



**PREVIEW
EDITION**

containing
executive summary,
selected investment cases,
city profiles and
methodology.

The Mobility Opportunity

Improving public transport to drive economic growth.

PUBLIC SUBWAY

UNDERGROUND

PUBLIC SUBWAY



We're all over London
THE BIG BUS COMPA





1. Foreword

Siemens foreword

Urban decision makers often cite transport among their top challenges. Around the world, public transport systems are ageing, underdeveloped or simply unable to cope with the demands of a growing mobile population. In a global economy, where cities compete for investment and talent, it is not only the quantity, but the quality of transport that matters.

Limited funds and resources are an obvious constraint to transport development. Yet investing in transport improvements would bring benefits for commuters and business, drive productivity and stimulate new economic activity. Being unable to quantify what the potential economic benefits would be makes it hard to make the case for investment.

That is why Siemens commissioned strategic consultancy Credo to establish both the economic cost of inefficient transport and the potential economic benefits of investing in public transport improvements. This is the first research of its kind to quantify the economic benefits on a global scale and to show that investment pays off. As a first step, it is indicative in nature and more detailed research would be required on a city-by-city basis in order to establish the level of investments that are necessary.

By presenting this research, we hope to offer guidance on the kinds of transport investments and technology solutions that will deliver the greatest economic impact, as urban decision makers strive to make their transport systems future-proof.

Dr. Roland Busch,
*Member of the Managing Board Siemens AG,
CEO Siemens Infrastructure & Cities Sector*

Credo foreword

As a consultancy with a strong transport focus, Credo was delighted to be asked by Siemens to research the economic potential of transport investment. Numerous studies have been carried out on the strengths and weaknesses of transport provision in different cities. Work by the International Union of Public Transport (UITP) through the Millennium Mobility project demonstrated the value of benchmarking transport networks, and this has since been taken forward by member organisations – such as the Community of Metros (CoMET) and the Nova group of metros – and academic and commercial reports.

However, the work to date has had important gaps. First, it has not always provided clear guidance on the *key value drivers* of addressing different parts of the mobility challenge – for example the balance between quantity and quality. Second, it has not always reflected the *future mobility challenges facing cities* – the key macro trends of population growth and urbanisation which

mean cities have to plan for the future. Third, it does not articulate the *economic value* of the mobility challenge. Cities have competing challenges on limited resources, and the value needs to be clear in order to make the case for investment

As a result, there is a lack of focus on the *total economic opportunity* which can be realised through improvements to urban transport systems, bringing together the objectives of greater capacity and quality of transport, and considering the future demands on cities' infrastructure. This study aims to address these issues.

Credo's approach to work is data-driven and rigorously analytical; in this study, we have applied these methods to offer cities a clear insight into the opportunities available to them. Whilst each city must develop its own strategy for success, understanding the scale of the benefits is an important first step down this road.

Chris Molloy,
*Managing Partner,
Credo Business Consulting LLP*



“Efficient transport can attract economic activity to cities, and boost productivity by improving connectivity and reducing time lost to travel”

2. Executive Summary

Why transport matters

Transport plays a key role in economic growth

Cities account for around 80% of the world's economic output, and drive an even higher share of global growth. However, in a globalised economy, with businesses and workforces increasingly able to relocate internationally, they must compete to offer the most attractive environment for economic activity. Transport plays a key role in this.

Efficient transport can attract economic activity to cities, and boost productivity by improving connectivity and reducing time lost to travel. Better transport can also improve quality of life. Making a city more attractive to live in helps provide business with the labour force to create its products and buyers to consume them, and so fuels economic growth. Conversely, inefficient transport networks represent a cost to cities and their inhabitants – both in economic and welfare terms – through productive time lost to travel and through poor-quality service.

Transport networks in cities are increasingly under pressure

Growth in the world's population and increasing migration to major cities will place ever more strain on cities' transport networks. In the 35 global commercial centres analysed in this study, the commuting population for public transport will increase by over 40% between now and 2030. The scale of the future demand challenge varies hugely between cities. As figure 1 shows, cities in the developing world like Lagos and Delhi will face more rapid growth than those in the West.

Cities face differing challenges

Population growth challenges the transport infrastructure of cities in different ways. In some of the world's largest

cities, such as London or Paris, infrastructure was built the best part of a century ago, to meet vastly different demands from a population with different expectations. These well-established cities face a need to upgrade and supplement existing infrastructure to meet modern requirements.

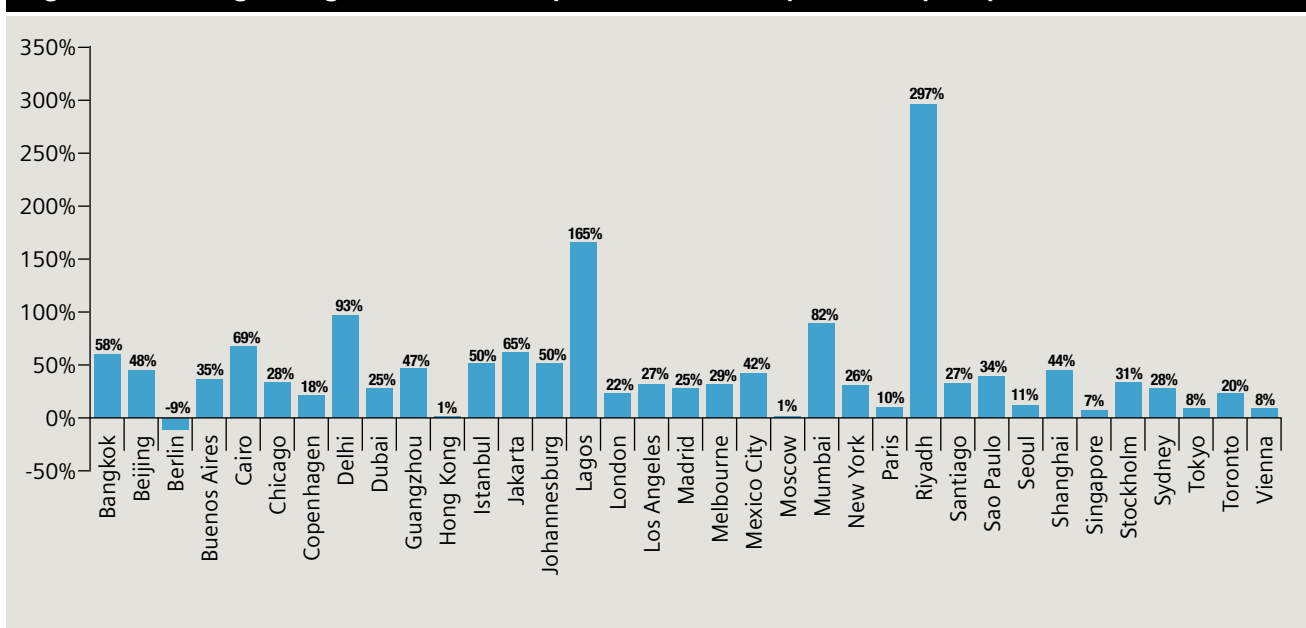
In other cities, such as Tokyo and Seoul, relatively recent wealth has created high density, compact centres, where infrastructure is more modern. These cities face the challenge of keeping pace with rapidly growing demands on the transport network.

Less wealthy, emerging cities such as Cairo or Delhi are less likely to have invested in infrastructure historically, and face rapidly growing populations that lack mobility. Some cities like Santiago have been able to invest to build efficient networks with sufficient capacity, positioning them for future growth. In other cities such as Lagos, the challenge is very different, as investment capabilities are constrained, threatening to limit future growth.

A unique study

This study is unique in seeking to put an economic value on the cost of inefficient transport to a city's economy and in turn, the economic benefits investing in transport improvements would bring. It quantifies the economic costs by calculating the true cost of commuting: considering factors such as journey time, the value of time, fare, crowding levels, ease of using the network, service reliability, user functionality and so on. This reflects the efficiency and speed with which a journey can be undertaken in a given city, capturing the knock-on effects on productivity. Investing in transport to reduce this

Figure 1: Percentage change in the volume of peak commuters on public transport (present - 2030)



cost would bring benefits for commuters and business, drive productivity and stimulate new economic activity as a city becomes better connected and more attractive.

To put a value on the economic benefits referred to above, the study analyses the performance of transport networks of 35 commercially important centres across six continents, both now and in 2030. We consider 2030, since due to the lead times of major transport projects, this is a reasonable timescale for cities to address their challenges, and attempt to unlock the benefits highlighted. To reflect different levels of wealth and development, we assess cities in three categories: ‘well-established’ cities, ‘high-density compact centres’ and ‘emerging cities’. Comparing cities to the leading examples in their categories, we determine the economic cost of sub-optimal transport and consequently the economic uplift if cities were to improve transport to the levels of the leading examples. The economic uplift includes benefits to public transport commuters, road users, businesses, and the wider economic impact in terms of increased productivity and new economic activity. To help urban authorities identify how they might access this uplift, we provide in-depth case studies from global cities, as well as key pointers for investment strategies.

This study focuses solely on public transport. While pedestrian, bicycle and car infrastructure are also important, public transport is a key part of the solution to the mobility challenge and thus merits a specific focus. In our analysis the transport network includes all forms of mass transit in a city such as bus, rail and light rail. For the most part the city population is typically that of the metropolitan area, with a few exceptions where we used the population of the “city proper” as this more closely represents the area served by the transport network. Data are drawn from a wide range of publicly available sources, using a single source for each metric where possible and using proprietary research where published data sets were unavailable. The economic modeling used to quantify the costs and benefits has been verified by an independent third party, Connected Economics.

Key findings

Cities that invest in transport will reduce economic costs and drive economic growth.

The potential impact from investment is clear: cities with plans in place will see the economic cost of transport fall, as well as drive economic growth. For example Paris’ large scale

investment in 200 km of new metro line will help to drive down its economic cost of transport by roughly one percentage point from 14% to 13% GDP per capita and generate annual economic benefits including wider economic impacts of \$2.7bn. With this level of potential economic benefit, it would take roughly 10 years to pay back the estimated investment cost of \$27bn, and in addition generate an economic value add of \$55bn over the estimated 30 year life of the project. And yet, even for those cities with strong future plans, there are still further opportunities to gain economic benefits from investments in transport improvements.

The economic costs of transport range from 9% to 28% of GDP per capita – and will generally rise by 2030

Current costs of transport range from about 9% of GDP per capita in Copenhagen to about 28% in Lagos. For many cities, the economic cost of transport is forecast to increase by 2030. Where cities have not already put plans in place to react to increased demand by 2030, or where current plans are insufficient, transport costs will consume an increasingly large portion of economic output. For instance, taking into account known investments, the cost of transport in New York is forecast to increase from 15% to 18% GDP per capita. Conversely Paris, which, as seen above, has clear plans in place, will see the economic cost of its transport decrease.

Greater transport efficiency across the 35 cities in our study would boost GDP already today by \$119bn, and by circa \$238bn annually by 2030

Our analysis suggests that if all the cities in the study invested to make their transport networks as efficient as the relevant ‘best in class’, the current economic benefit would be worth \$119bn annually. The cities that stand the most to gain in absolute terms today are Tokyo (\$15.4bn), Moscow (\$14.1bn), London (\$11.9bn), Paris (\$10.6bn) and New York (\$9.8bn) on an annual basis. Rising populations, labour force engagement and wealth will increase the gain, and so by 2030, the economic benefit will be worth \$238bn annually (in current prices).

The potential economic opportunity from investing in transport in cities globally could be as much as \$800bn, or around 1% of global GDP

Extrapolating to all relevant cities globally suggests an economic opportunity of almost \$800bn – equivalent to almost 1% of global GDP – on top of which would come further social and environmental benefits (see figure 2). Without investment in their transport networks, cities will be unable to unlock this opportunity cost, and face being

Figure 2: Economic opportunity through investment in transport

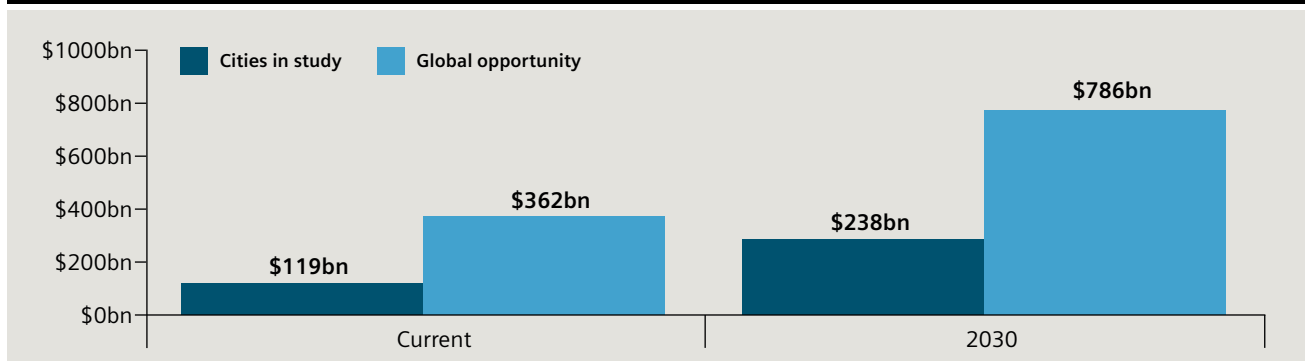


Figure 3: Leading cities by present economic cost of transport (percentage of GDP per commuter)

Well-established cities		High-density compact centres		Emerging cities	
Copenhagen	8.6%	Singapore	8.9%	Santiago	10.8%
Madrid	8.7%	Hong Kong	9.2%	Mexico City	12.2%
Vienna	9.7%	Beijing	11.0%	Bangkok	12.6%
Range	9-19%	Range	9-16%	Range	11-28%

left behind in the competition for growth. The investment needed to address the future mobility challenge will often be high, but some cities have found relatively low cost ways of improving their transport systems. Furthermore, the benefit of improvement is a permanent increase in GDP. When discounted over a 30 year period the global benefits could be almost \$15trn, making the case for investment in transport highly compelling.

Copenhagen is the best-performing city overall; Singapore and Santiago top their respective categories

Copenhagen’s transport network is the most cost-efficient of the cities in this study. Its performance is driven by the capacity of its network and the strength of its plans, which include adding two new metro lines. These rigorous plans will help ensure that the cost of transport does not rise by 2030, even with increased demand.

Among high-density compact centre cities, Singapore’s system is the best in class (see figure 3), particularly due to its strong governance and high capacity. Santiago is the best performer within the emerging cities category. Over the past twenty years, it has expanded its metro to meet the changing demands of its population, modernised its ageing bus network, and created a modern, integrated mass-transit network.

Leading cities share efficiency, broad coverage, integration and clear planning

The best networks minimise the time passengers spend travelling and optimise their daily lives. The leading cities in our study – like Copenhagen and Singapore – show common attributes. They provide efficient transport networks with sufficient capacity to minimise crowding, and broad coverage to ensure convenience. Modern rolling stock and infrastructure helps to provide a reliable and frequent service. Fully integrated networks mean passengers can make multi-modal journeys using the same payment system, planned through joined-up journey planners. They also have clear plans to address future demand.

Pointers for investment strategies

As all cities are likely to require investment across a range of areas, rather than make specific recommendations – which must be tailored to a particular city’s requirements, potential economic benefits, and ability to invest – we propose a number of pointers.

The scale of economic benefits should dictate the level of investment

In larger, wealthier cities, the cost of inefficient transport is

higher, and so large-scale, high-value projects can be justified – like the estimated \$27bn that Paris plans to invest in its metro network. For less wealthy cities, investment should focus on incremental improvements and other low-cost options to maximise existing capacity – for example Sao Paulo integrated fares and introduced priority measures for buses.

Using technology to improve quality may be the best route to economic uplift

Investing purely in new capacity may not be the most efficient way to realise benefits. Certainly, in cities like Cairo where capacity is a major constraint, adding new lines and increasing seats should be the focus. However, in cities like Stockholm or Berlin capacity is adequate and it would be better to invest in quality. Technology can maximise the potential of existing systems. This might include modern communications-based train control (CBTC) signalling to increase reliability and train frequency, or integrating technology such as shared payment systems to encourage customers to use multiple modes and so ease the burden on high congestion routes. Technology can also improve the customer experience, e.g. introducing WiFi, helping to drive increased public transport usage.

Urban rail networks are a key way to meet demand for larger cities which can afford them

Although urban rail development requires significant investment, it forms the basis of all of the most cost-efficient systems in our study, such as Copenhagen, Santiago, and Singapore, and is a key feature of those cities with strongest future plans, such as Riyadh. Despite the outlay, the economic benefits can be significant, particularly for larger or wealthier cities, or those facing more major capacity challenges.

Governance should be effectively integrated to create successful plans and bring them to fruition

Cities with effective transport networks (such as Singapore) and those that have been able to plan clearly for the future (such as London) have integrated governance and planning capability. For example, Singapore’s 2013 Master Plan updates a previous long-term plan from 2008, and lays out clear plans to 2030 across all modes of transport, whilst the Mayor’s Transport Strategy sets out plans for London as far as 2031.

Cities should act now

The benefits of investment appear clear, but the timescales for major transport projects must be considered. Unless cities act to address the inefficiencies in their transport networks, the economic costs of transport will rise by 2030 as highlighted. Cities can invest in their transport networks in a range of ways and should not be afraid of the upfront investment cost, since the economic benefit is likely to repay that investment many times over.