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Urban Mobility

Challenge Definition - Summary

MCRIT





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What is Urban Mobility?

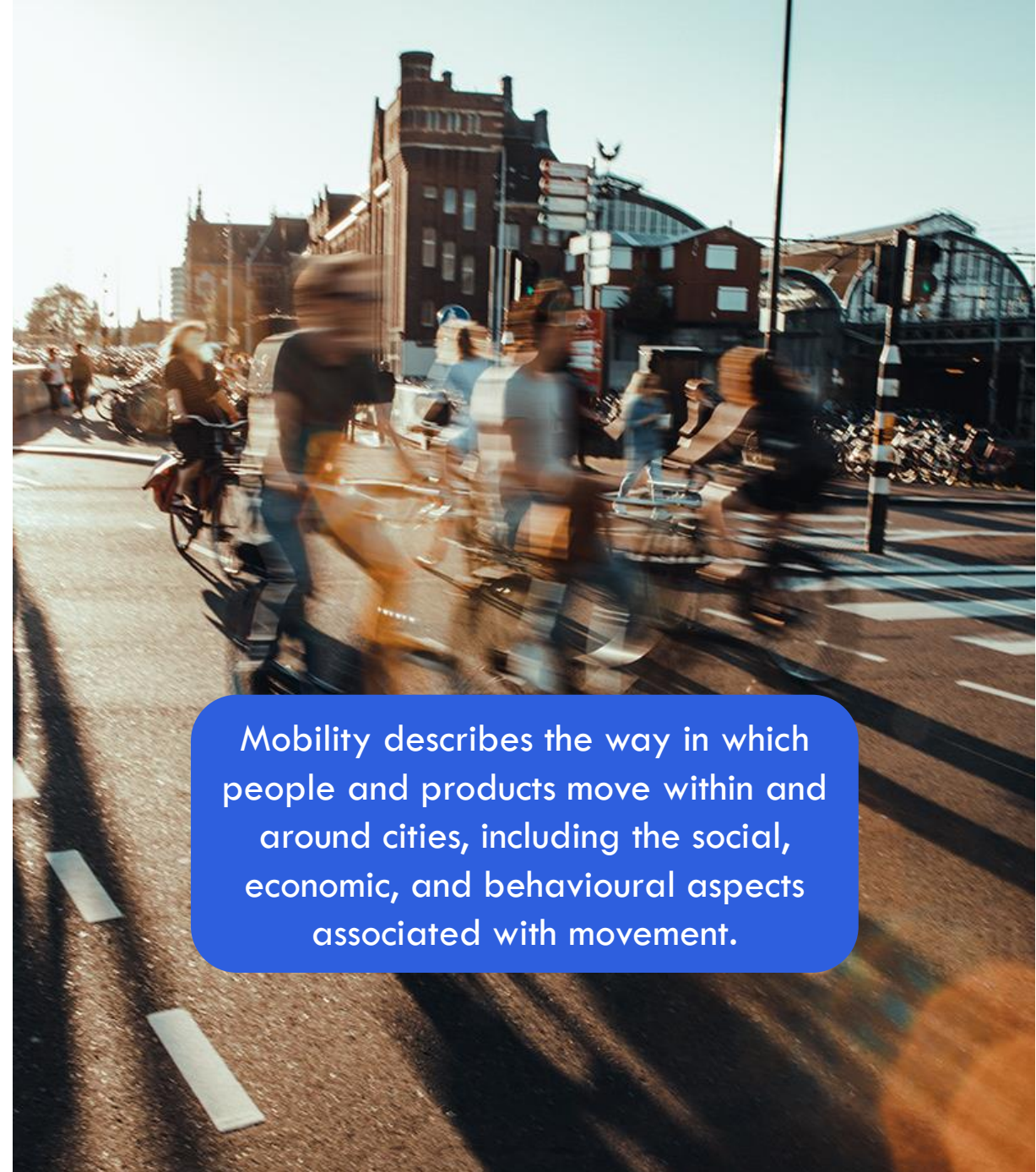


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What is Urban Mobility?

- Urban mobility encompasses the movement of people and goods within cities, viewed as a **fundamental aspect of urban development**.
- **Urban transport** pertains to the physical act of moving goods or people within a city while **urban mobility** emphasizes the ability to freely move or be moved, with a **key distinction being the emphasis on "ability."**
- This shift in terminology reflects changes in our economy: value creation has transitioned from vertically-integrated value chains to **laterally-scaled digital platform models** (subscription and access models).
- This transformation in language usage stems from the **growing emphasis on services and access** over ownership. E.g, Mobility-as-a-Service (MaaS) represents the shift from personal vehicle ownership to the utilization of "mobility solutions" offered as services.



Mobility describes the way in which people and products move within and around cities, including the social, economic, and behavioural aspects associated with movement.



Subcategories of Urban Mobility



Active Mobility

Active mobility is a form of transport that only uses physical activity. The most common forms of active mobility are walking and cycling.



Micro Mobility

Micro mobility is comprised of very light vehicles equipped with an engine. It includes, among others, electric scooters, skateboards, and bicycles, as well as solowheels.



Intermodality

Intermodality combines the best qualities of various modes of transportation in the different parts of the cities to complete one trip.



Mobility Infrastructure

Mobility infrastructure encompasses the physical structures that facilitates and constrains the movements of people, things, information, and energy.



Digital Technology

Digital technology includes the use of artificial intelligence, 5G, sensors and smart infrastructure in mobility development and infrastructure construction.



Subcategories of Urban Mobility (II)



Energy

The type of energy used in transportation systems is crucial to reducing the carbon footprint of mobility infrastructure.



City Logistics

City logistics encompass the movement of goods within a city, including services such as mail delivery and waste management.



Public Realm

Public realm represents a complex space of social interaction that is generally open and accessible to all citizens, and is seen as key to urban livelihood



Ecological Impact

Ecological impact of mobility refers to the emissions, pollution, and other environmental dangers that may be produced because of transportation.



Accessibility

Accessibility of transportation refers to who can utilize it. Mobility for all aims to improve physical and geographic accessibility for target groups and vulnerable travellers.



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Why do we care about Urban Mobility?



Why do we care about Mobility?

Socio-Environmental Impacts

Equity and Access

- Disparities in transportation access result in social exclusion, particularly affecting disadvantaged communities. In the UK, those with disabilities take 38% fewer trips than those without.
- Rapid changes in transportation can overlook the needs of disabled individuals, exacerbating exclusion.

Health and Wellbeing

- Air pollution leads to premature deaths from diseases like strokes, lung cancer, and heart attacks. Excessive noise in urban areas causes stress, sleep problems, and disrupts wildlife.
- Road accidents result in loss of life, injuries, and significant economic costs.
- Walking and cycling promote physical activity, reducing the risk of obesity and related health problems, while poorly connected transport systems can lead to social isolation and affect mental health.

Greenhouse Gas Emissions

- Urban mobility is a major source of greenhouse gas emissions, primarily CO₂ from fossil fuels, significantly impacting climate change.
- These emissions make up a substantial portion of a city's overall carbon footprint.

Urban Mobility

Air, Noise and Water Pollution

- Urban mobility emits harmful air pollutants like NO_x, VOCs, and PM.
- It also produces noise and vibrations, harming human well-being and ecosystems.

Energy Consumption

- Most cities worldwide are major contributors to transport-related emissions.
- Transportation represents 30% of global energy consumption (EEA, 2020).

Land Use and Infrastructure

- Storms or floods can destroy sacred spaces and cultural areas.
- Transportation projects may impact cultural heritage sites and urban identities.



Unequal effect on territories and society, depending on their degree of vulnerability



Why do we care about Mobility? (II)

Economic Impacts

Employment and Economic Productivity

- Transport industry employs 10 million people and contributes 5% to GDP (JR, 2023), with significant impact on growth and employment.
- Mobility facilitates the movement of goods and access to essential public services (i.e., education, health).
- Mobility also stimulates economic growth in remote regions.

Infrastructure Investments

- Investments in transportation infrastructure, like roads, bridges, and public transit, boost economic growth, create jobs, and improve connectivity, trade, and business attractiveness.

Cost of Externalities

- Environmental and social costs from transportation, like pollution and health impacts, create economic burdens.
- These burdens encompass healthcare expenses, environmental cleanup, and reduced quality of life.

Congestion Costs

- Traffic congestion leads to economic costs such as longer travel times, higher fuel consumption, and increased vehicle wear and tear.
- It also lowers worker productivity, raises transportation expenses, and hinders economic growth.

Tourism and Mobility Services

- Efficient transportation systems contribute to the growth of tourism and mobility service industries.

Urban Mobility



Unequal effect on territories and society, depending on their degree of vulnerability



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The Challenge in Europe



The Challenge in Europe

- Europe is confronted with a **range of interconnected demographic, public health, and environmental challenges** that are, at the same time, interrelated with mobility.

1

Changing Climate

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The Rise of Urbanisation

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Aging Population

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Balancing Efficiency, Quality of Life, and
Meaningful Journeys



1

Changing Climate

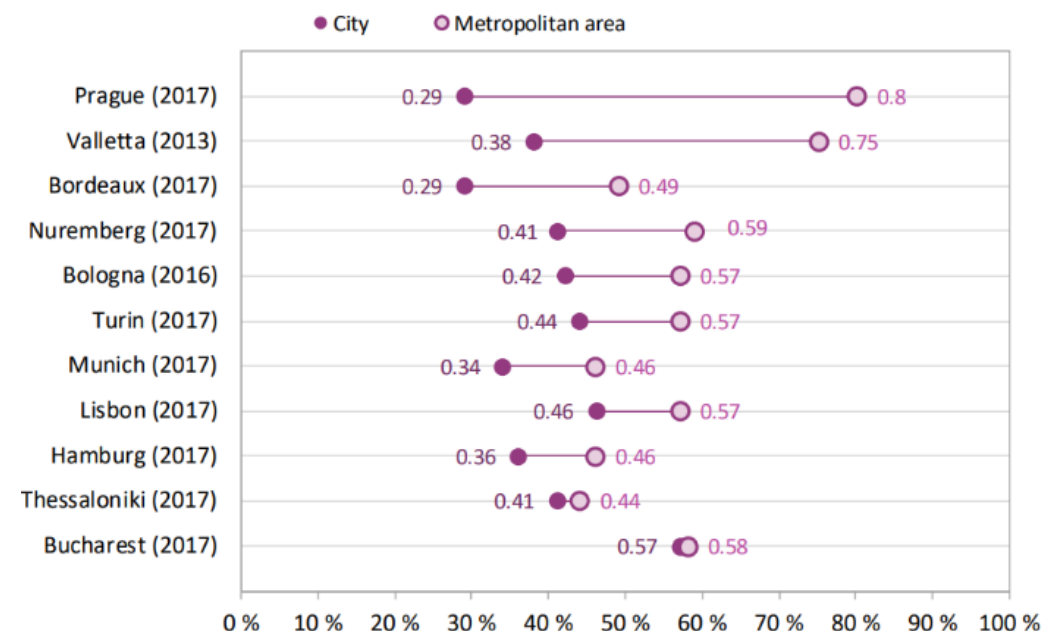
- The challenges posed by urban mobility structures are **exacerbated by climate change**.

Flooding	<i>Impact on underground structures and surface infrastructure, leading to erosion</i>
Pluvial Floods	<i>Traffic disruptions, congestion, and decreased road safety</i>
Heavy precipitation, hail, and high winds	<i>Impact on road transportation, increasing the risk of crashes and damage to vehicles</i>
Wildfires and heat waves	<i>Reduce visibility, worsen air quality, and pose health risks</i>

2

The Rise of Urbanisation

- In the next 30 years, about **one in three European cities could see a population increase of over 10% (JRC)**, leading to increased road traffic and use of public transport, potentially straining transportation capacities.



Modal share of private vehicles in 11 cities and metropolitan areas surrounding cities. Source: ECA on replies to its survey on urban mobility.

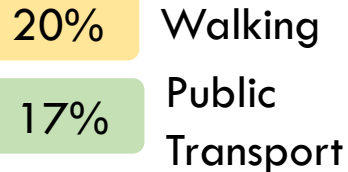


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Aging Population

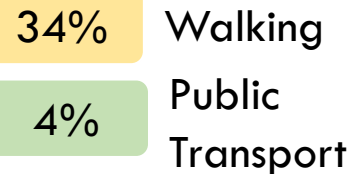
- The global society in which we all live is being transformed at an unprecedented pace: **population ageing** is now taking place in almost all the countries of the world.
- Age-related preferences shape transportation choices: **older generations spend more journeys walking**, while 18- to 24-year-olds utilize public transport more than any other group.

Younger generations



Modal split by age groups in the Netherlands

Older generations

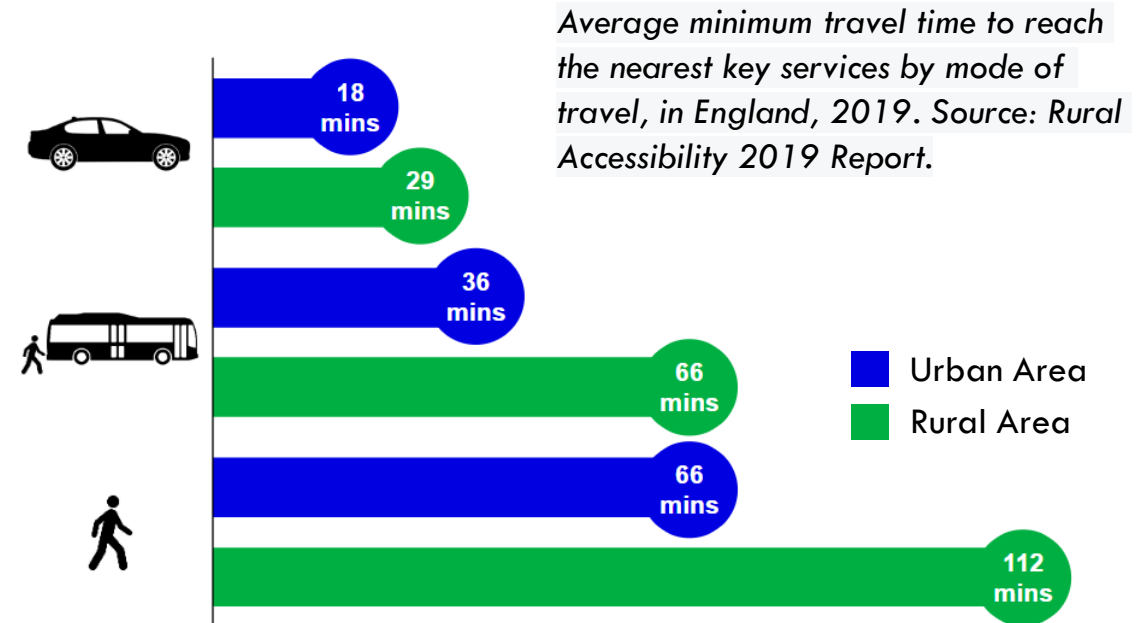


Source: Wegman & Aarts, 2005.

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Accessibility of Public Transport

- Access to public transport is typically good within cities, but **areas just beyond city limits often lack it.**
- People from these areas who commute to the city or suburbs often resort to **private vehicles** due to inadequate public transport coverage, highlighting the need for mobility solutions beyond city centers.





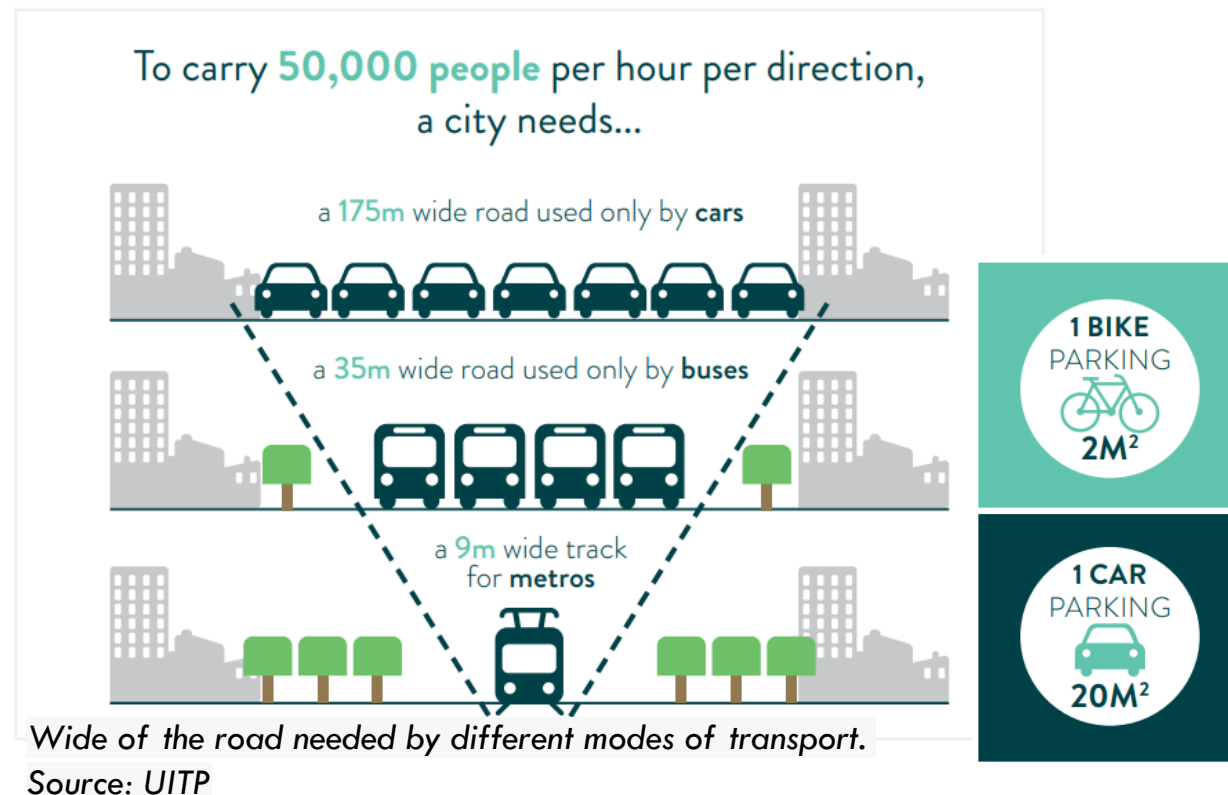
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The Escalating Scarcity of Urban Space

- **Private vehicle transport** (which are usually parked for 95% of the day) takes significantly **more space than any other form** of transportation, making it the least space efficient mode of transportation. In central London, parking makes up 14% of road space (UITP, 2021).
- Commuting by car uses 90 times more space than taking the metro due to highway and road layouts.



Karl Jilg/ Swedish Road Administration.





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Congestion and Noise Pollution

- Congestion costs Europe an estimated **€270 billion annually**, but a 10% reduction in journey time could boost productivity by 2.9% (ECA, 2019).
- Some cities like Stockholm, Sweden, and Valletta, Malta, have implemented **congestion charges** during peak hours to discourage heavy use of private road transport.
- High noise pollution in many cities negatively impacts human health, leading to delayed cognitive development in children, increased heart rate, hearing problems, and mood disturbances.

60%

of EU citizens consider congestion to be the greatest issue affecting roads in Europe (EC, 2016).

30%

of EU population experiences disturbed sleep due to city noise pollution (UITP, 2021).

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Urban Air Pollution

- From 2013 to 2019, **transport emissions rose**, contrasting with reductions in most other sectors; 23% of transport emissions are linked to urban areas (ECA, 2020).
- High emissions from urban mobility, coupled with pollution concentrated in cities and along roads, have made urban air pollution **detrimental to human health**.

7

million people globally are dying prematurely every year due to toxic levels of air pollution (WHO).

70%

By 2050, almost 70% of people globally are projected to live in urban areas (ISGlobal, 2022).

20%

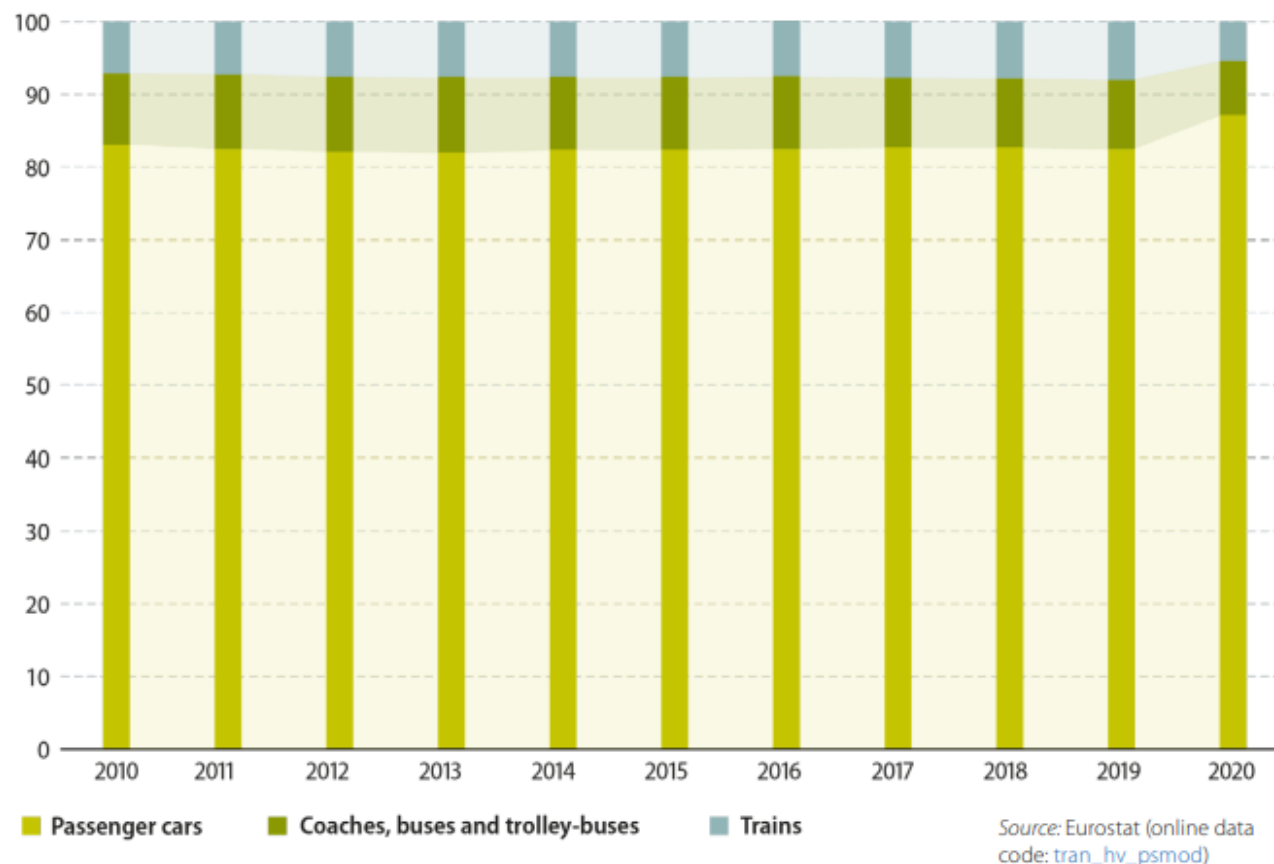
Cities can avoid 20% of premature deaths with better urban and transport planning (ISGlobal, 2022).



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Encouraging Sustainable Travel Habits

- There is an increasing recognition at local, national, and EU levels that **promoting active mobility**, particularly walking and cycling, **can address many of the challenges previously discussed**.
- In response to the Covid-19 pandemic, **major cities in Europe implemented infrastructure changes to encourage cycling and walking** (i.e., temporary widening or creation of new cycle lanes and the implementation of lower speed limits such as 30km/h or 20km/h zones).
- In 2023, studies noted a **33% increase in the use of dockless bikes**, providing convenient and fast travel, while scooters also gained popularity, alongside a lesser increase in mopeds (Mobility Innovation Marketplace, 2023).



Development of modal split of inland passenger transport (% based on passenger-kilometres, EU, 2010–2020). Source: Eurostat, 2022.



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Strengthening Traffic Safety Measures

- In the EU in 2021, **nearly 20,000 fatalities** occurred in road accidents, with pedestrians, cyclists, and moped riders representing over 32% of these deaths (EC 2021).
- Urban areas had even higher risks**, with 52% of traffic-related deaths involving pedestrians, cyclists, or moped riders, primarily due to car collisions (EU figures, 2020).

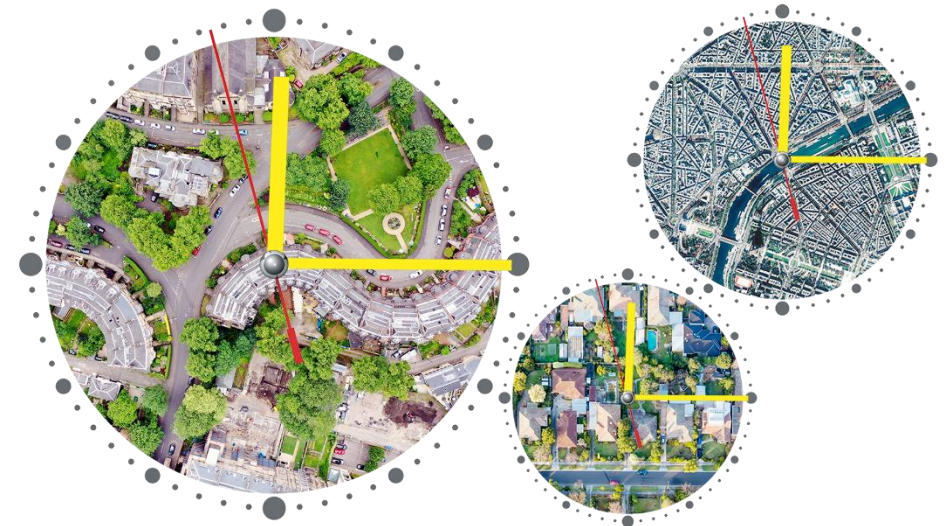
Road Traffic Fatalities Urban Areas in the EU. Source: EC-Mobility and Transport, 2020.

FATALITIES												TOTAL
PEDESTRIANS		▶	●	17	6	82	1740	283	219	78	149	2574
CYCLISTS		▶	9	24	9	8	470	88	136	19	42	1064
MOPED RIDERS		▶	1	1	1	4	105	14	20	4	10	273
MOTORCYCLISTS		▶	8	5	5	21	510	85	37	12	28	1173
CAR OCCUPANTS		▶	8	5	0	4	493	99	151	34	102	1951
LORRY (<3.5T) OCCUPANTS		▶	1	0	0	1	20	16	7	1	10	134
HEAVY GOODS VEHICLE (>3.5T) OCCUPANTS		▶	0	1	0	0	2	1	15	0	0	46
BUS OR COACH OCCUPANTS		▶	2	0	0	0	5	0	0	0	0	17
OTHER/UNKNOWN		▶	1	2	0	3	59	9	8	5	9	216
TOTAL			30	55	21	123	3404	595	603	153	350	7448

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Balancing Efficiency, Quality of Life, and Meaningful Journeys

- We witness a cultural shift where **mobility profoundly impacts quality of life**. Seamless transport should not overshadow the significance of **purposeful journeys and reducing compulsory travel**.
- A life-centred mobility approach should focus on **enhancing people's lives**, promoting walking, establishing traffic calm zones, and designing public transport systems with hospitality and conviviality in mind.





Summing-up: what makes innovation in Urban Mobility crucial in the current context?



Transport contributes to about 25% of Europe's GHG and is the main driver of urban air pollution.

Globally, it's responsible for 11% of the annual premature deaths caused by PM2.5 and ozone pollution (EEA, 2022).



Mobility impacts health and well-being, affecting physical activity, community involvement, mental health, independence, and dignity, especially for seniors and the disabled. **In Europe, 59% of adults are overweight or obese**, and a quarter experience annual **mental health issues** (WHO, 2022).



Currently, around 70% of European population lives in cities, and this number continues to grow (EC, 2021).



Fragmented transport is a widespread problem in Europe also dealing with **population ageing, immigration, gender**, and other forms of **inequality**.



Rising mobility and new transport modes complicate urban dynamics, affecting safety. One-third of fatal road accidents occur in cities, where pedestrians and cyclists, often the most vulnerable, are frequently the victims (EC, 2021).



COVID-19 prompted a mobility shift, emphasizing the need for shared, accessible, affordable, flexible, and sustainable services. It also brought lasting changes to remote work and commuting.



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The role of Mobility in a Circular Economy



The role of Mobility in a Circular Economy

- Mobility is a key element for fostering a successful urban economy; however, many current urban mobility practices result in substantial economic losses.
- The reason for these losses? **The linear structure of urban transport systems.**

Impacts of the linear structure of urban transport systems

2-5%

of **global GDP**
in the form of time, fuel
waste, and increased
business costs is lost
annually from congestion.

20%

**Gross household
income** accounted
by car ownership
alone in Europe

13%

Of **global
resource
consumption**
made up by
mobility

Source: Ellen MacArthur Foundation, 2015.

Tires, one of the many car parts that are wasted in the linear economy



Every year, around 1.5 billion tires are wasted (Elsevier Ltd, 2022). Despite the high potential recyclability of tires, due to their high concentration of steel and rubber, they are still sent to landfills.

Space lost from the amount of land used for parking and roads



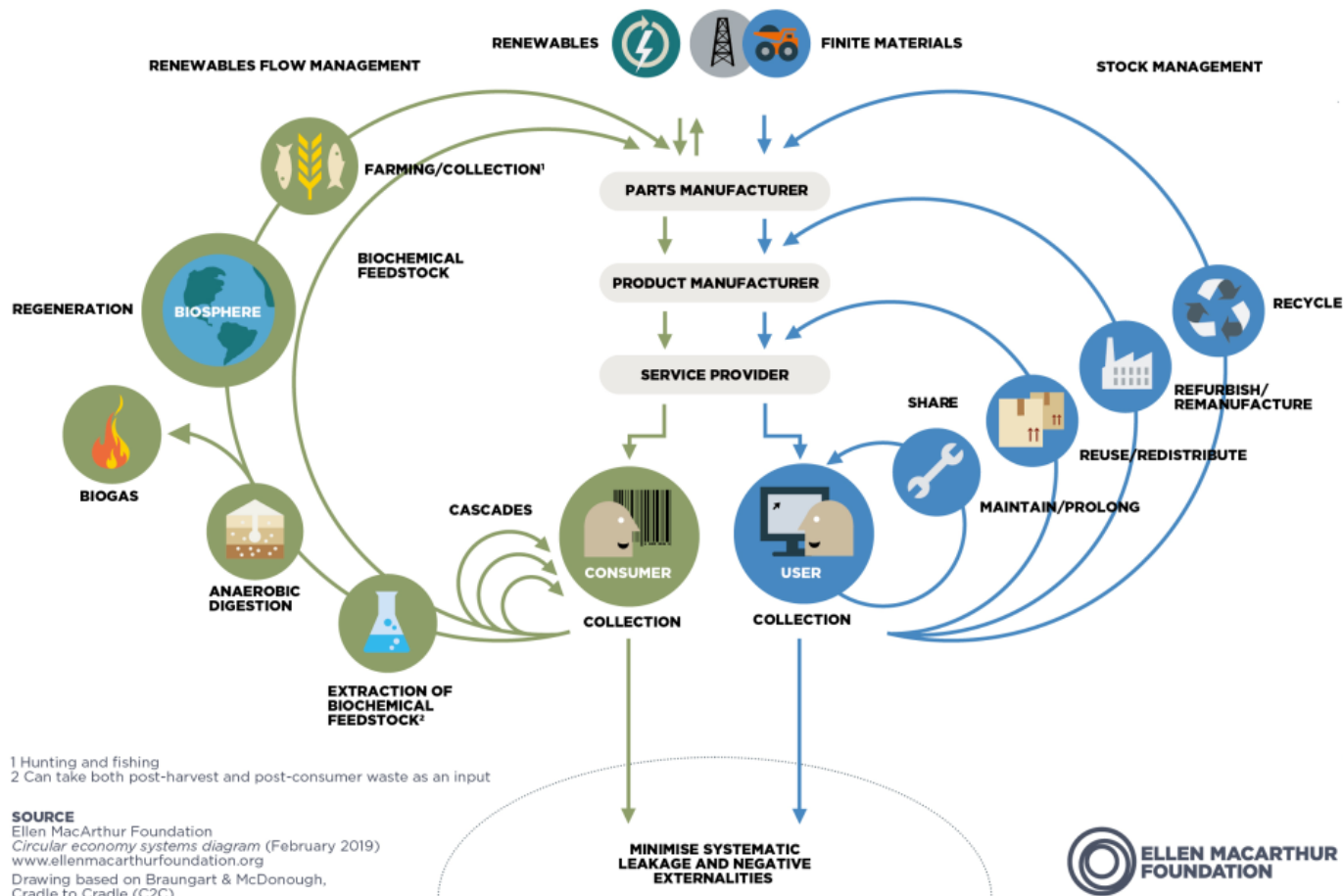
In European cities, 50% of land is allocated to roads and parking, but during peak hours, only 10% of urban roads are utilized. European cars are parked 92% of the time, and when driven, only 1.5 out of 5 seats are occupied.



How can Circular Economy approach address these challenges?

- **Circular economy principles** can address these problems by promoting sustainable mobility planning, diversifying transport modes, reusing materials, reducing waste, and cutting costs.
- By seizing opportunities like **compact urban development, digital optimization of mobility services, innovative manufacturing, and new business models**, cities can create a more prosperous urban mobility system that benefits the economy, environment, and society.

With a big focus on
**Circular
Economy**





Examples of Circular Economy Opportunity



Planning

- Compact city development for effective mobility
- Urban freight strategies for effective reverse logistics and resource flows
- Infrastructure for zero-emission vehicles and energy storage
- Using big data solutions to optimise mobility systems



Designing

- Designing vehicles for adaptable and shared use
- Design for zero-emission transport vehicles and energy grids
- Designing transport infrastructure for adaptable use
- Designing regenerative and energy positive, mobility infrastructure



Making

- Sourcing infrastructure materials strategically
- Manufacturing vehicles using resource-effective techniques
- Building infrastructure with new construction techniques



Accessing

- Alternatives solutions that reduce transport needs
- Active and low-impact mobility solutions
- Multimodal transport as an integrated service
- Optimising freight capacity through shared solutions and distributed centres



Operating & Maintaining

- Minimising trip length, duration, and operational energy use via digital solutions
- Mobility assets operated and maintained in new business models
- Refurbishing and repairing vehicles to extend material cycles
- New techniques for infrastructure operation and maintenance



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Future Trends



Future Trends

Mobility is undergoing one of the most transformational shifts of a generation, with far-reaching implications for the way we live our lives. Below are some of the most relevant trends that will shape future mobility.



Towards urban growth and urban sprawl

- Half of the global population resides in cities today.
- In 25 years, cities are projected to house two-thirds of the world's population.
- This urban growth will intensify mobility demands and strain transportation networks.



Reduced reliance on private transport and a push for alternative modes

- Private transport in Europe to sharply decrease by 2035, driven by policies and shifting cultural values.
- Shared mobility, like ride-hailing, poised to generate €1 trillion by 2030, reflecting economic potential.
- Global micro-mobility set to double its current worth, reaching €440 billion by 2030.
- Reduced private transport will cut noise and air pollution, boosting public health and lowering city healthcare costs.



Reduction on transport emissions

- Ambitious climate policies could cut urban transport emissions by 80% by 2050, compared to 2015 levels.
- Inaction would result in emissions dropping by a mere 5% by 2050 (International Transport Forum, 2021).



▲ New technological advancements

Every year, more and more mobility innovations are developed and soon, these products will reach the public market, changing urban mobility drastically.



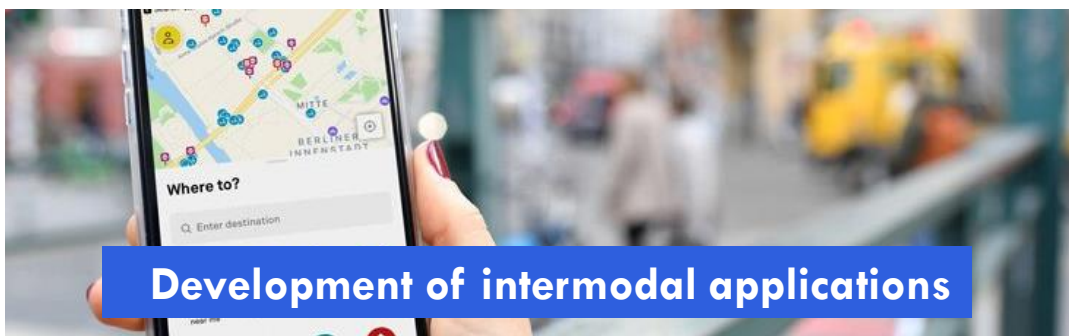
Autonomous vehicles (AVs)

Passenger vehicles in Europe and North America will have an increased amount of level-three (conditionally automated driving) and level-four (highly automated driving) automation features.



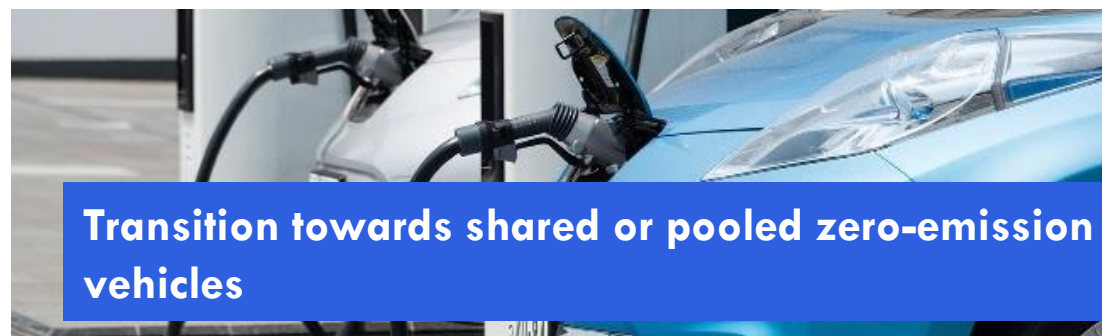
Rise of micromobility

The global micromobility market is worth about 160€ billion today. Some analysis show that the value could more than double by 2030 to reach about \$440 billion.



Development of intermodal applications

Intermodal journeys involve more than one type of transportation. Platforms that integrate all possible mobility combinations for a particular route are already starting to emerge, allowing travellers to plan their journeys more easily.



Transition towards shared or pooled zero-emission vehicles

Shared mobility (including ride hailing) is on the rise, as consumers look for transportation options that are convenient, cost-effective, and sustainable. This segment could generate up to \$1 trillion in revenues by 2030 (McKinsey, 2023).



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Strategies for Urban Mobility



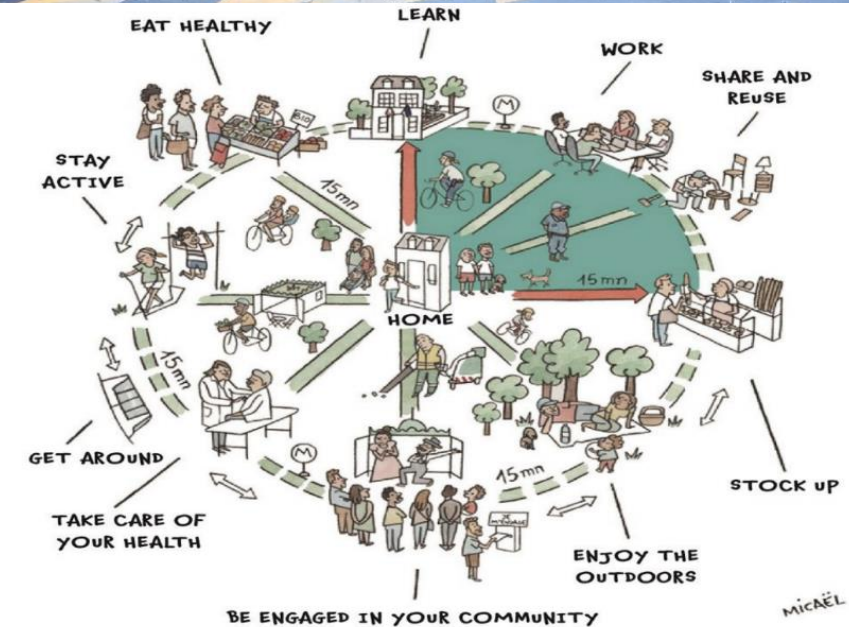
Strategies for Urban Mobility

(1) New Urban Models to make cities healthier

- Many cities are working on increasing active mobility and public transport use by simply providing the infrastructure and making the transport modes more accessible.

Example 1. Barcelona's Superblocks, a global urban best practice, are transforming the city. Over 500 Superblocks are planned to reduce traffic, create space for people, active travel, and green areas, building on successful small-scale initiatives in places like Poblenou, Horta, and Sant Antoni.

Example 2. Paris is embracing the concept of the 15-minute city, where work, school, and entertainment are all within a 15-minute walk from home. This approach involves reimagining our cities, promoting social diversity over economic segregation, and cutting down on long-distance travel to reduce CO2 emissions, air pollution, and noise.



15-minute city, Paris. Source: Ubique.



(2) *Optimal transport planning pyramid*

- By making active mobility more attractive, cities around the world are observing a **rise in modal share of active mobility**.

Examples

- Expand green spaces linked to transport networks.
- Designate paths for each transport mode.
- Create wide roads without kerb drops for pedestrian-friendly streets.
- Plant trees along sidewalks for shade.
- Install bike parking.
- Limit passenger vehicle parking.
- Implement private car purchase taxes.
- Reduce speed limits in crowded pedestrian areas.
- Establish Low Emission Zones (LEZs) and restrict high-emission vehicles.
- Improve nighttime safety with better lighting.
- Develop safe pedestrian intersections like raised crosswalks.
- Enhance access to public amenities, including water, restrooms, waste bins, and wayfinding signage (UITP, 2021).



London's bike superhighway.
Source: Evening Standard, 2019.



(3) Gender equality initiatives

- **Women make up the majority of public transport riders in many cities.** Public transport, though welcoming to women riders, does not always have the necessary safety measures to ensure safe travel for women.

Example.

- **In Paris, RATP focuses on female safety,** offering crisis support such as police contact, taxi escorts, complaint assistance, and access to aftercare.
- RATP also provides accompaniment for female passengers to enhance their security.
- The table outlines measures for improving public transport accessibility and related performance indicators.

	PRACTICAL MEASURES	OPERATIONAL ASPECTS	URBAN ENVIRONMENT	COMMUNITY INVOLVEMENT	POLICY/LEGAL ASPECTS	CAPACITY BUILDING
COMFORT	Improve waiting environment	✓	✓	✓	-	-
	Maintain shelters with AC and ventilation	✓	-	-	-	-
	Clean public toilets	✓	-	-	-	-
EASY-TO-USE	Services between stops	✓	✓	✓	✓	-
	Control camera, panic buttons	✓	-	-	✓	-
	Women-only services	✓	✓	✓	✓	-
	Process for harassment reports	-	✓	✓	✓	✓
SAFETY & SECURITY	Better lights and pavements	-	✓	✓	-	-
	Trained and professional staff	✓	-	-	-	✓
	Enforce rules and regulations	-	✓	✓	✓	✓

A consideration of the different aspects for practical measures related to performance indicators. Source: UITP, 2021.



(4) Integrating economic activities with public transport

- One method used to increase efficient city land-use integrates lifestyle and business with public transport.

Examples

- **In Japan, integrating malls, restaurants, offices, and hotels around stations boosts real estate revenue**, potentially increasing profits by 150% by 2027. State or transport department initiatives could direct these earnings toward public transport operation and development.
- **Nottingham, London employs levies to fund transportation.** Offices with over eleven employees are taxed on parking spaces, generating €87 million from 2011 to 2021. This revenue expanded the tram system and improved the central station and bus networks, while also discouraging private transport use, potentially reducing cars on the road, improving air quality, and reducing noise pollution.
- **Many cities reduce the cost of new mobility infrastructure by repurposing abandoned or unused structures into pedestrian walkways and parks.** In New York City, the Manhattan High Line, a former railway, has become a 2.33 km green space with adjacent real estate developments and museums.



New York City Highline.



Barcelona's Highline in
Sants Neighbourhood.



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Case Studies: what will be
needed in the future?



Start-ups

- **Many smaller companies and start-ups** have taken it into their own hands to develop technology and systems that help address Mobility Challenges.



Chainge - Designing low-emissions delivery services

Copenhagen-based company Chainge employs bike-driven vans for quieter, eco-friendly food and subscription goods deliveries. Amsterdam's startup, Homerr, involves individuals and businesses as intermediary delivery agents, reducing the need for extra van trips to check if recipients are home (EU-Startups, 2022). Similar startups include Magway (UK), Onomotion (Germany), and Bolt (Estonia).



Upway – Pushing for sustainability by recycling used or unwanted vehicles

Founded in France in 2021, Upway refurbishes and sells second-hand e-bikes and e-scooters, actively reducing their ecological impact while promoting micro-mobility (Upway, 2023). Similarly, companies like Bicing in Barcelona, Spain, Dott in Amsterdam, Netherlands, and Voi in Stockholm, Sweden, offer rentable electric micro-mobility options and platforms for selling such vehicles.





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Lilium - Developing an electric flying taxi service

Based in Wessling, Germany, Lilium is developing an electric flying taxi service with vertical take-off to conserve space and zero emissions post-production, offering an economical long-distance transport alternative to US taxis (Lilium). Similar startups include Volocopter (Brusall, Germany) and Joby Aviation (Santa Cruz, USA).



BlaBlaCar – Connecting drivers with passengers for a collective mobility

France's BlaBlaCar connects drivers and passengers heading the same way on its long-distance ride-sharing platform, providing an affordable and sustainable intercity travel option (Seedtable, 2023). Similar startups include Ants (Oslo, Norway), flinc (Berlin, Germany), Heetch (Paris, France), Ride Joy (California, USA), and Together (Noord-Holland, Netherlands).





ParkBee *ParkBee - Reutilizing underused parking spaces and giving them back to the city*

In Amsterdam, ParkBee repurposes underutilized parking spaces, offering convenient booking options and affordable rates to reduce road congestion while benefiting both real estate owners and drivers (ParkBee). Similar startups include Get My Parking (Bengaluru, India), ParqEx (Chicago, USA), and Just Park (London, UK), all offering public parking services.



RIDEVISION *Ride Vision - Enhancing motorcycle safety*

Herzliya-based Ride Vision offers motorcycle riders safety-enhancing lights and cameras utilizing AI and computer vision tech for real-time hazard alerts. It also records rides and is developing an emergency call system (Ride Vision). Similar companies include Brake Free Technologies (Denver, USA) and Cosmo Connected (Paris, France), all dedicated to rider safety.





MUV B Corp – Playing to move, moving to play

MUV B Corp, founded in Italy in 2012, promotes sustainable mobility via a sports-oriented transport app. Users earn points for eco-friendly travel and can engage in training, challenges, and team competitions. The app, with user consent, shares anonymous data to assist global mobility policy improvements. MUV also offers a corporate version for companies to incentivize their employees' sustainable transportation habits (MUV).



Cling – Pushing for sustainability by recycling used batteries

Stockholm's Cling, established in 2020, addresses the upcoming surplus of used electric vehicle batteries by connecting manufacturers, workshops, and dismantlers to enable battery reuse and recycling. They aim to optimize trade efficiency through strategic partnerships (Cling). Similar companies working on recycling systems include Circunomics (Mainz, Germany), Akksel (Therwil, Switzerland), and Reneos (Tienen, Belgium).





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