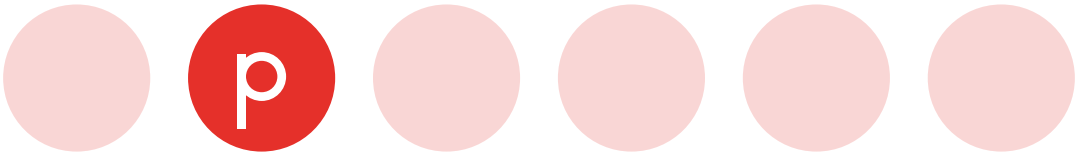
CIRCULAR ECONOMY IN CITIES



PLANNING EFFECTIVE TRANSPORT OF PEOPLE, PRODUCTS AND MATERIALS

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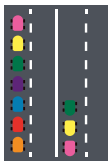
ARUP

Mobility is a key urban priority. It is central to how a city operates, and has a significant impact on quality of life, the local environment, and resource consumption. Effective urban mobility systems can be enabled by accommodating all modes of transport. The system can be further optimised by integrating mobility planning with the spatial planning while considering how products and services are produced and accessed.

CASE FOR CHANGE



2–5% of global GDP is lost due to congestion, by measures such as in lost time, wasted fuel, and increased cost of doing business[1]

50%

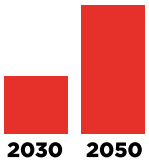
As much as **50%** of European inner-city land is devoted to roads and parking; but, even at rush hour, cars use only **10%** of urban roads[2]

90% of air pollution in cities is caused by vehicle emissions[3]

60% of air pollution from urban road transport comes from freight[4]

86%

86% of delivery vehicle parking is illegal because of a lack of loading spaces[5]



In a business-as-usual scenario, total motorised mobility in cities will rise by **42%** by 2030 and **94%** by 2050 compared to 2015[6]

"The rationalisation of goods transport by pooling spaces and vehicles, as well as by linking up the territory, is essential for the growth of the circular economy."

Mairie de Paris, Paris Circular Economy Plan (2017)

EXAMPLES OF CIRCULAR ECONOMY OPPORTUNITIES

Compact city development for effective mobility

As outlined in *Buildings: Planning*, urban density and land-use patterns heavily determine transport habits. Compact cities are transit-oriented and dense with mixed-use neighbourhoods. These attributes create favourable conditions for both shared mobility options (e.g. buses, trams, ride-shares) and active mobility options (e.g. walking, bicycling), which subsequently have a broad range of benefits. In contrast, low-density, sprawling cities require increased mobility infrastructure and typically this sees a growth in the number of vehhicles in use, which results in more congestion, energy and resource consumption, and pollution.[7]

Urban freight strategies for effective reverse logistics and resource flows

In a circular economy, where goods and materials will increasingly circulate locally, effective urban freight and logistics are key. The development of urban freight strategies by city governments is essential to enable the provision of such services in a way that also supports parallel priorities for air quality, noise, waste, and economic growth.[8] Reaching beyond vehicles and infrastructure, these strategies can also plan for and support new practices and technologies e.g., the virtualisation of products (such as, music streaming), digital manufacturing, and underground vacuum (pneumatic) waste collection and sorting systems. This approach will help reduce the overall need for urban freight transport.

Infrastructure for zero-emission vehicles and energy storage

By 2022, more than 10% of urban vehicles will be electric or hybrids, which will require the rollout of supporting infrastructure such as charging points and stations.[9] The electrification of urban fleets should go hand-in-hand with a transition to renewable energy to reap the full benefits. Vehicle-to-grid infrastructure (or bi-directional chargers) allowing energy stored in vehicles to support local grids, could also be a part of the infrastructure transition. Re-use and recycling of EV batteries is a further element for consideration, keeping batteries in use, at their highest value, and avoiding pollution.[10] (See *City Case Study: Shenzhen*).

Using big data solutions to optimise mobility systems

One of the main advantages of urban mobility planning today is the availability of data and complex data-processing technology. Transport agencies and operators can use this wealth of data (such as commuter habits or the impact of events on transport) to inform the management, planning, and operation of a city's transport networks over time. Real-time data solutions can also be used to monitor and instantly regulate traffic flows in the form of dynamic pricing, route planning, and parking space allocation.[11]

EXAMPLES OF WHAT URBAN POLICYMAKERS CAN DO

Urban planning pertaining to transport, infrastructure and buildings, is very often within the remit of city governments. City governments therefore have a significant opportunity to reduce travel and freight distances through compact city development. Integrated **roadmaps and strategies** for all urban mobility, including freight, is also proving a key lever for ensuring effective logistics and resource flows. **Convening and partnering** with key stakeholders can lead to new solutions and innovations that support better asset use, such as battery reuse or big data solutions. Through **public procurement**, city governments can encourage zero-emission vehicles to spur innovation and improve the local environment. City data on urban traffic flows can provide valuable information for the identification of circular economy opportunities in urban **asset management** practices.

To explore further see **Policy Levers**

EXAMPLES OF LINKS TO OTHER SYSTEMS AND PHASES

Mobility: Designing Urban mobility plans can be influenced by and can influence vehicle and infrastructure design. For example, an integrated mobility plan that works to reduce heavy road freight deliveries can support the design of lighter road vehicles suitable for cities.

Products: Accessing An effective local products system is dependent on well-functioning delivery and collection services. Aligning freight strategies with the expansion of circular economy business models can be crucial.

RELEVANT CASE EXAMPLES

London's Walking Action Plan

By 2030, congestion is projected to cost London GBP 9.3 billion a year. To counter this, the city is rolling out an extensive transport plan, which includes a dedicated walking action plan aimed at adding 1 million additional walking trips a day. The city will invest GBP 2.2 billion to redesign streets, install better signposting and maps, add more pedestrian crossings, as well as improve public transport. Analysis shows that a walkable London is significantly more land-use efficient, can save up to GBP 1.6 billion in public healthcare costs, increase retail sales, reduce emissions, and increase social cohesion and living conditions.[12]

Paris' logistics hotels and inner-city green freight

Paris is bringing logistics facilities back into the city with the use of so-called 'logistics hotels' in high-density areas. These urban hotels help to reduce heavy vehicle use and the associated negative impacts, such as emissions and noise, while increasing the productivity of the delivery services. Parcels from suburban logistics centres are pooled at the 'logistics hotels' via freight train services or a limited number of larger delivery shuttle-trucks. From there deliveries are made in smaller, lower-emission vehicles such as electric tricycles that can carry up to 180 kg. The space in these 'logistics hotels' is rented out by the city at a favourable rate, but requires delivery firms to use low-emission transport modes. [13]

Reversing car-centric mobility in São Paulo

The city's 2014 urban masterplan includes a focus on the urban mobility system to expand public and active transport modes. The intention is for the measures in the plan to help increase the number of residents living near public transport from 25% in 2015 to 70% in 2025. The city allocated 30% of urban development funds towards this effort. The masterplan aims to unlock economic, societal, and environmental opportunities including supporting the provision of more affordable housing and improving economic opportunities for urban residents.[14]

Open data improves public, private, and active transport in London

With over 31 million journeys made in London every day, Transport for London (TfL) chollects vast amounts of anonymised data about how people, vehicles, and public transport move across its networks.[15] Through big data analytics, TfL are working on everything from optimising public transport lines, improving pedestrian conditions, monitoring air pollution, predicting changing transport patterns, supporting electric vehicle use, and decreasing road traffic accidents. The data is also publicly available to spur innovative solutions to the city's transport challenges. Almost 700 apps have been developed so far which are regularly used by over 40% of Londoners. In 2017, it was estimated that the release of TfL open data cost GBP 1 million, and generated annual economic benefits and savings of up to GBP 130 millions for travellers, the city, and TfL itself. Furthermore, the open data initiative directly supports around 500 new jobs, and indirectly another 230 jobs in the supply chain and the wider economy.[16]

Stockholm's integrated freight strategy

Stockholm has developed a dedicated freight strategy as one of six thematic plans that together constitute the city's mobility strategy. The plan has four objectives: to enable more reliable delivery times, facilitate the effective use of commercial freight vehicles, promote the use of clean vehicles, and advance the freight delivery system through collaborations between the city and other stakeholders. Concrete activities include improving possibilities for off-peak transport, increasing the use of waterways, increasing consolidation of logistics solutions and continuously building an understanding of how to improve the system through cross sector dialogue and data gathering.[8]

EXAMPLES OF BENEFITS

JOBS, SKILLS, AND INNOVATION

Creating jobs through public transport investment

The economic benefits of public transport investment include both direct job creation and indirect support for manufacturing, construction, and other economic activities. An investment of USD 1 billion in public transportation supports 36,000 local jobs in the US.[17]

Accessing employment

In Washington D.C., residents living in highly walkable areas can access 15–21% more local jobs, while also having better access to bus lines and parks than residents living in less walkable areas.[18]

HEALTH AND ENVIRONMENT

Reducing CO^2 emissions and pollution from cars

A car ban in central Pontevedra in Spain resulted in a 70% reduction in CO^2 emissions and less pollution.[19]

Reducing emissions from alternative freight solutions

By saving time and mileage, new urban freight delivery solutions can cut vehicle emissions by as much as 70%.[20]

Reducing obesity risk

Increasing levels of walkability in neighbourhoods decreases the risks of excess weight. A US study found that walking to work could decrease the risk of obesity by almost 10%.[21]

ECONOMIC PRODUCTIVITY

Reducing movement of trucks, storage, and costs

Underground pneumatic collection of household and commercial waste in the Jumeirah Beach Residence, Dubai, has reduced waste collection movement of trucks by 90%, space required for in building waste storage by 74%, and the cost of waste collection by 60%. Reductions have also been seen where they system has been retrofitted, such as in Bergen.[22]

Strengthening local economy

Pedestrianisation and a ban on cars in central Pontevedra in Spain resulted in increased sales in local retail stores and attracted approximately 12,000 new inhabitants to the city.[23]

Increasing freight efficiency

Redevelopment of the Southern Industrial Area (SIA) in Sydney into a genuine mixed-use area and relocation of some services could create regional freight efficiencies worth around AUD 6.5 million a year. This benefit comes from bringing supply chains closer together.[24]

Reducing costs and mileage

By using urban consolidation centres, companies could save costs up to 25% per parcel delivery and reduce delivery-related mileage by up to 45%.[25]

Positive return on active transport investment

In Amsterdam, the return on investment of improved bicycle infrastructure was estimated to be 1.5:1 while similar calculations for Delhi and Bogotá estimated the ratio to be 20:1 and 7:1 respectively.[26]

COMMUNITY AND SOCIAL PROSPERITY

Increasing personal mobility

Compact development and urban mobility planning in Curitiba has enhanced the affordability of public transport making it possible for the average low-income family to spend only around 10% of its income on transport, which is comparatively low in Brazil.[27]

Reducing crime

In Kansas City, crime in Kessler Park dropped by 74% in the year that the 2.6 miles around it were designated a car-free zone on weekends.[28]

Increasing social cohesiveness and quality of life

Empirical studies confirm lower levels of traffic in residential areas increase people's quality of life and strengthen the local community. For example, people on low-traffic streets have more friends and acquaintances from the same street than people living in areas of higher traffic.[29]

Revitalising designated areas

By restricting vehicle use in identified road grids (superblocks) within Barcelona, 60% of the land that has to date been dedicated to cars, is being turned into 'citizen spaces' leading to the revitalisation of the local area.[30]

RESOURCE USE

Reducing resource use

Urban form and spatial structure are strongly related to resource use. Compact city development can:

- Reduce the (relative) need for new urban land
- Reduce energy use for transportation by reducing distances and encourage use of public transport
- Increase the efficiency of infrastructure in general and contribute to a reduction in resource consumption (e.g., in infrastructure construction, where fewer metres of infrastructure are necessary to supply the same number of users)[31]

Increasing land-use efficiency

Through changes such as shifting land-use patterns, taking advantage of inner-city vacant land, and promoting compact urban growth, land use can be reduced by as much as 75% compared with a sprawl scenario.[32]

Reducing delivery vehicle numbers

In densely populated cities in developed countries, implementing freight measures such as consolidation centres, load pooling, autonomous electric vehicles, parcel lockers and bike couriers, could lead to a third fewer vehicles on the road due to more efficient routing and fewer failed deliveries, as well as reduced delivery costs per parcel of 35%.[33]

Balancing the electricity system

When connected to the electricity grid, electric vehicle batteries could store power when generation is high and return it to the grid when use is high. Helping balance supply and demand in this way can reduce the amount of power generation capacity needed.[34]

ENDNOTES

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