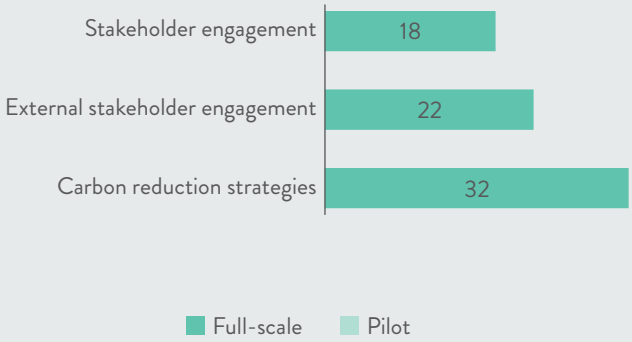


Figure 2.5: Awareness and action



5) AWARENESS AND ACTION

The final cluster looks at two sets of actions that focus on raising awareness and communication with stakeholders (both internal and external), as well as those that concern a reduction in targets to improve operational performance and large-scale strategic plans that link land use and public transport. Figure 2.5 provides a snapshot of these actions.

STAKEHOLDER (INTERNAL AND EXTERNAL) ENGAGEMENT

Energy saving measures typically focus on technological solutions, but stakeholder engagement can also play a big role in changing behaviour. Staff engagement is citied as an area where planned activities can result in potential savings without the need for significant investment (it is generally accepted that a minimum of 10% and up to 40% of an organisation's energy use is wasted due to staff behaviour).

Much can be done to recognise best practice and exchange of learning within the sector. This is the objective of the UITP Sustainability Charter, launched in 2003. The APTA (American public Transport Authority) Sustainability Commitment was launched in 2009. Incentive schemes, such as that of the public transport provider in Bremen, Germany, use reward systems for reaching targets, which will help to increase energy efficiency per customer by up to 50% by 2020. Hamburg, Germany, also uses incentives for its supply chain as a means of ensuring the use of cleaner locomotives.

Information is a powerful tool for making public transport more attractive for users. The city of Alba Iulia, Romania, will soon have an integrated information service, ticketing scheme and a unique real-time journey planner, the first in the country. Initial tests of the scheme have showed that at least 210 cars were displaced daily from peak hour traffic. By maintaining this project in the coming years, the city expects to save at least 535 tonnes of CO_2 emissions per year. Another great example is in Bangalore, India, where every year, the local community is engaged on World Environment Day, to raise awareness of the environmental benefits of public transport.

CARBON REDUCTION STRATEGIES

The final action area identified concerns major transport plans for the future. Central to these plans is stakeholder and community engagement. The Vivapolis charter which includes Transdev[46] and the establishment of voluntary agreements between governments and Catalan organisations in Spain will help share knowledge and innovation with cities and offer further opportunities.

The public transport organisation in Brussels, Belgium, aims to reduce its direct and indirect emissions by 40% for journeys undertaken on its network (reference year 2010). In terms of direct emissions alone, this reduction will rise to 50%. In order to achieve that goal, no fewer than 50 actions[47] have been identified, covering rolling stock to buildings, purchases, a mobility plan for its workers, waste and the production of renewable energy. This will contribute to a 5% reduction in overall passenger transport emissions in the Brussels Capital Region. In addition, the public transport operator of Berlin, Germany has introduced a carbon reduction strategy that will help **reduce 400,000 tonnes of CO_2**.

A number of other organisations have also set targets for reducing emissions on their networks; in Hong Kong, the target is a 21% reduction by 2020. In Montreal, Canada, STM's goal is a 20% reduction by 2020 while in London, UK, the public transport authority has a target of 40% reduction by 2025 (2013 baseline).

Urban development also features in the plans; the IPCC report on climate mitigation[48] recommends that investing in public transport can help link urban and economic development in order to generate sustainable cities and low-carbon transport networks. As urban areas become denser and rely more on public transport, carbon emissions are reduced. One example is Curitiba, Brazil, and the strategy of Transit-Oriented Development (TOD) based on their successful BRT system.

The urban mobility strategies adopted by cities will be dependent on existing infrastructure, the quality of its municipal administration and the current state of its economy. Small cities like El Torno, Bolivia (circa. 0.05 million inhabitants) to huge cities such as New York[49] (circa. 8.5 million inhabitants) are all looking at promoting plans that encourage urban and regional development tailored to the needs of local public transport. These initiatives aim to encourage walking and cycling and building more compact and efficient cities. In fact, many of the pledges and climate commitments include some element of urban planning and coordination between different transport modes, helping create a sustainable transport system that is appealing, efficient and easy to use.

39 Valley Metro Solar Project
40 press release
41 JR East CSR
42 ECCO2
43 SNCF Ecofootprint
44 See Ticket to Kyoto
45 MTR Sustainability
46 Vivapolis
47 Carbon strategy
48 IPCC Report
49 Smart Growth/TOD

Cities worldwide with the 'best' liveable, green and high socio-productive systems have an integrated mobility system with public transport at its core.[50] On the ground, both policy and practical measures will need to come together to directly and indirectly shape people's travel behaviour and to encourage them to choose sustainable transport options. For all of this to happen, it is essential to have a clear urban mobility strategy in place, driven by visionary leadership. A number of pledges stand out in this regard; in Sweden, a goal to double the market share of public transport compared with 2006 is set to be achieved by 2030. This will mean an increase in the market share held by public transport from 18 per cent in 2006 to 36 per cent in 2030.[51] In Helsinki, Finland[52], their vision for 2025 hopes to promote public transport as the number one choice for travel.

Copenhagen City Council, the EU Green Capital in 2014, has decided to make the city the first carbon-neutral capital in the world by 2025. Transport causes a large proportion of the total carbon emissions and Copenhagen has set a goal that by 2025, at least 75% of all trips will be undertaken by foot, bike or public transport. This demonstrates the fundamental role that sustainable transport choices play in reducing emissions and delivering city goals. In Belgrade, Serbia, in order to improve the economic and environmental efficiency of their mobility network, the city is providing a combined mobility offer with public transport as the backbone. The goal is to increase the market share of passenger transport in the city from 50% to 60% by 2025. Lastly, UTAH Transit Authority's 2020 Strategic Plan[53] outlines an ambitious goal of doubling ridership by the year 2020. The climate change and air quality benefits that will result from this plan are significant and include the **removal of over 333,000 tonnes of pollutants**, thanks to changing travel patterns in the Salt Lake City region.

CONCLUSIONS

Public transport undertakings have considerable scope to expand their service offer, and are already taking significant steps to reduce emissions from the transport sector. It is clear that investing in public transport networks makes sense.

Public transport is central to *avoiding* or reducing trips, *shifting* to more environmentally-friendly modes of transport and *improving* the efficiency of all modes of transport while at the same time making great efforts to improve its already excellent carbon performance.

What these pledges and climate commitments show is that public transport systems are the backbone of sustainable, urban low-carbon transport.

These pledges are just the tip of the iceberg when it comes to what the sector is doing, and will continue to do, on climate action. Showcasing these activities provides a positive context for international climate negotiations, showing that action on climate change at the local level is scaling up and that it will continue to do so. UITP will continue to showcase its members' new efforts in the build-up to Paris 2015 in the hope that these actions will leverage wider action on low-carbon transport, both within the scope of the UN 2014 Climate Summit and beyond. These types of actions across the entire urban transport sector can result in savings of USD70 trillion by 2050.[54]

50 Arthur D Little The future of urban mobility 2.0
51 The Swedish Roadmap
52 HSL Strategy
53 UTA Strategy Plan 2020
54 International Energy Agency: Report – A tale of Renewed Cities

ANNEX

Organisations included in this analysis:

ARGENTINA
- ENTE DE LA MOVILIDAD DE ROSARIO

AUSTRALIA
- BRISBANE TRANSPORT

AUSTRIA
- GRAZ KÖFLACHER BAHN UND BUSBETRIEB (GKB)
- INNSBRUCKER VERKEHRSBETRIEBE UND STUBAITALBAHN GMBH (IVB)
- LINZ LINIEN GMBH FÜR ÖFFENTLICHEN PERSONENNAHVERKEH
- WIENER LINIEN GMBH & CO KG

BELGIUM
- SOCIETE DES TRANSPORTS INTERCOMMUNAUX DE BRUXELLES (STIB/MIVB)
- ASSOCIATION OF THE EUROPEAN RAIL INDUSTRY (UNIFE)
- VAN HOOL NV
- VLAAMSE VERVOERMAATSCHAPPIJ VVM DE LIJN

BOLIVIA
- MINISTERIO DE OBRAS PUBLICAS SERVICIOS Y VIVENDA

BRAZIL
- ASSOCIACAO NACIONAL DOS TRANSPORTADORES DE PASSAGEIROS SOBRE TRILHOS (ANTPRILHOS)
- COMPANHIA DO METROPOLITANO DE SAO PAULO - METRO
- CONCESSAO METROVIARIA DO RIO DE JANEIRO SA (METRO RIO)
- CONSORCIO METROPOLITANO DE TRANSPORTES - AUTOPASS (CMT - AUTOPASS)
- ELEKTRO
- EMPRESA MUNICIPAL DE DESENVOLVIMENTO DE CAMPINAS SA (EMDEC)
- FEDERACAO DAS EMPRESAS DE TRANSPORTES DE PASSAGEIROS DO ESTADO DO RIO DE JANEIRO (FETRANSPOR)
- GRUPO CCR S/A
- INSTITUTE FOR TRANSPORTATION & DEVELOPMENT POLICY (ITDP)/BRT TRANSOESTE
- MINISTERIO DAS CIDADES - SECRETARIA NACIONAL DE TRANSPORTE E DA MOBILIDADE URBANA
- SISTEMA DE TREN ELECTRICO URBANO (SITEUR)

BULGARIA
- STOLICHEN ELEKTROTRANSPORT PLS

CANADA
- AGENCE METROPOLITAINE DE TRANSPORT (AMT)
- SOCIETE DE TRANSPORT DE LAVAL (STL)
- SOCIÉTÉ DE TRANSPORT DE MONTRÉAL (STM)
- TORONTO TRANSIT COMMISSION (TTC)
- METROLINX

CHINA

- MASS TRANSIT RAILWAY CORPORATION LIMITED (MTRC)

COLOMBIA

- EMPRESA DE TRANSPORTE DEL TERCER MILENIO TRANSMILENIO S.A.
- SOCIEDAD INTERNACIONAL DE TRANSPORTE MASIVO (CIUDAD MOVIL SA)

CZECH REPUBLIC

- DOPRAVNI PODNIK HLM PRAHA AS (DP PRAHA)

DENMARK

- CITY OF COPENHAGEN
- MOVIA PUBLIC TRANSPORT - TRAFIKSELSKABET MOVIA

FINLAND

- HELSINKI REGIONAL TRANSPORT (HSL)

FRANCE

- RÉGIE AUTONOME DES TRANSPORTS PARISIENS (RATP GROUP)
- SOCIETE NATIONALE DES CHEMINS DE FER FRANCAIS (SNCF)
- SYSTRA
- TRANSDEV GROUP

GERMANY

- BERLINER VERKEHRSBETRIEBE (BVG)
- BOCHUM-GELSENKIRCHENER STRASSENBAHNEN AG (BOGESTRA)
- BOMBARDIER TRANSPORTATION
- BREMER STRAßENBAHN AG (BSAG)
- BUNDESVERBAND CARSHARING E.V (BCS)
- DRESDNER VERKEHRSBETRIEBE AG (DVB)
- HAFTPFLICHTGEMEINSCHAFT DEUTSCHER NAHVERKEHRS- UND VERSORGUNGSUNTERNEHMEN (HDN)
- HAMBURG PORT AUTHORITY
- HAMBURGER HOCHBAHN AG (HHA)
- HEAG KONZERN-MOBILO GMBH
- HÖFT & WESSEL - ALMEX AG
- KASSELER VERKEHRS- UND VERSORGUNGS-GMBH (KVVKS)
- KNORR-BREMSE
- KÖLNER VERKEHRS-BETRIEBE AG (KVB)
- LEIPZIGER VERKEHRSBETRIEBE GMBH (LVB)
- MAGDEBURGER VERKEHRSBETRIEBE GmbH (MVB)
- MOBIEL
- MÜNCHNER VERKEHRSGESELLSCHAFT (MVG)
- STADTWERKE MÜNSTER GMBH (SWMS)
- STADTWERKE OSNABRÜCK AG VERKEHRSBETRIEBE
- STUTTGARTER STRASSENBAHNEN AG (SSB)
- ÜSTRA HANNOVERSCHE VERKEHRSBETRIEBE AG
- VERKEHRS- UND TARIFVERBUND STUTTGART GmbH (VVS)
- VERKEHRSVERBUND OBERELBE GmbH (VVO)

HOLLAND
- CONNEKT
- PROVINCIE GELDERLAND
- ROTTERDAMSE ELEKTRISCHE TRAM (RET)

HUNGARY
- BUDAPESTI KÖZLEKEDÉSI KÖZPONT (BKK)

INDIA
- BANGALORE METROPOLITAN TRANSPORT CORPORATION (BMTC)

IRELAND
- RAILWAY PROCUREMENT AGENCY (RPA)

ITALY
- AZIENDA TRASPORTI BERGAMO SERVIZI S.P.A. (ATB SERVIZI)
- CONSORZIO TRASPORTI E MOBILITÀ CAGLIARI S.P.A (CTM)
- ASSOCIAZIONE TRASPORTI (ASSTRA)

JAPAN
- EAST JAPAN RAILWAY COMPANY (JR EAST)

LEBANON
- TEAM INTERNATIONAL

LIECHTENSTEIN
- VERKEHRSBETRIEB LIECHTENSTEINMOBIL (LIEMOBIL)

LUXEMBOURG
- SALES-LENTZ AUTOCAR SA. (SLA)

MEXICO
- DINA CAMIONES
- SISTEMA DE TREN ELECTRICO URBANO (SITEUR)

MOROCCO
- CASABLANCA TRANSPORT SA (CASA TRANSPORT)

NORWAY
- RUTER AS

POLAND
- PRZEDSIEBIORSTWO KOMUNIKACJI TROLEJBUSOWEJ SP.ZO.O (PKT)

PORTUGAL
- CARRIS - LISBON
- METROPOLITANO DE LISBOA

ROMANIA
- SOCIETATEA DE TRANSPORT PUBLIC ALBA IULIA (STP SA)

RUSSIA
- MOSCOW METRO
- SAINT PETERSBURG METRO
- TRANS-ALFA ELECTRO

SENEGAL
- CONSEIL EXECUTIF DES TRANSPORTS URBAINS DE DAKAR (CETUD)

SERBIA
- GSP BEOGRAD-CITY PUBLIC TRANSPORT COMPANY

SINGAPORE
- LAND TRANSPORT AUTHORITY (LTA)

SPAIN
- CONSORCIO DE TRANSPORTE METROPOLITANO AREA DE GRANADA (CTAG)
- FERROCARRILS DE LA GENERALITAT DE CATALUNYA (FGC)
- TRANSPORTS METROPOLITANS DE BARCELONA (TMB)

SWEDEN
- CITY OF GOTHENBURG
- X2 KOLLEKTIVTRAFIK AB
- VÄSTTRAFIK AB

SWITZERLAND
- BERNMOBIL - STÄDTISCHE VERKEHRSBETRIEBE BERN (SVB)
- REGIONALVERKEHR BERN-SOLOTHURN (RBS)
- TRANSPORTS PUBLICS FRIBOURGEOIS (TPF)

UNITED KINGDOM
- ABERDEEN CITY COUNCIL - ABERDEEN HYDROGEN BUS PROJECT
- CENTRO
- GO-AHEAD GROUP
- LOTHIAN BUSES
- NEXUS
- RAIL SAFETY AND STANDARDS BOARD (RSSB)
- STAGECOACH GROUP
- TRANSPORT FOR GREATER MANCHESTER (TFGM)
- TRANSPORT FOR LONDON (TFL)
- WEST OF ENGLAND LOCAL ENTERPRISE PARTNERSHIP

UNITED STATES OF AMERICA
- AMERICAN PUBLIC TRANSPORTATION ASSOCIATION (APTA)
- KING COUNTY METRO
- METROPOLITAN TRANSPORTATION AUTHORITY (MTA)
- SAP AMERICA INC
- TRIMET
- UTAH TRANSIT AUTHORITY
- VALLEY METRO
- WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY (WMATA)

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