

Urban Mobility System Upgrade: How shared self- driving cars could change city traffic

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urboan

human



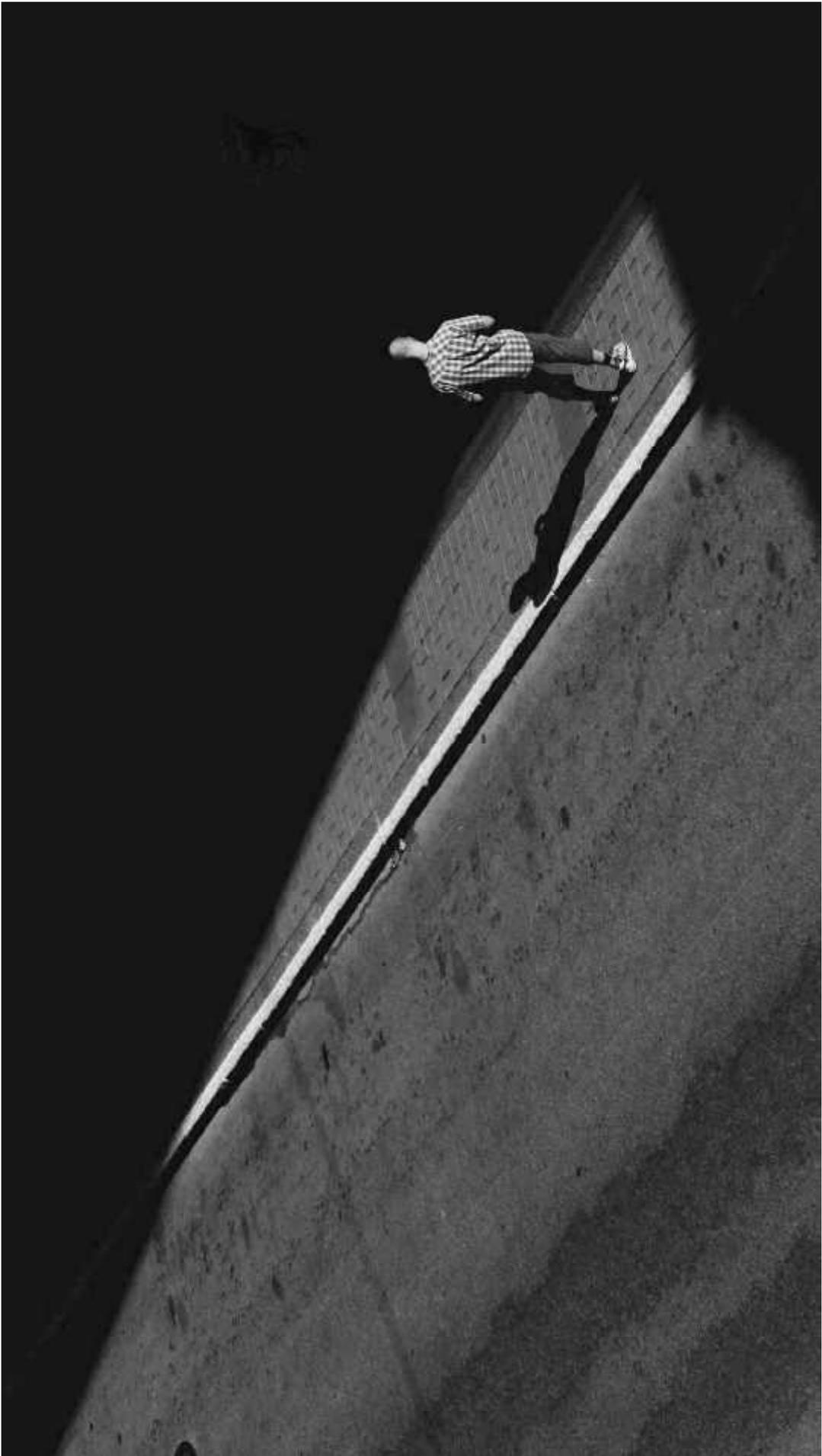
















400,000,000,000,000

~cumulative number of trips globally 2014-2050

54,000,000,000,000

~cumulative number of new trips globally 2014-2050

94%

in emerging economies

97%

in urban areas

New trips 2014-2050

Urban Mobility: System Upgrade

Why

What we did

What we found

Urban population : 1950



Urban Mobility: System Upgrade

Why

What we did

What we found

Urban population : 1950, 1990



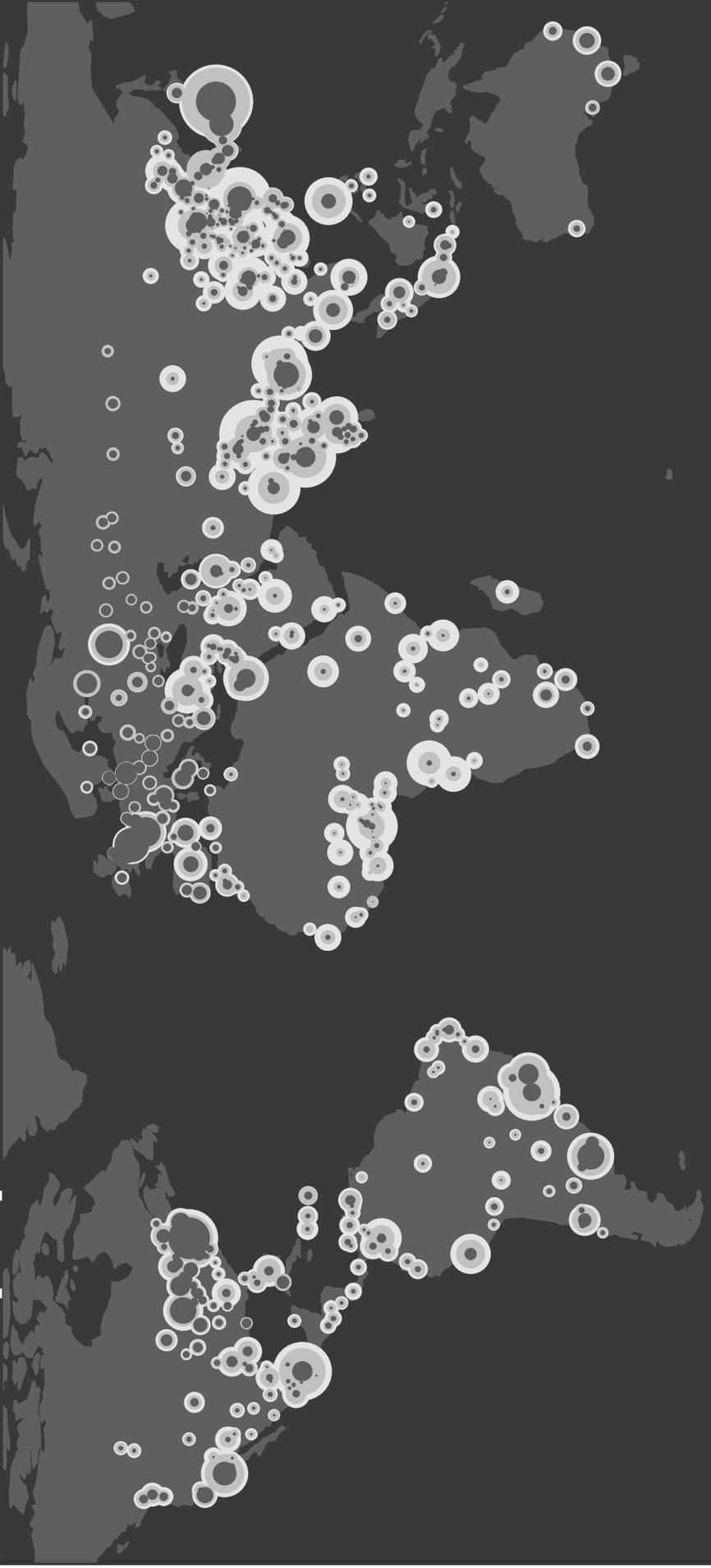
Urban Mobility: System Upgrade

Why

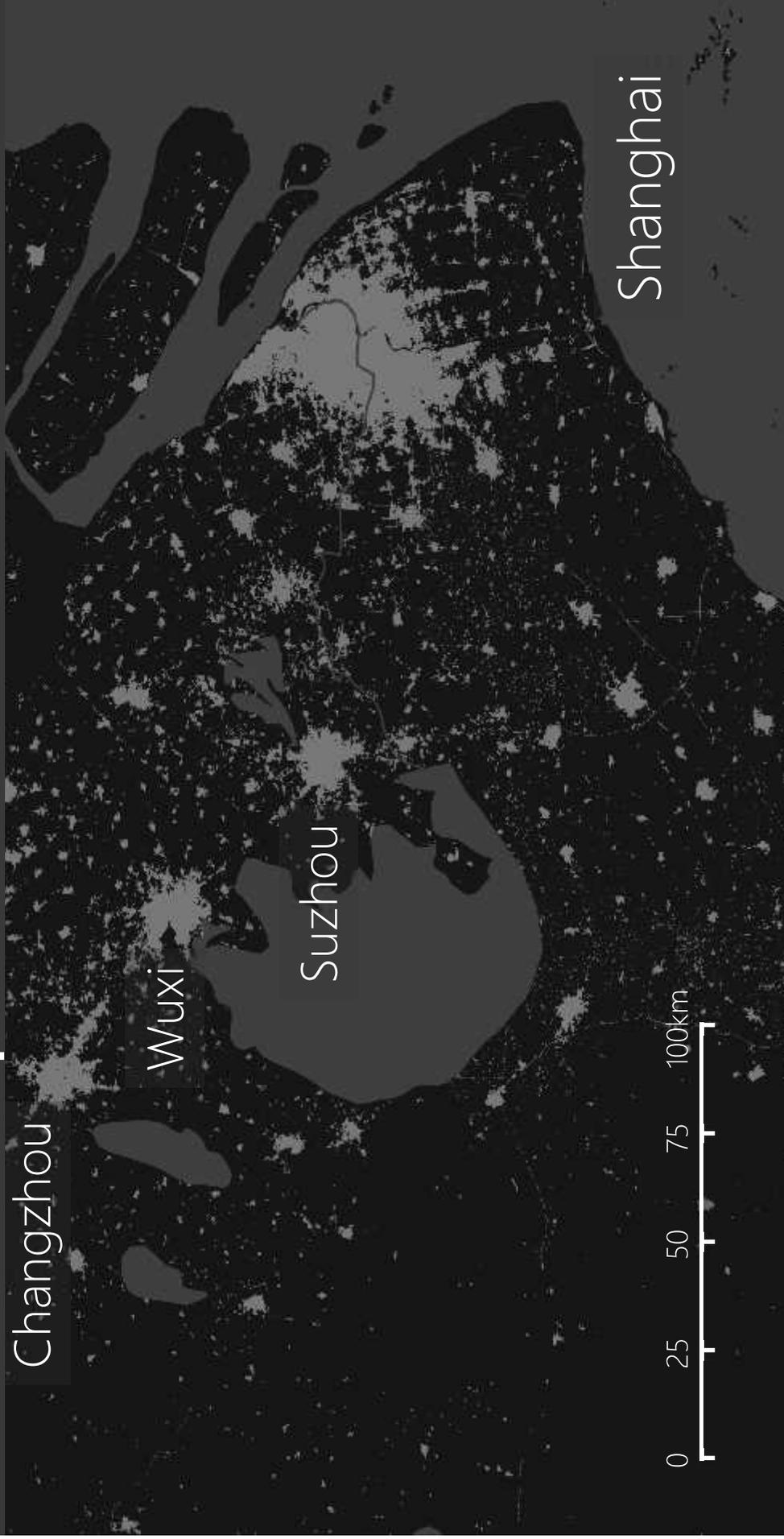
What we did

What we found

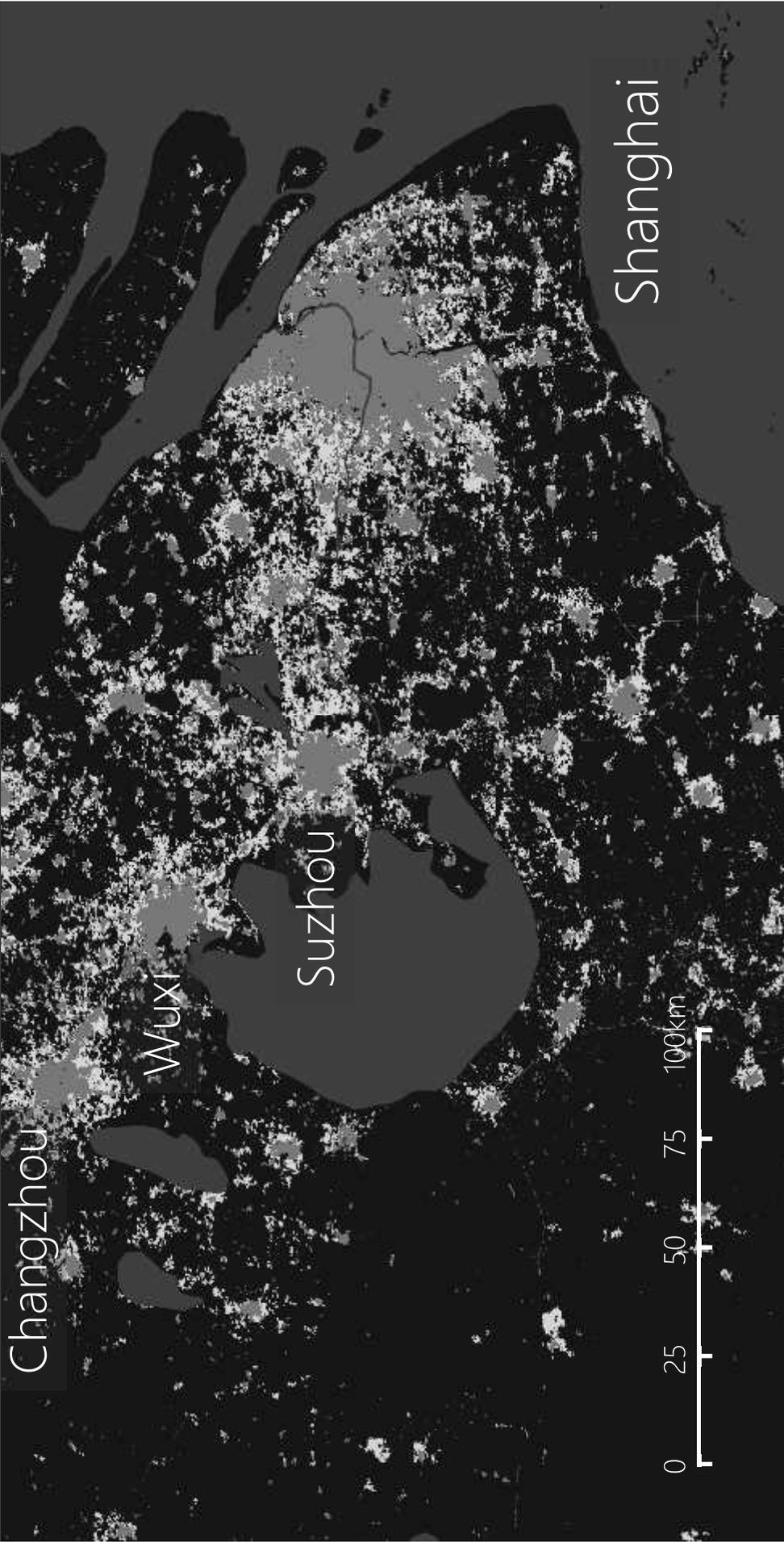
Urban population : 1950, 1990, 2025

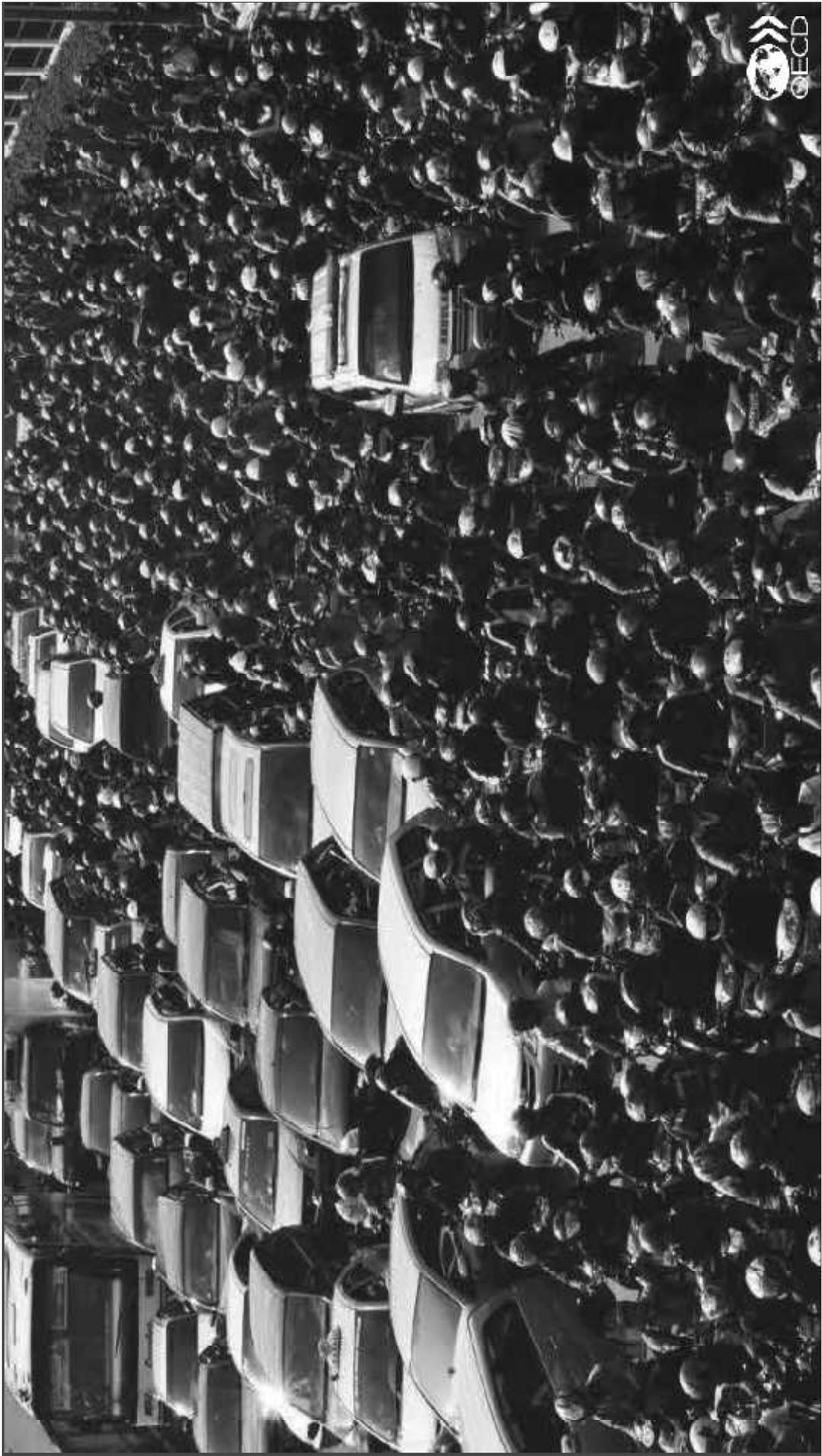


Urban land occupation - 2000



Urban land occupation – 2000, 2010

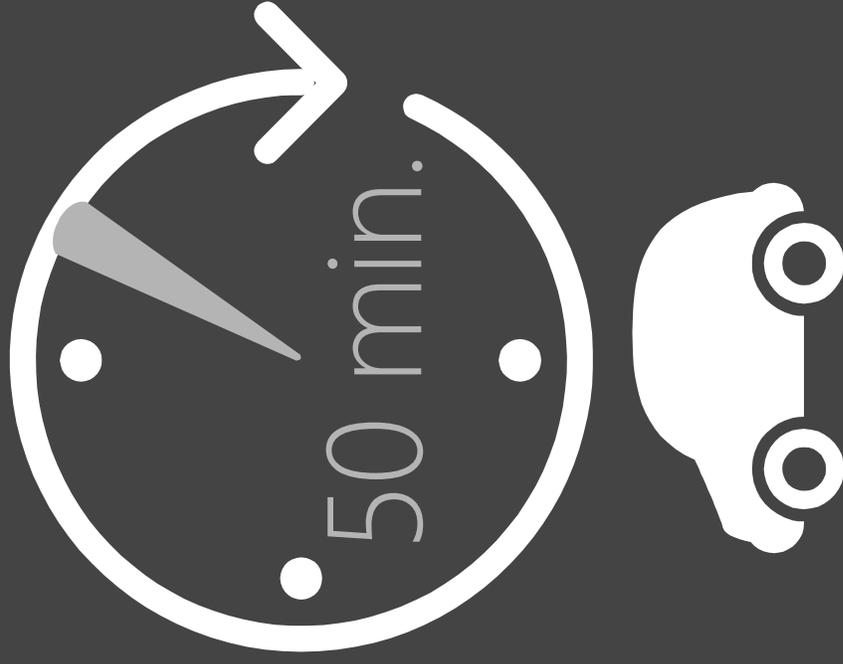








disruption



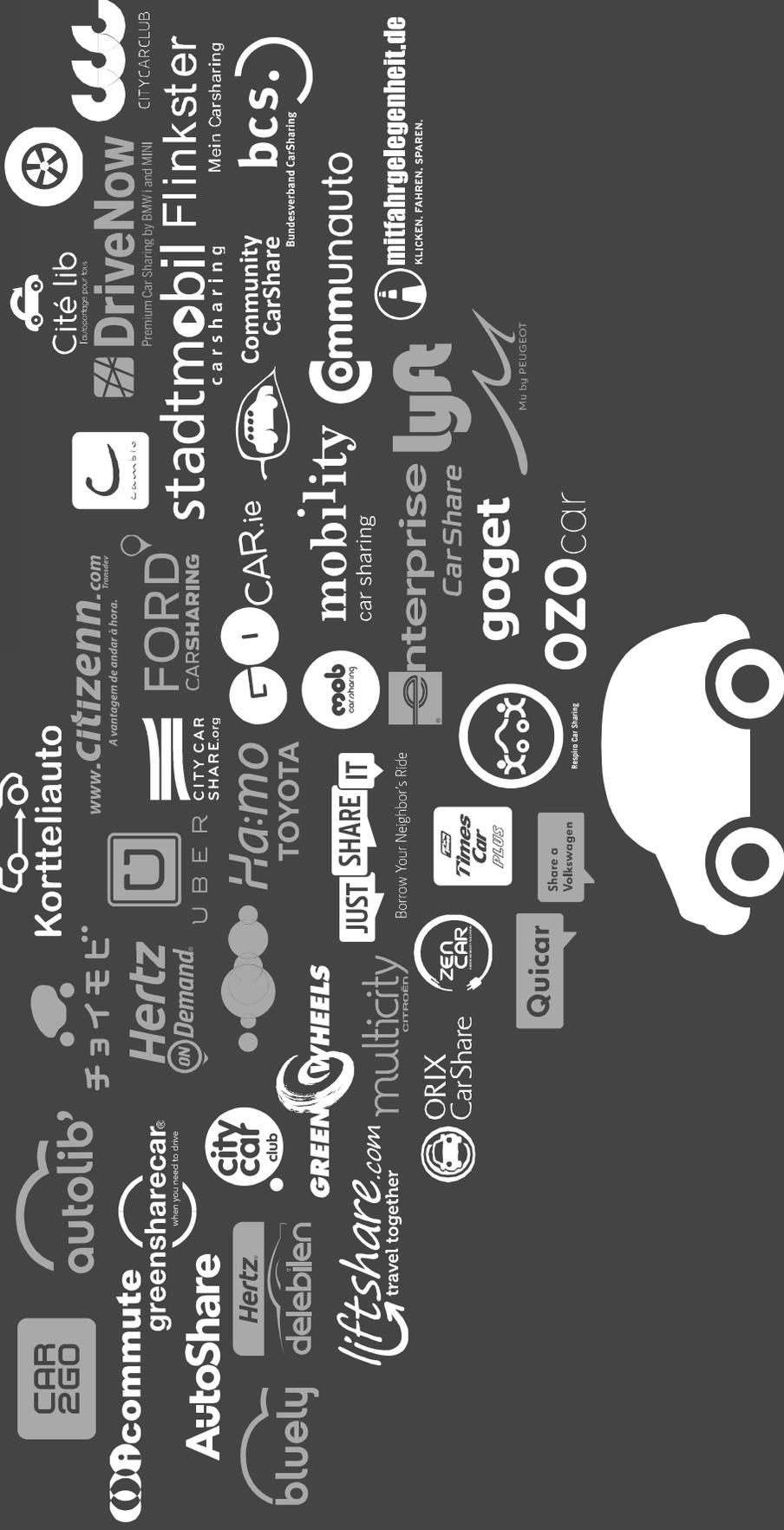
sharing



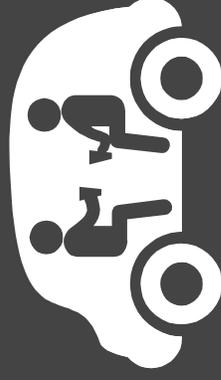
Urban Mobility: System Upgrade

Why

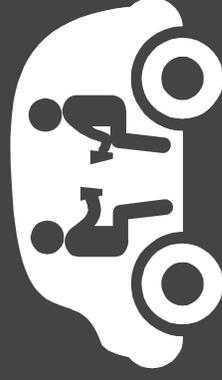
What we did



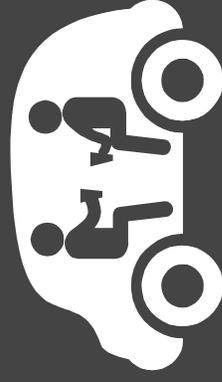
self-driving



same as it ever was



what if?



Urban Mobility: System Upgrade

Why

What we did

What we found

real city

Urban Mobility: System Upgrade

What we did

What we found

Why

real trips



Urban Mobility: System Upgrade

What we did

What we found

Why

real routes



Urban Mobility: System Upgrade

What we did

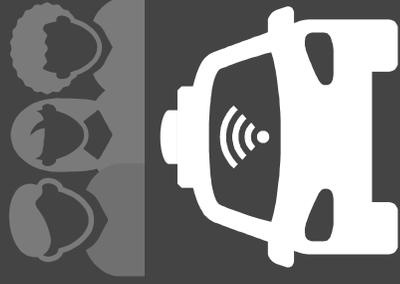
What we found

Why



same quality

Urban Mobility: System Upgrade



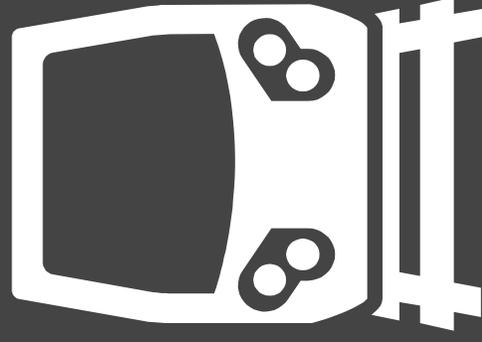
TaxiBot
ride-sharing

Why

What we found



AutoVot
car-sharing



high-capacity public transport



all day vs. peak hours

5 minutes

maximum delay, from base case trip start

+20%

maximum travel time, capped at 10 minutes

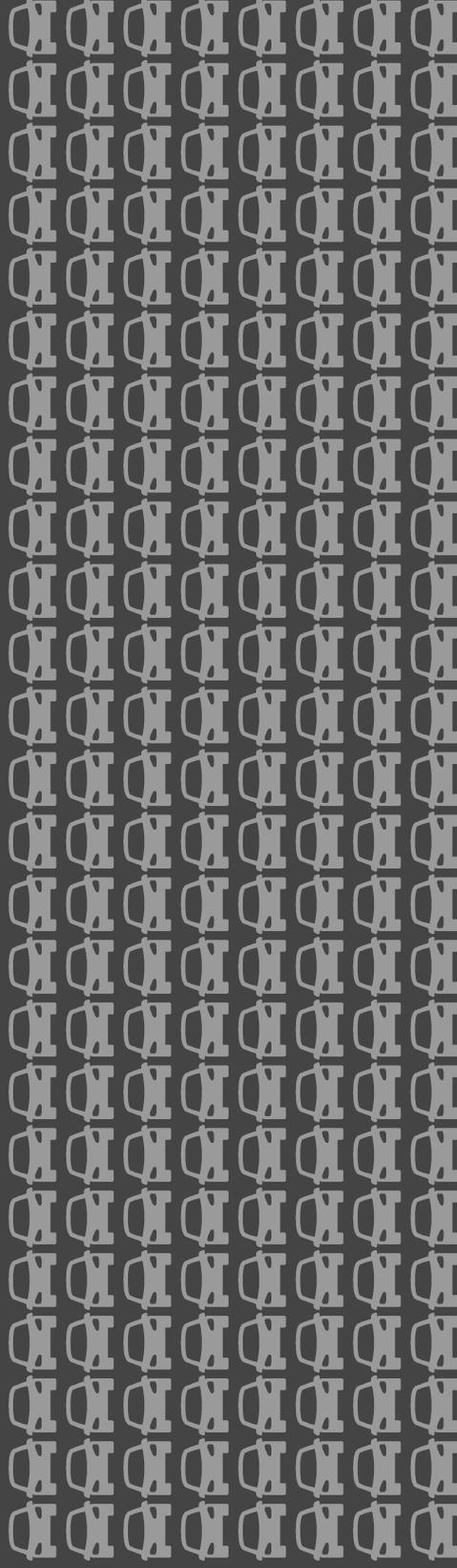
maximum diversion distance, capped at 2 kilometres

Urban Mobility: System Upgrade

What we found

What we did

Why



Scenario: 24 hours



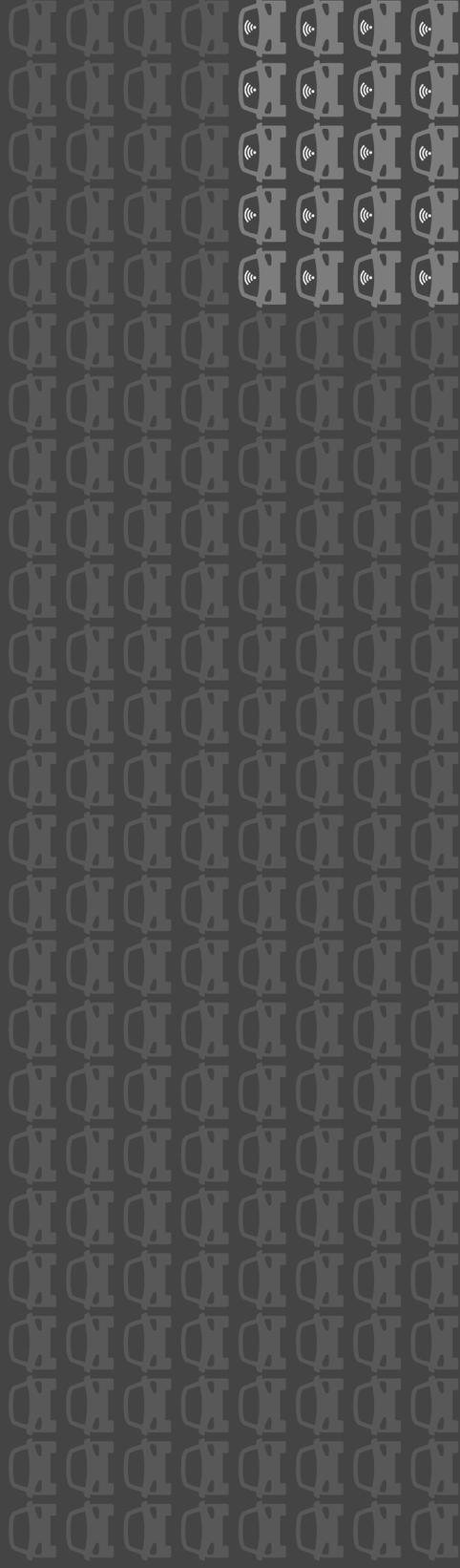
+



TaxiBots Ride-sharing
Public transport (high capacity)



number of cars required
to provide the same trips
as before:



Scenario: 24 hours



TaxiBots
Ride-sharing

+



Public transport
(high capacity)



number of cars
required to provide the
same trips as before:

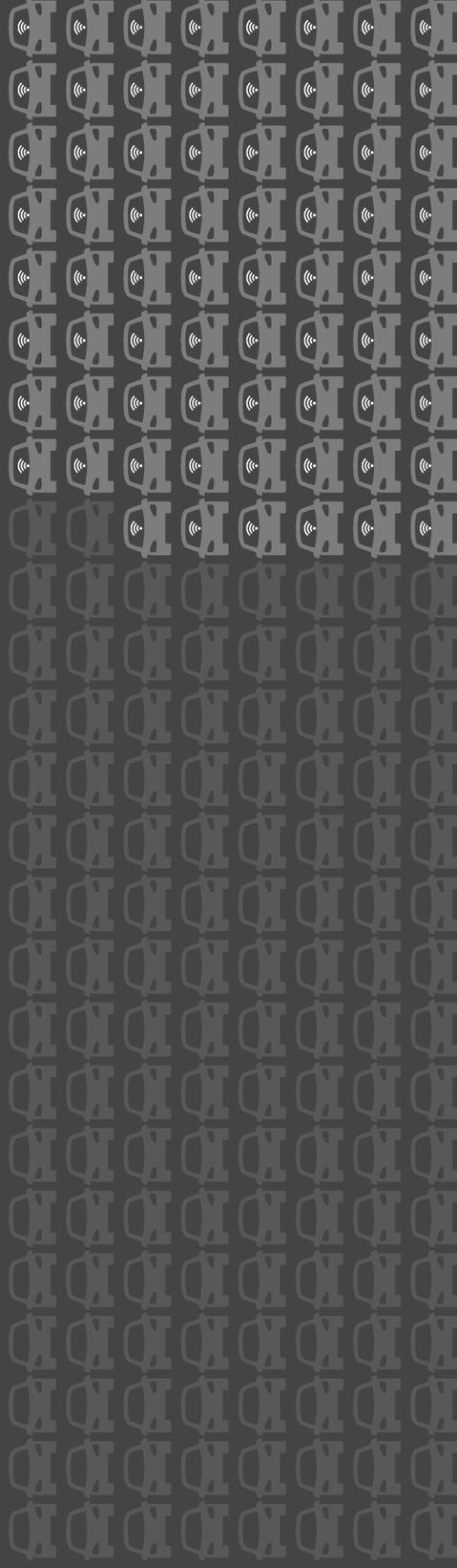
100%

Urban Mobility: System Upgrade

Why

What we did

What we found



Scenario: Peak hours



+



TaxiBots
Ride-sharing

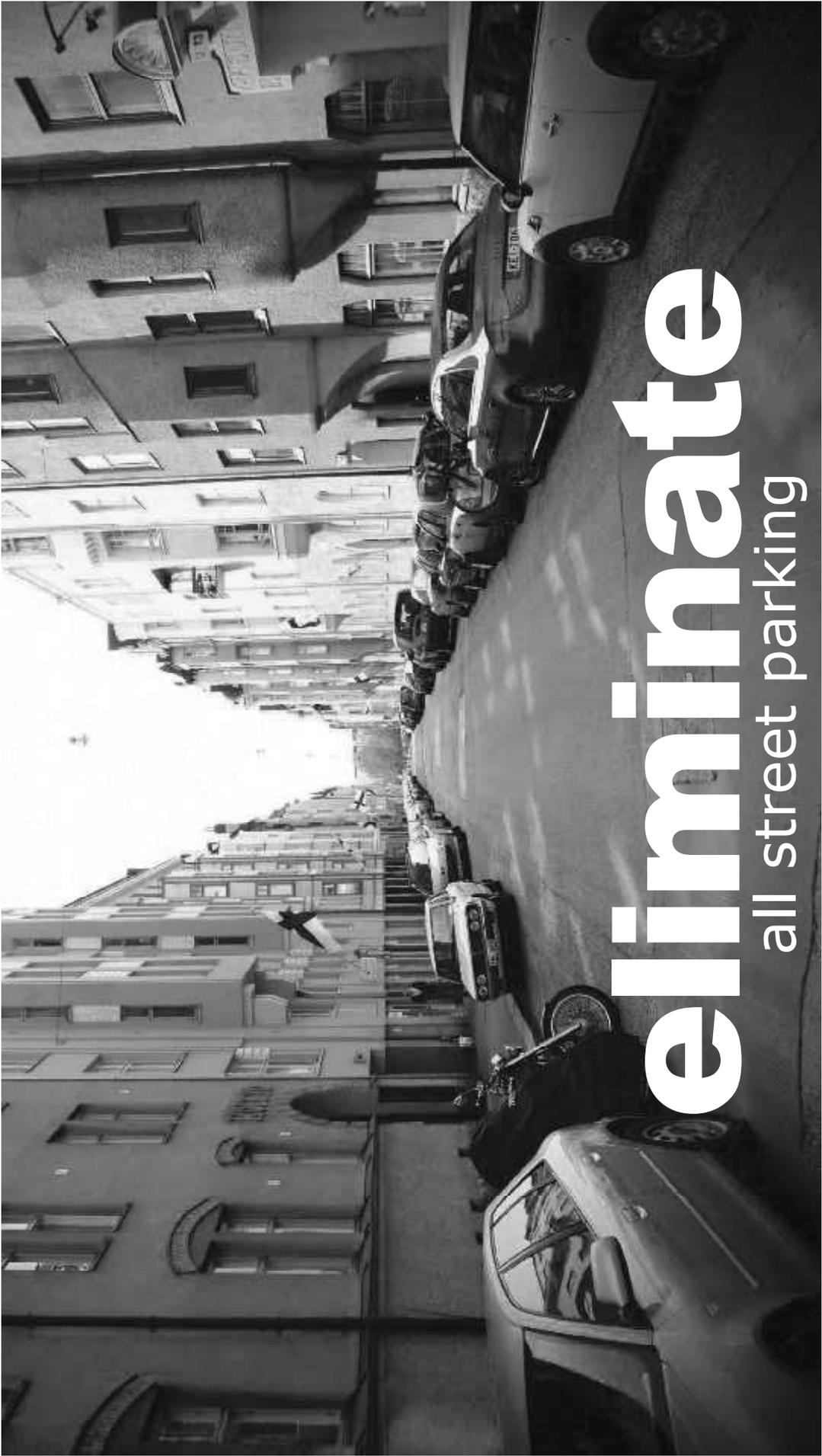
Public transport
(high capacity)



number of cars
required to provide the
same trips as before:

35%





eliminate

all street parking



+20%
kerb-to-kerb street space

PARKING



PARKING

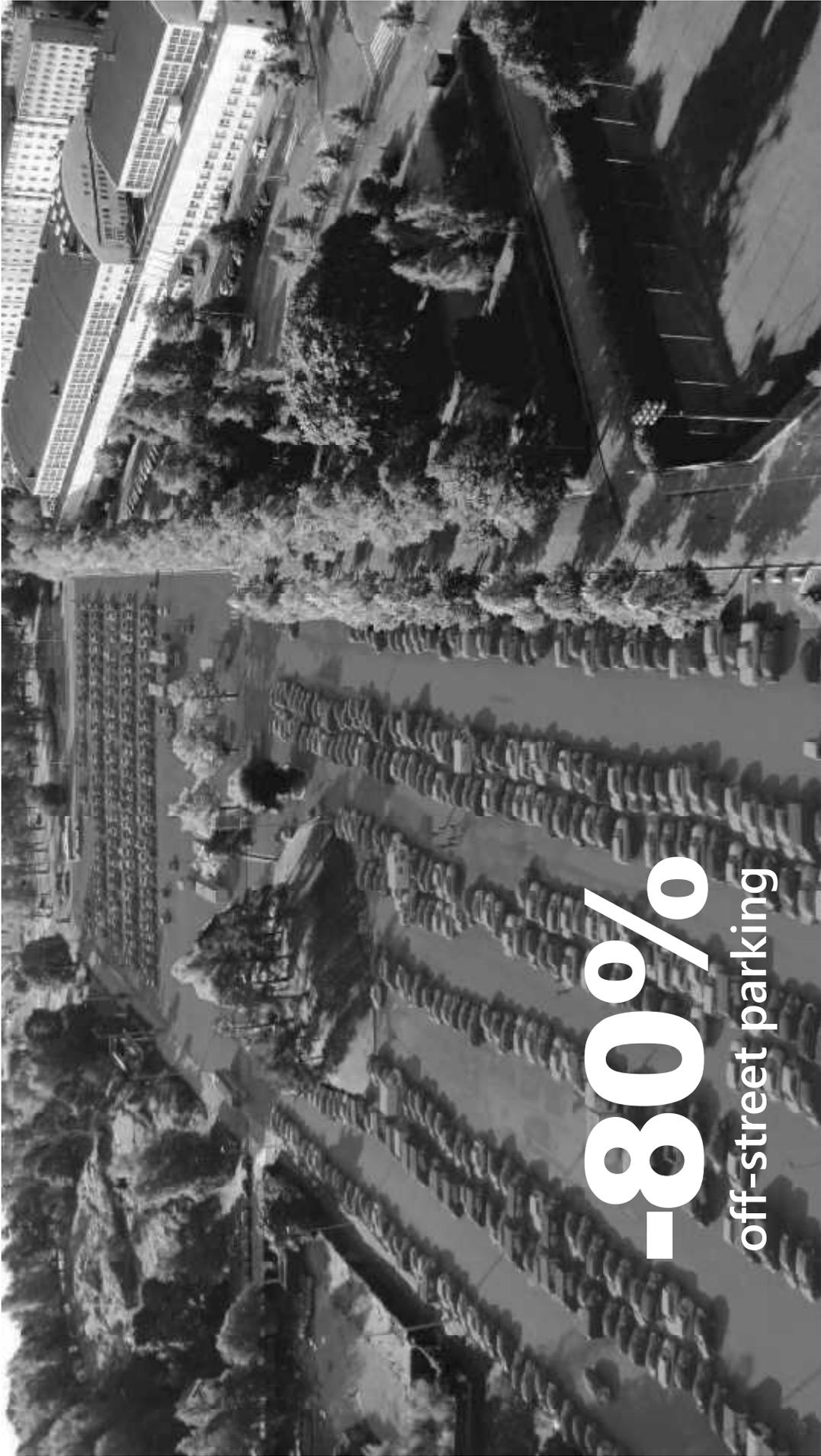












-80%

off-street parking



-80%

off-street parking



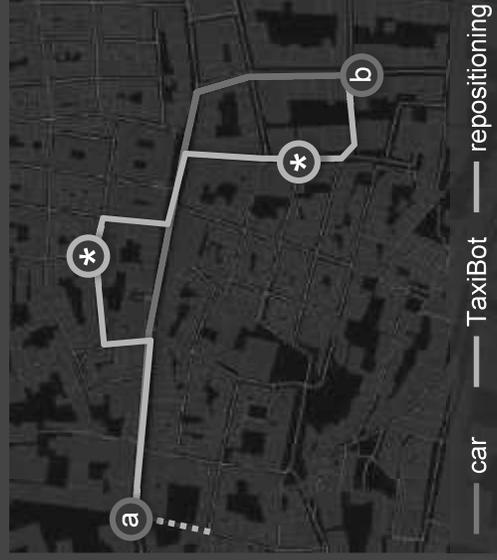
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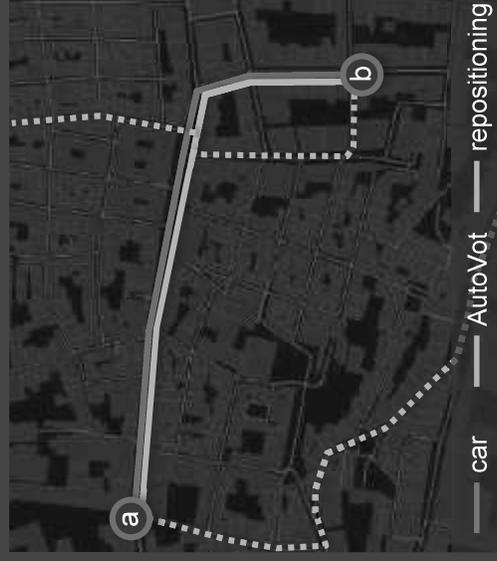


**TaxiBots and AutoVots
will travel more than
today's cars**



+6%

more kilometres travelled due to bus replacement, pick-ups, drop-offs and re-positioning



+44%

more kilometres travelled due to bus replacement, re-positioning



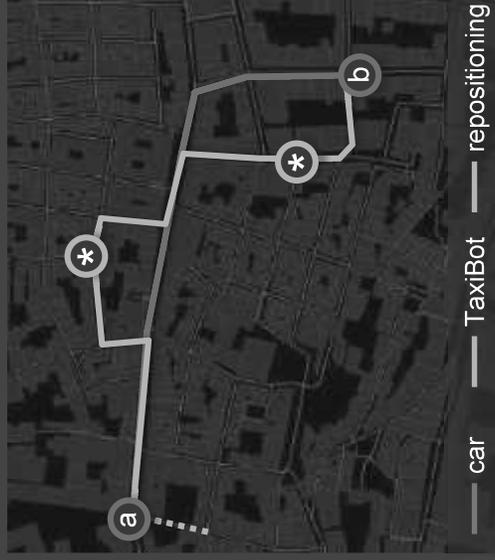
+



+

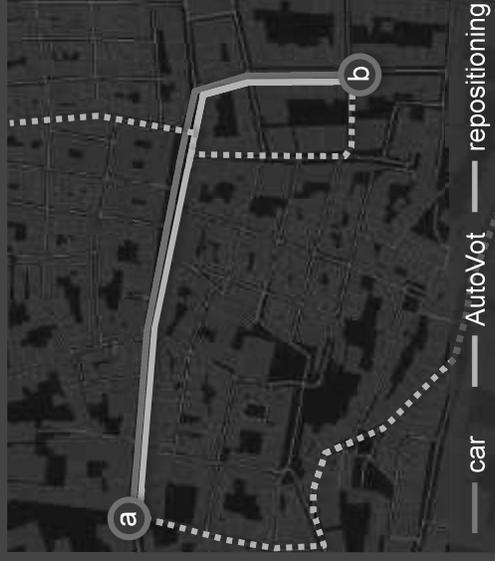


**TaxiBots and AutoVots
will travel more than
today's cars**



+8%

more kilometres travelled due to bus replacement, pick-ups, drop-offs and re-positioning

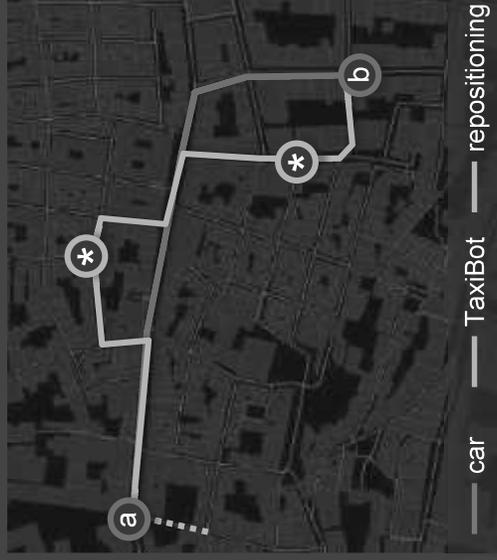


+54%

more kilometres travelled due to bus replacement, re-positioning

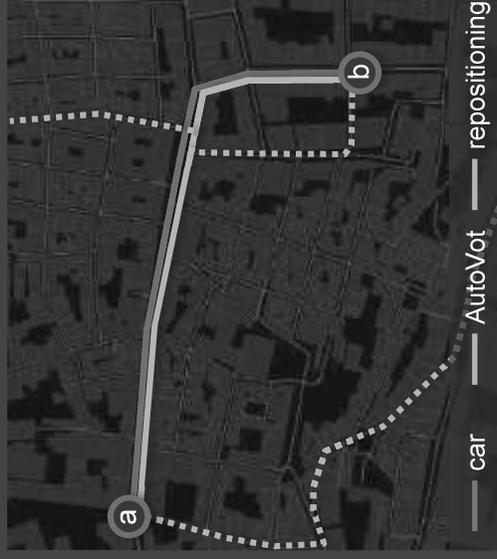


**TaxiBots and AutoVots
will travel more than
today's cars**



+25%

more kilometres travelled due to bus replacement, pick-ups, drop-offs and re-positioning



+103%

more kilometres travelled due to bus replacement, re-positioning

Where does the traffic go?

Road occupancy during morning peak



Motorways

35.8%

+3%

+64%

Trunk roads

42.5%

+5%

+62%

Distributors

34.3%

+13%

+76%

Local roads

16.7%

+31%

+115%



Urban Mobility: System Upgrade

Why

What we did

What we found



can we do better



improved dispatching algorithm modified acceptable delays

waiting time from 5 minutes (<3 km), up to 10 minutes (>12 km)

total delay (wait+detour) from 7 minutes $5 < 3$ km), up to 15 minutes (>12 km)

new shared mode

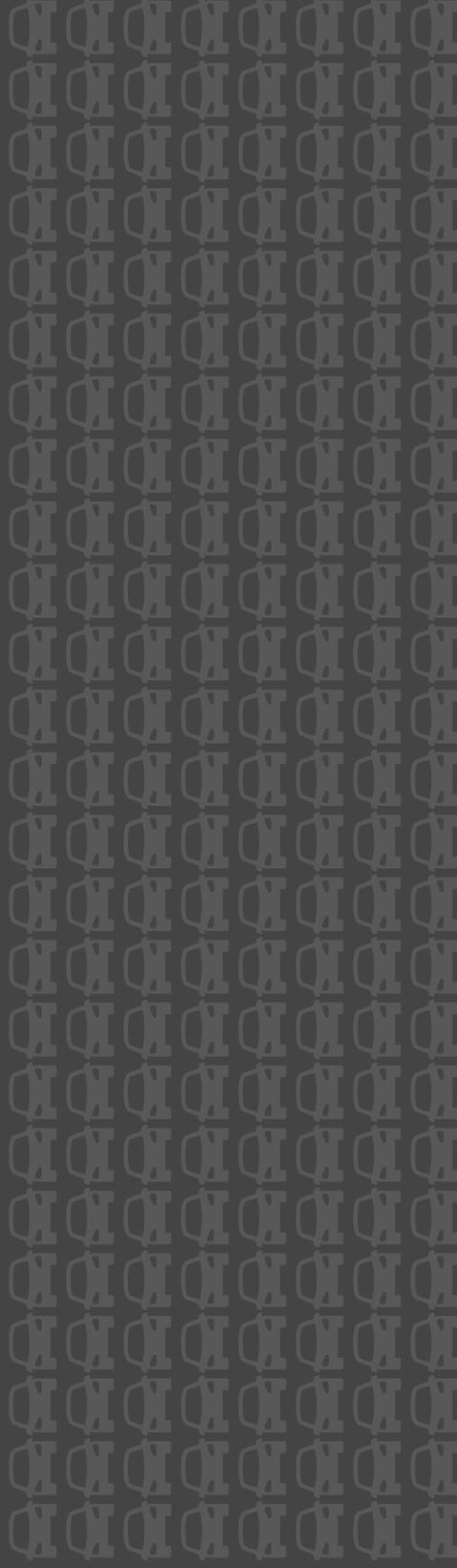




TaxiBus

optimised on-demand bus

30mn advanced booking, <300 meter distance to “pop-up” stop, 10mn tolerance from preferred boarding time



Scenario: 24 hours



TaxiBot

car-sharing

+



TaxiBus

on-demand bus

+

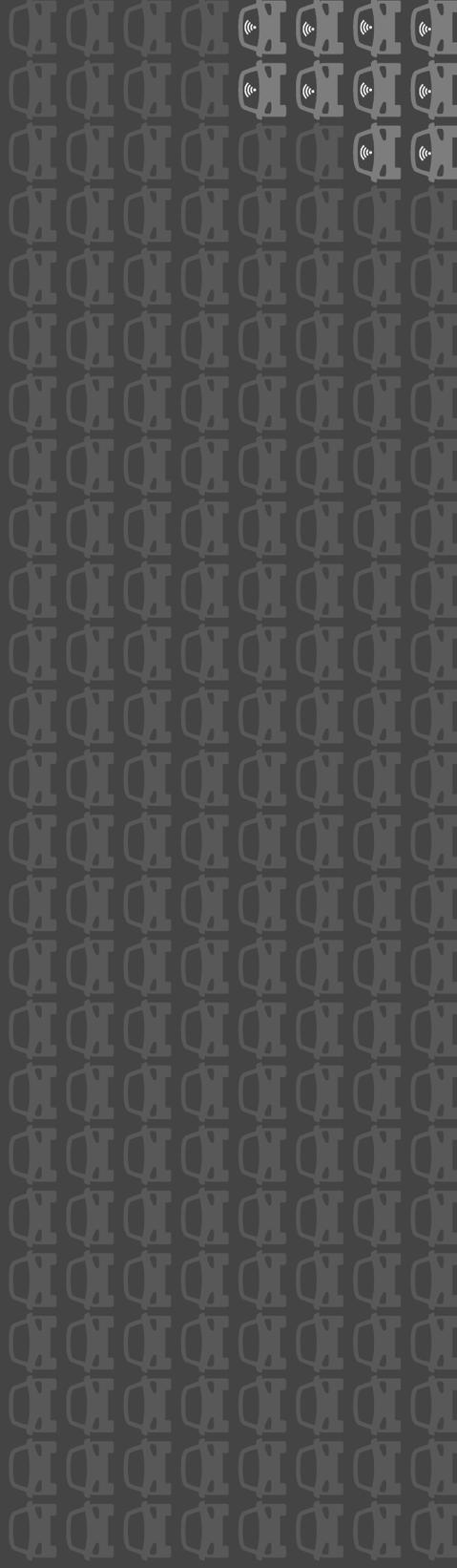


Public transport

high-capacity



number of cars
required to provide the
same trips as before:



Scenario: 24 hours



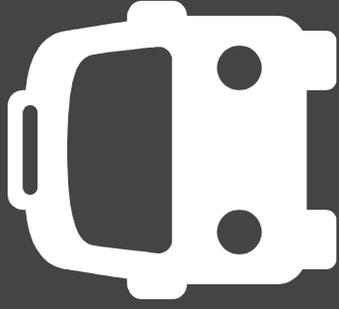


TaxiBot ride-sharing + TaxiBus on-demand bus + Public transport high-capacity



number of cars required to provide the same trips as before:

50%



+ 230%

But now 8-16 person capacity vs. 80 person capacity before

-15% vehicle kilometres

Scenario: 24 hours



+



+



TaxiBot
ride-sharing

TaxiBus
on-demand bus

Public transport
high capacity



-22% vehicle kilometres

Scenario: Peak hours


 TaxiBot
ride-sharing

+


 TaxiBus
on-demand bus

+


 Public transport
high capacity



-27% CO₂ emissions

Scenario: 24 hours



TaxiBot
ride-sharing

+



TaxiBus
on-demand bus

+



Public transport
high capacity





Only 2% more cars would be necessary for handling EV recharging and range issues.

Policy insights:

Freed space must be managed to
lock-in benefits

Policy insights:

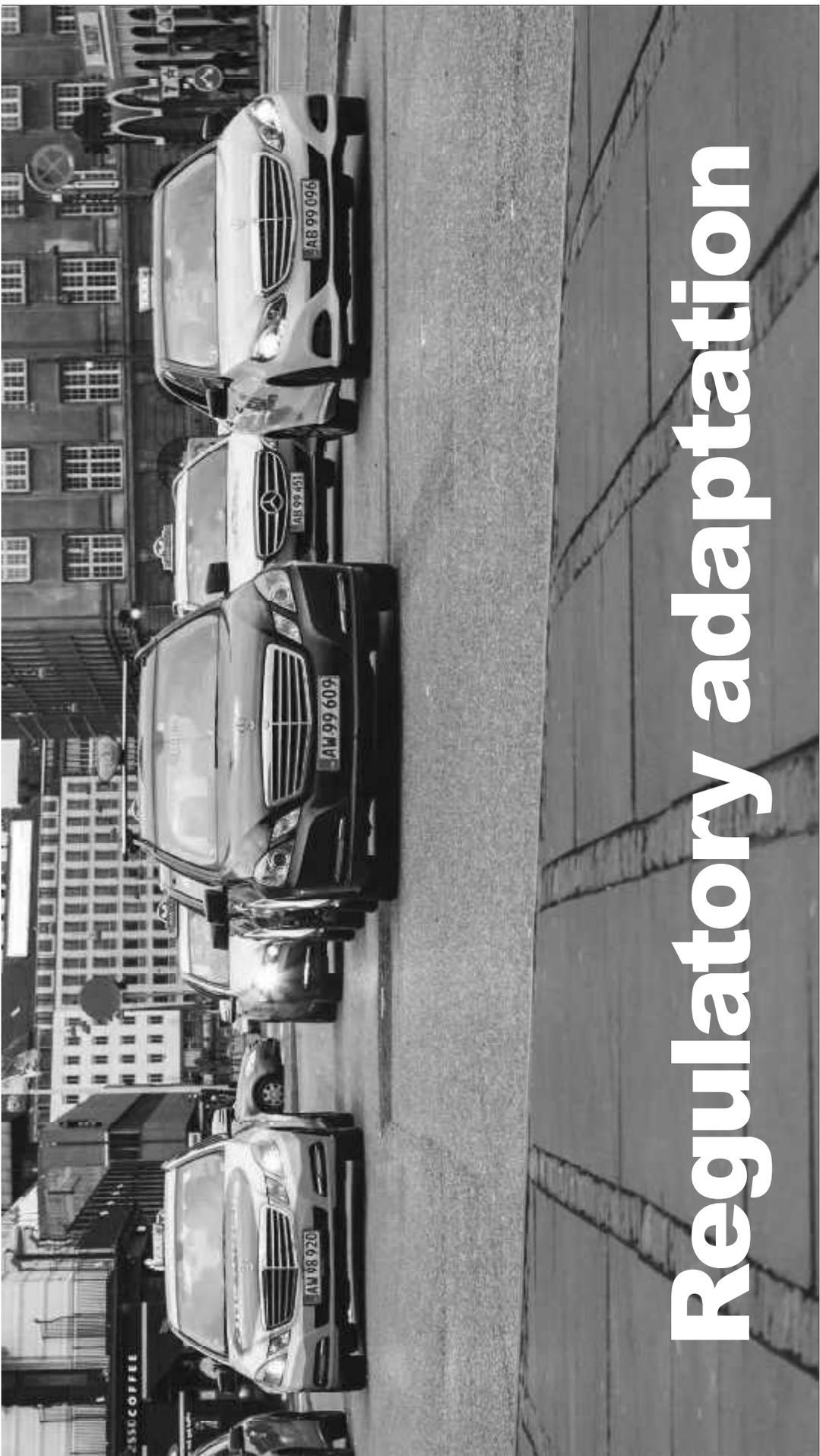
Overall benefits linked to system
and market design

Policy insights:

Policy focus is on self-driving
technology, not its use

Policy insights:

Public transport, taxis and
governance must adapt



Regulatory adaptation

Policy insights:

New business models (and car models) required

Urban Mobility: System Upgrade

Why

What we did

What we found



Policy insights:

Data will be the fuel of 21st
century urban mobility

Thank you!