



# Transport challenges

# How do we provide access that is safe, sustainable and affordable?

## Strategic challenges

How do we tackle congestion?

How do we minimise harm (safety and health)?

How do lower emissions?

Is the system resilient to natural disaster and risk?

How do we maintain international connectedness?

How do we fund the future transport system?

Technological challenges and opportunities?

## What we need to know

Do we understand how people make transport decisions?

What are the options to influence behaviours?

How effective are existing and new interventions?

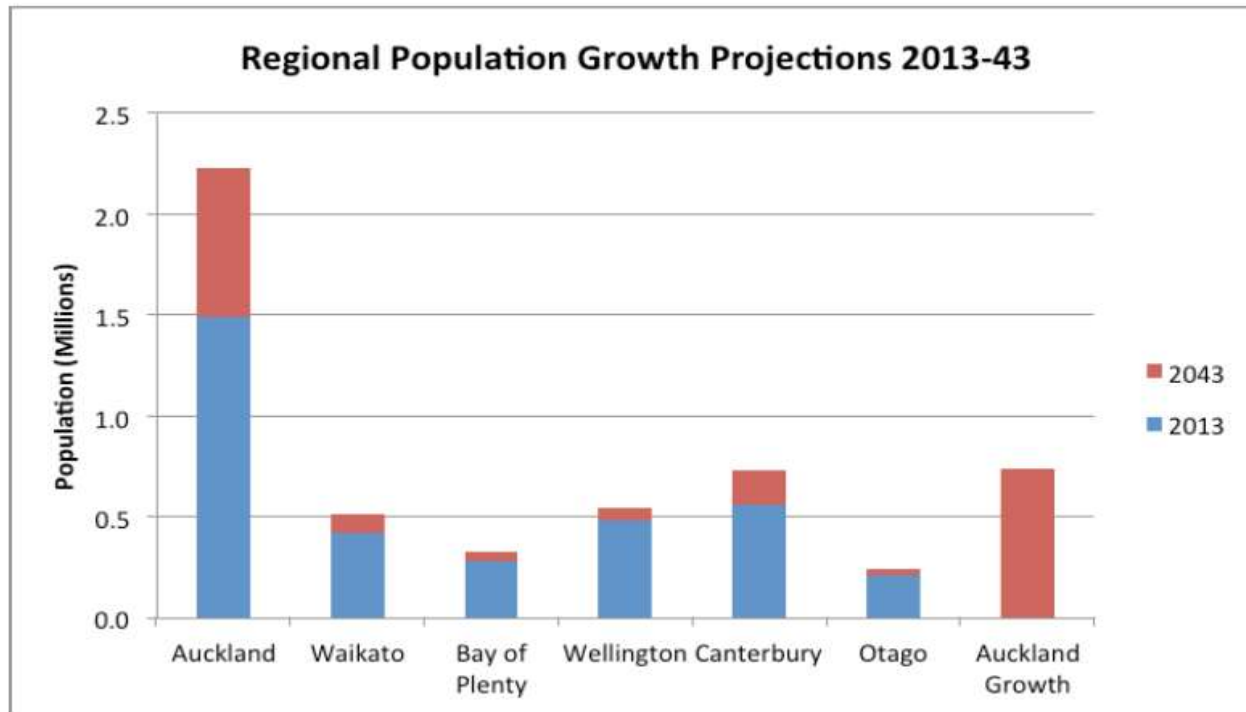
Is our current transport system resilient? How resilient does it need to be? How much do users value resilience?

Do we understand the value of connection?

What do the future funding mechanisms look like? Do we have the right system and capability to plan and manage such mechanisms?

How do we embrace technological challenges and opportunities?

# Will population changes create demand challenges?



Source: Statistics New Zealand medium population growth projections

# It doesn't always turn out how we predict...

The value of the euro will  
soar when introduced.

International consulting firm

There will be peace  
in our time.

Neville Chamberlain

I think there is a world market  
for maybe five computers.

Thomas Watson  
CEO of IBM late 1940s

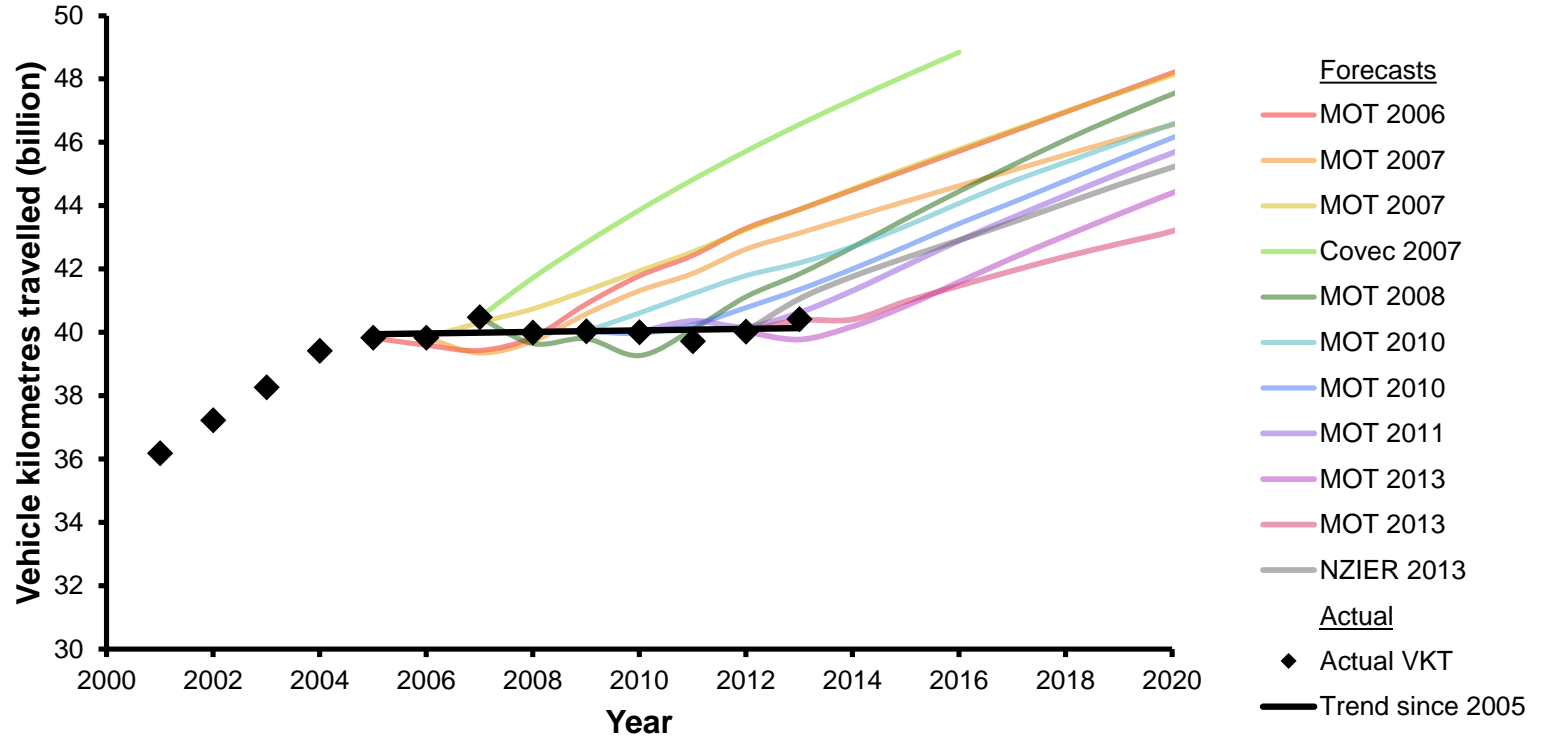
Inventions have long  
since reached their limit,  
I see no hope of further  
development.

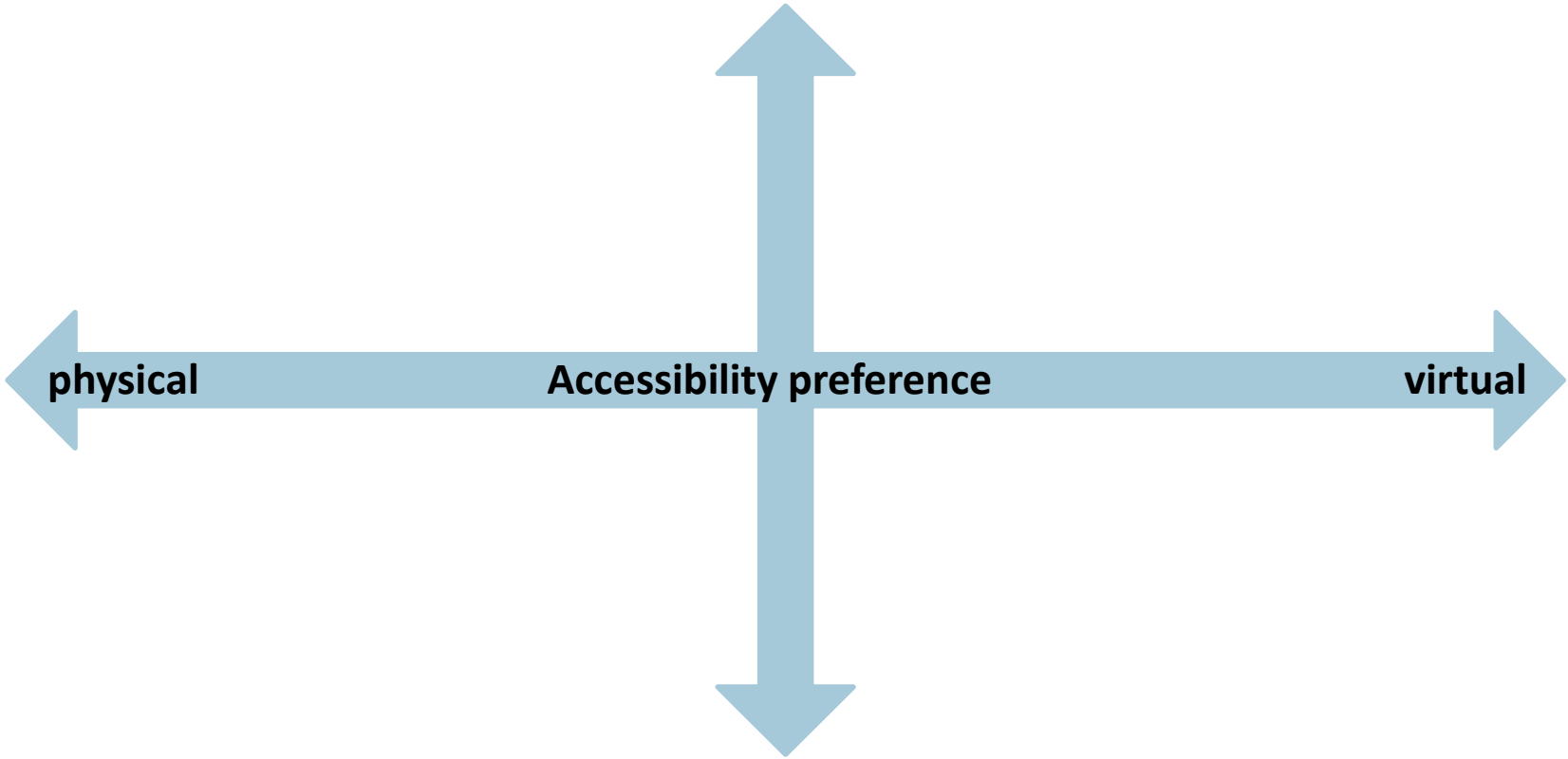
*Sextus Julius Frontinus*  
*Roman Engineer*

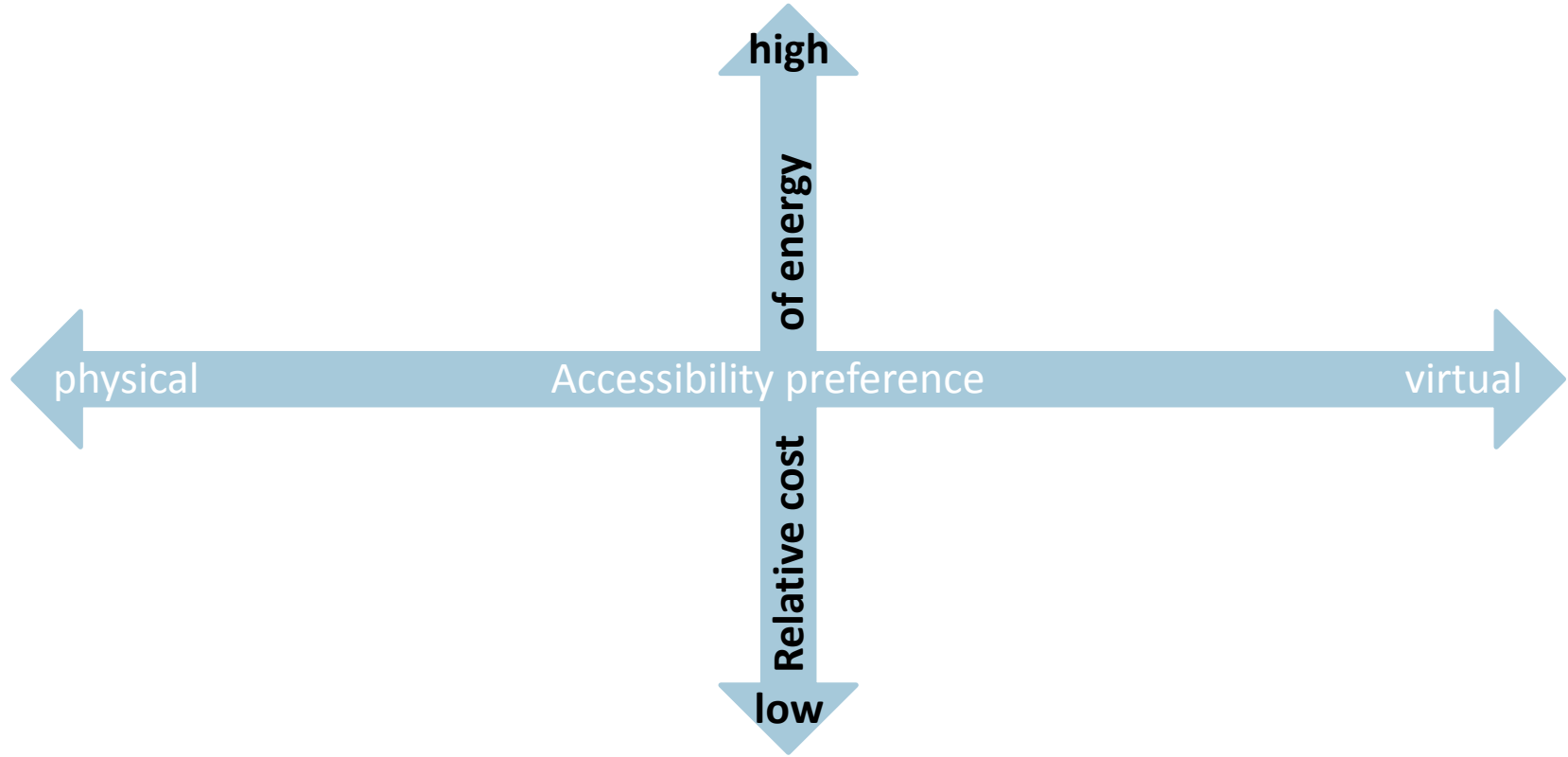
Any prediction about  
serious matters is likely  
to be off the mark,  
except by accident.

Prof Norm Chomsky

# Peak, pause or plateau







Co-operative and Close



Global Locals



high

of energy

physical

Accessibility preference

virtual



Travellers' Paradise

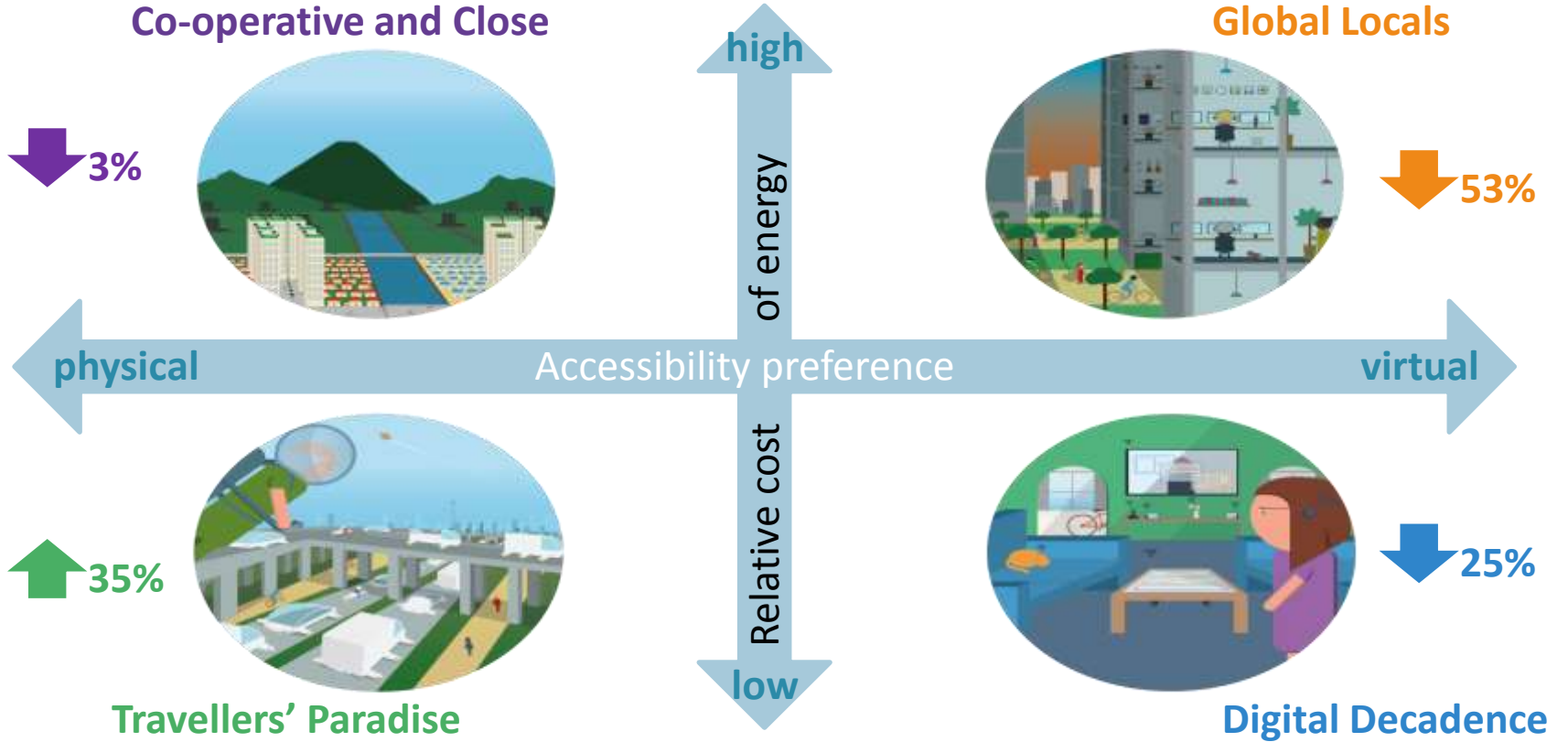
low

Relative cost

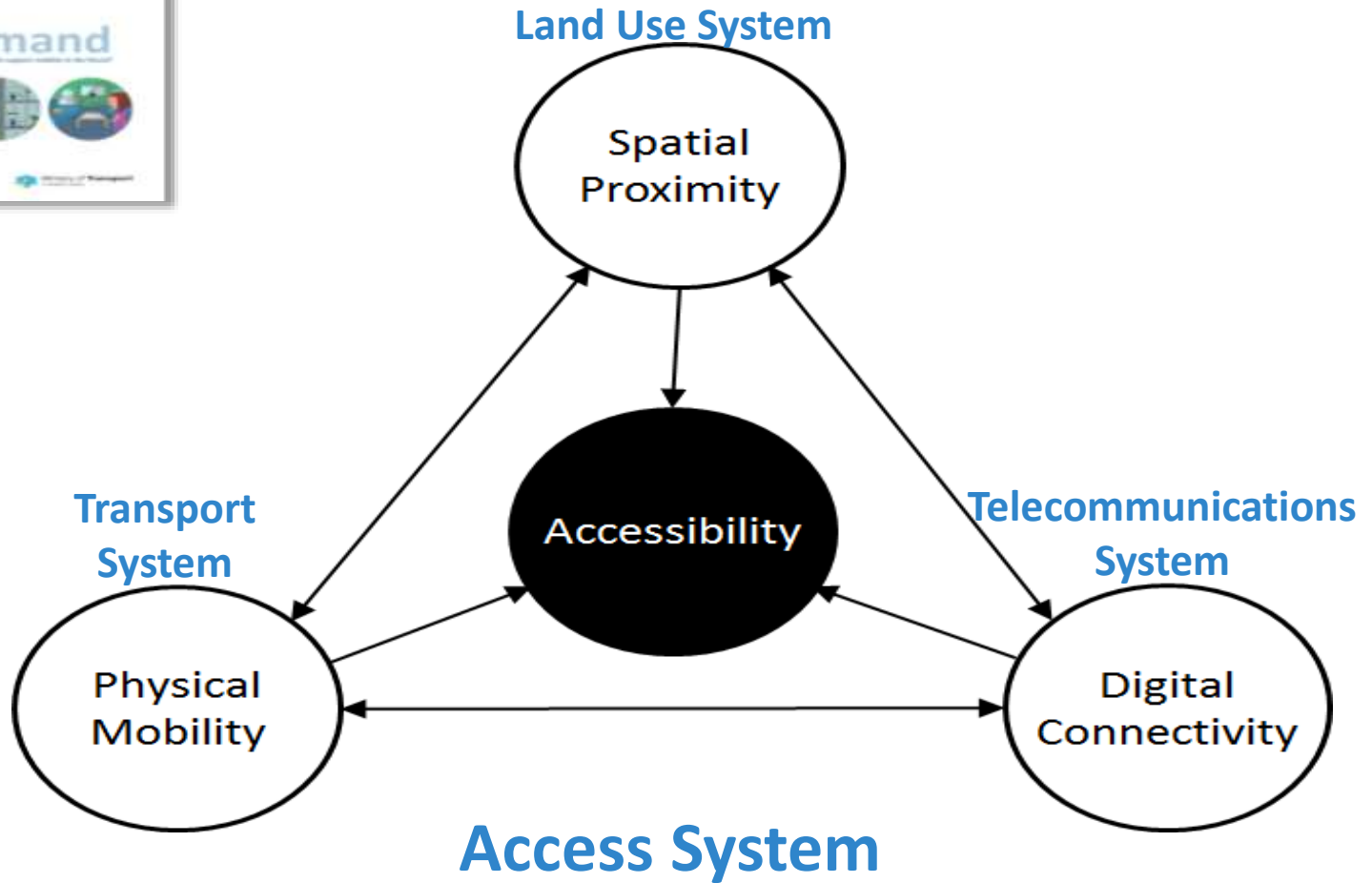


Digital Decadence





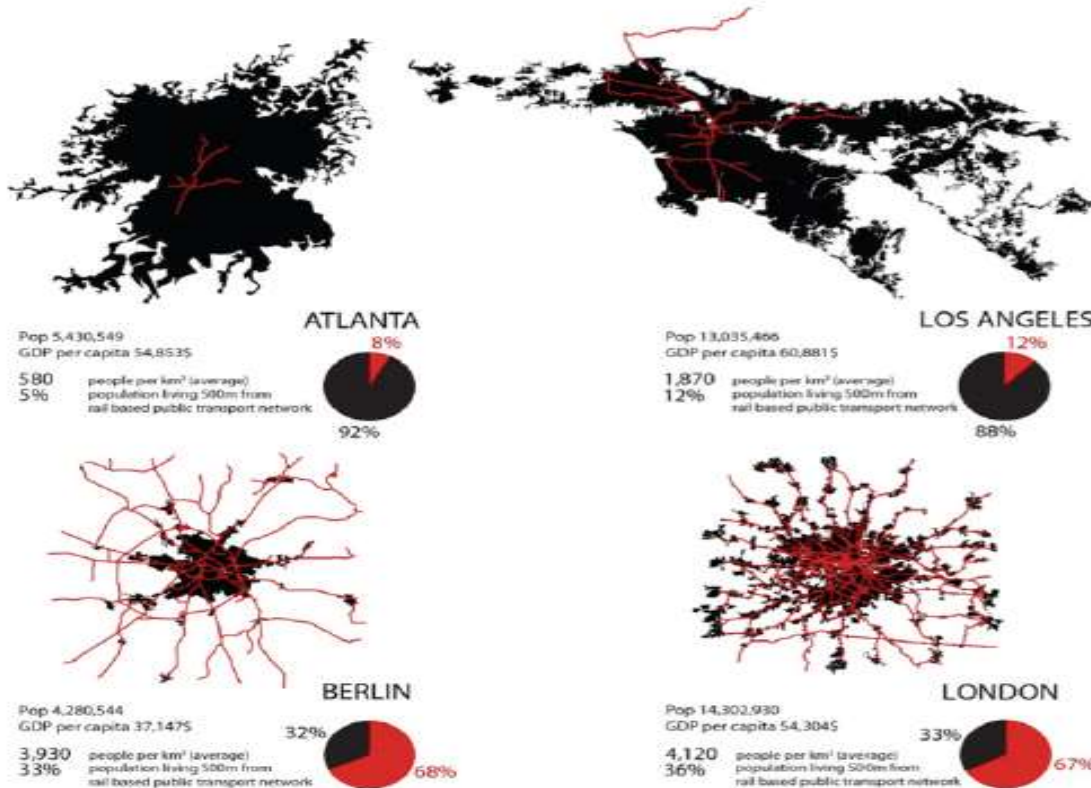
**Percentage change in total vkt from 2014 to 2042**



Enabling us to reach people, goods, services and opportunities

# How should we design our cities?

Urban form and modal share (black in pie chart is private motorised) of selected cities



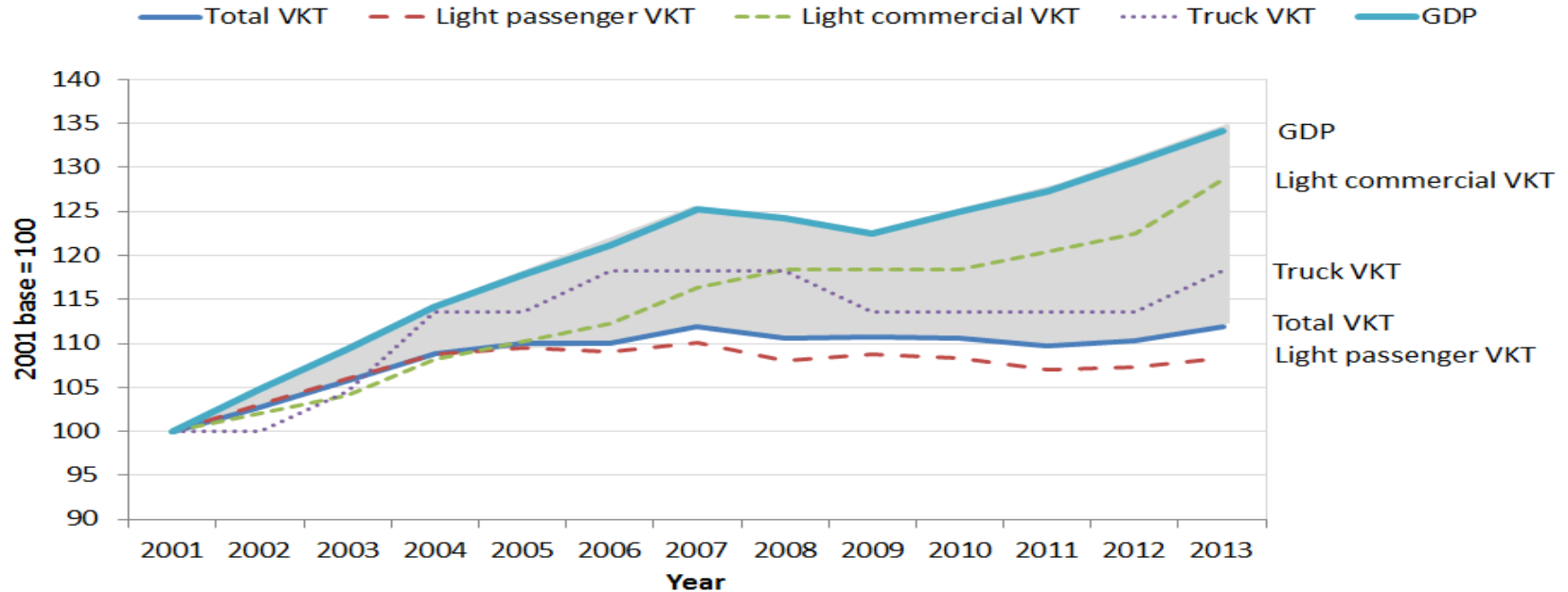
Economic output achievable using different pathways

But with what cost for transport?

Enduring co-dependence of (urban) form and transport systems

# Could virtual substitute for physical?

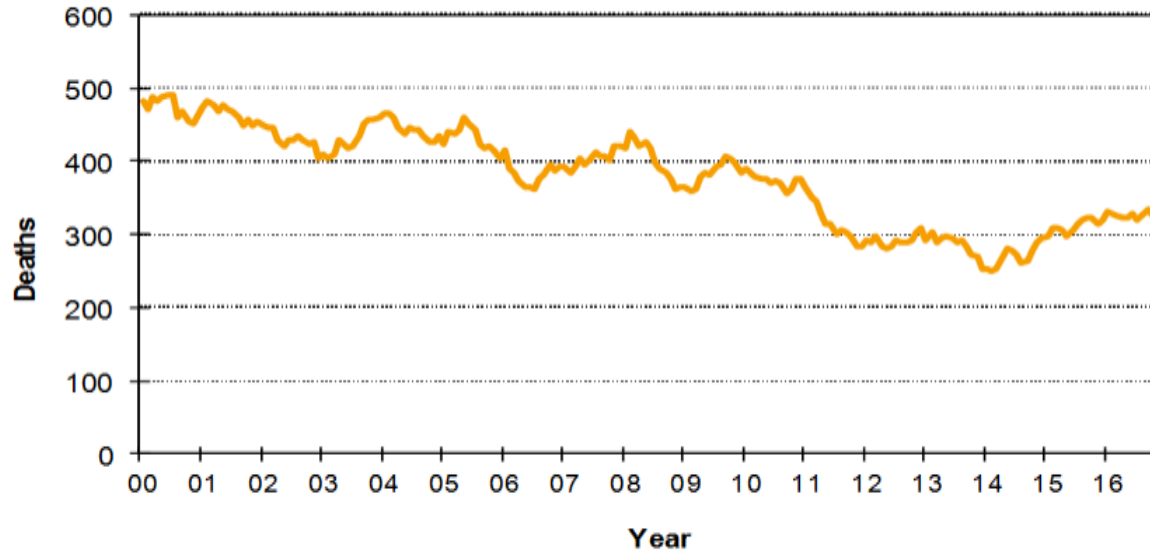
**Gross Domestic Product (GDP) and vehicle kilometres travelled (VKT) by vehicle type**



In New Zealand the traffic intensity of economic activity has been reducing

# How can we reduce fatalities on the road?

## Road Deaths



Each point shows the number of deaths in the preceding 12 months

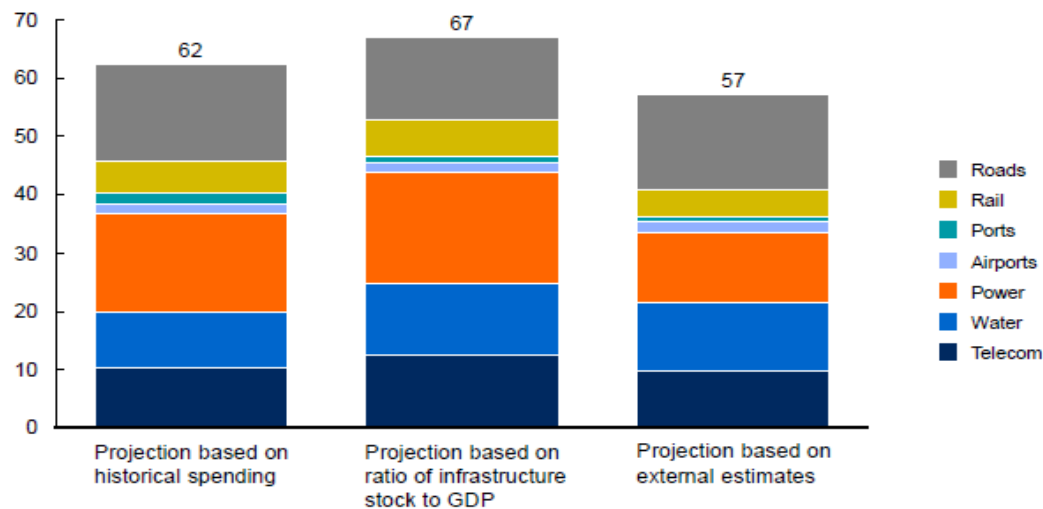
# \$57tn investment needed in infrastructure

## Exhibit E1

### We use three methods to derive similar estimates of need

Estimates of needed infrastructure investments, 2013–30

\$ trillion, constant 2010 dollars



SOURCE: Organisation for Economic Co-operation and Development (OECD); International Energy Agency (IEA), 2011; International Transport Forum (ITF); Global Water Intelligence (GWI); McKinsey Global Institute analysis

# Opportunities to save \$1 trillion per year

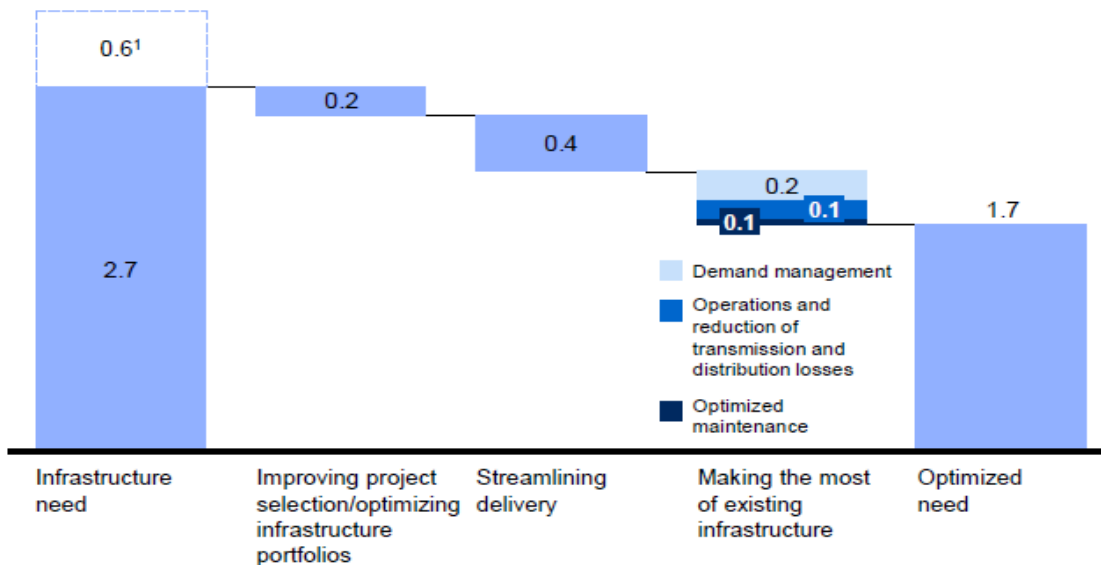
## Exhibit E2

### The \$1 trillion-a-year infrastructure productivity opportunity

Global infrastructure investment need and how it could be reduced

Yearly average, 2013–30

\$ trillion, constant 2010 dollars

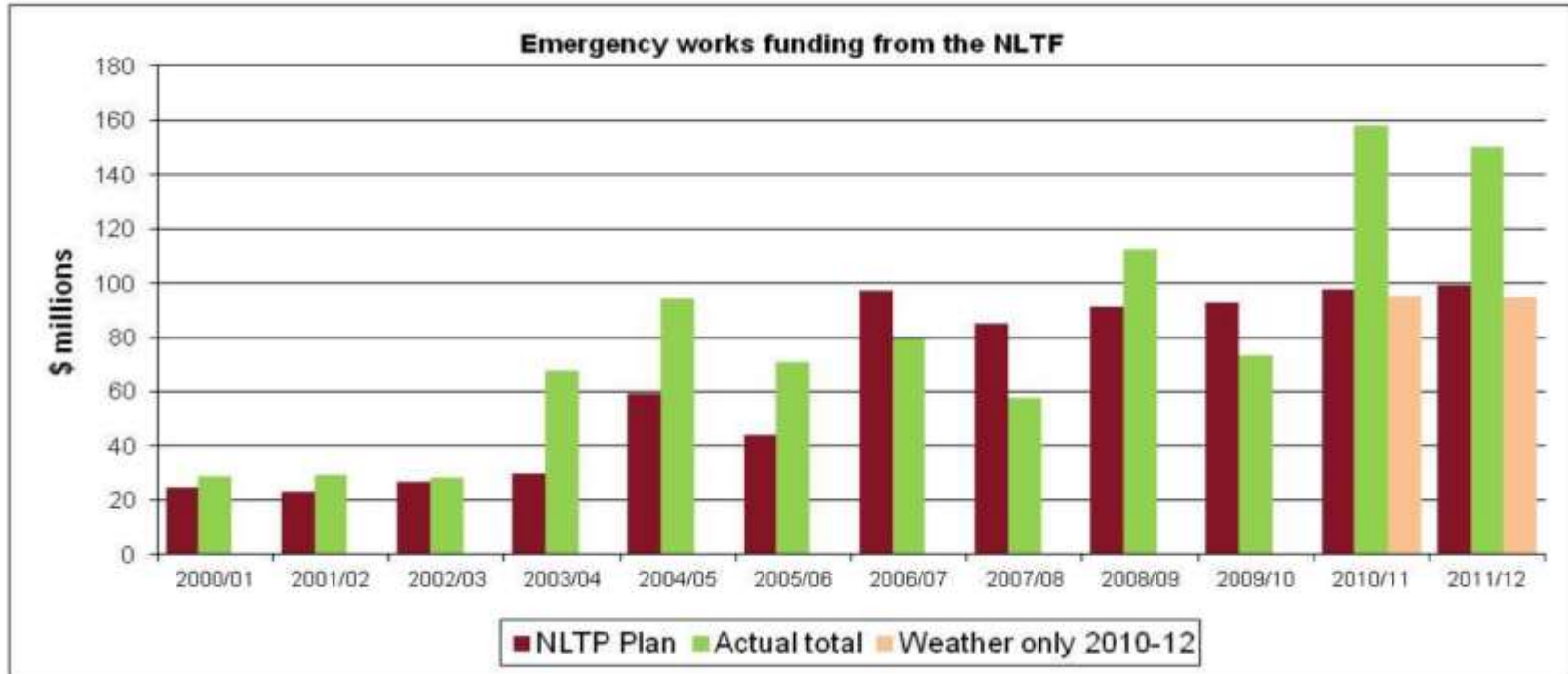


1 Telecom investment need beyond the scope of this paper.

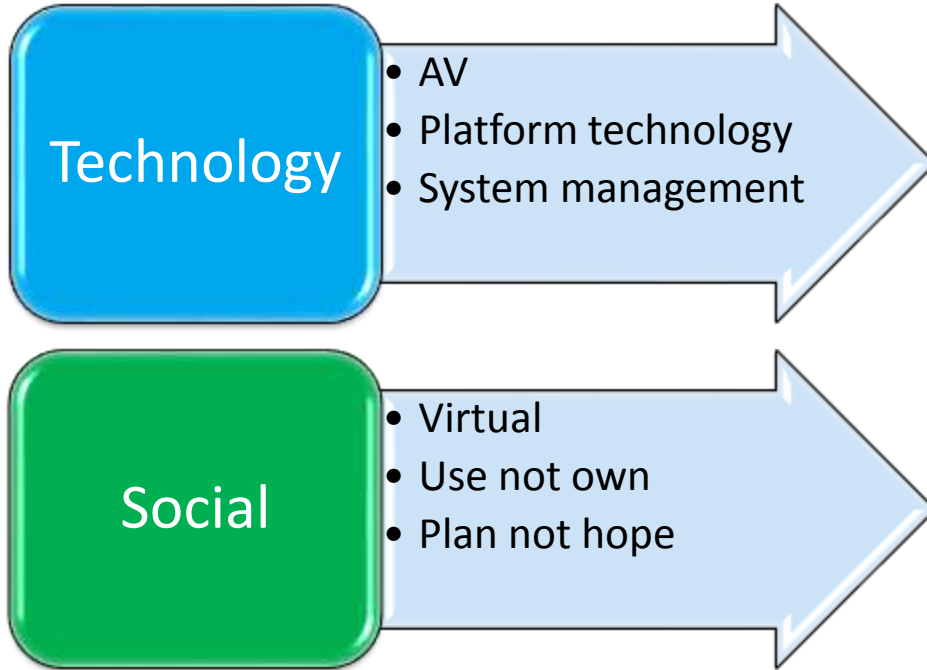




# What does a resilient transport network look like?



# Disruptions to transport



# Disruptions to transport

Technology

- AV
- Platform technology
- System management

Social

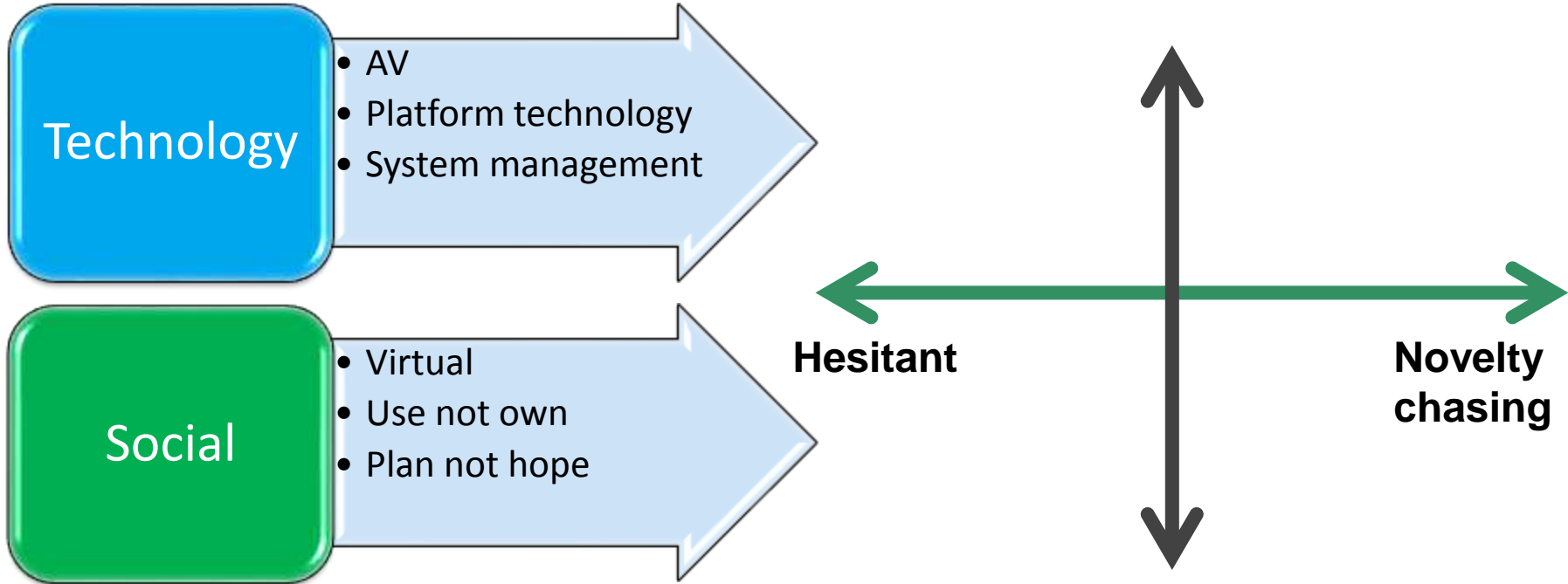
- Virtual
- Use not own
- Plan not hope

Seamless

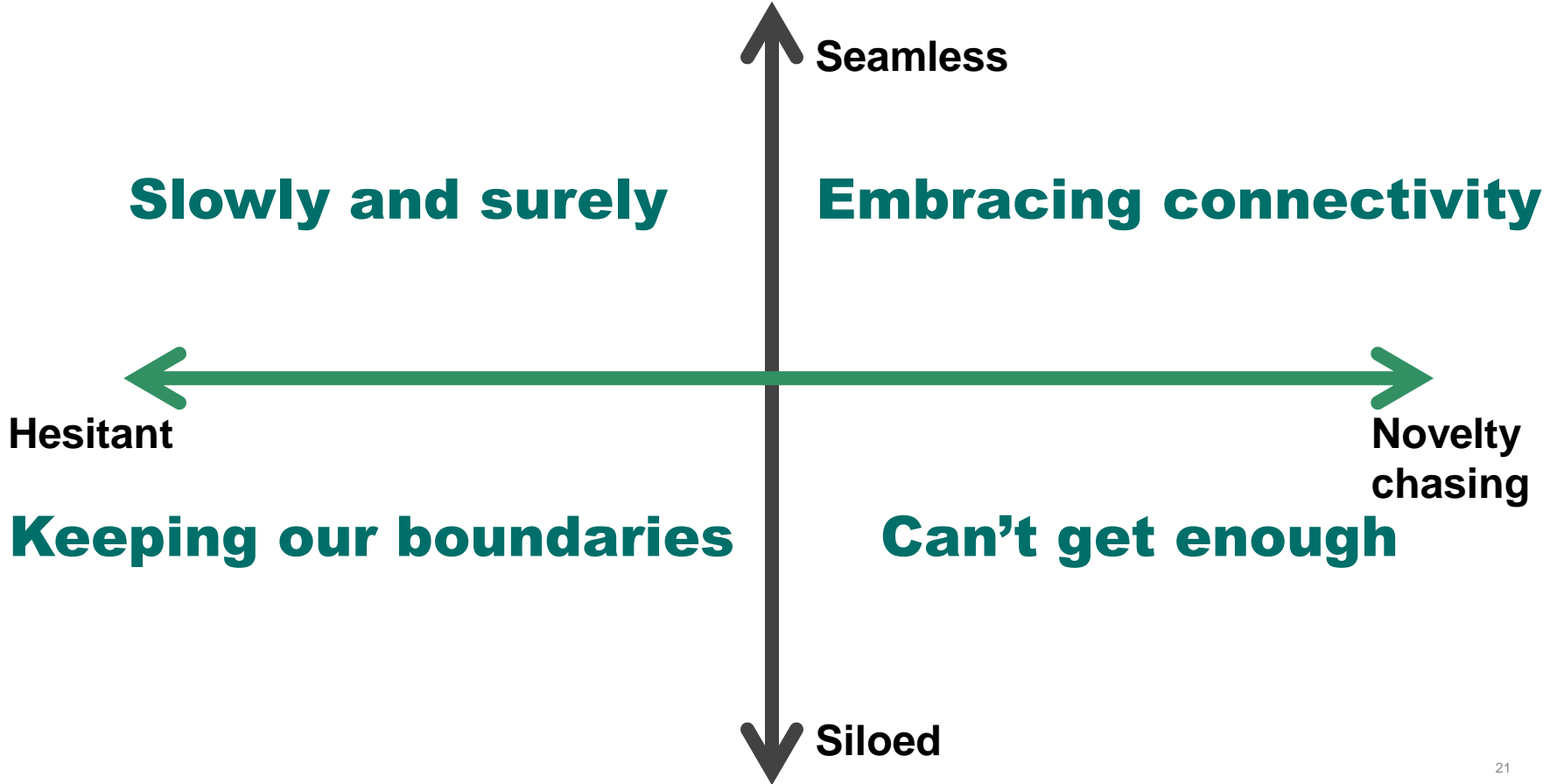


Siloed

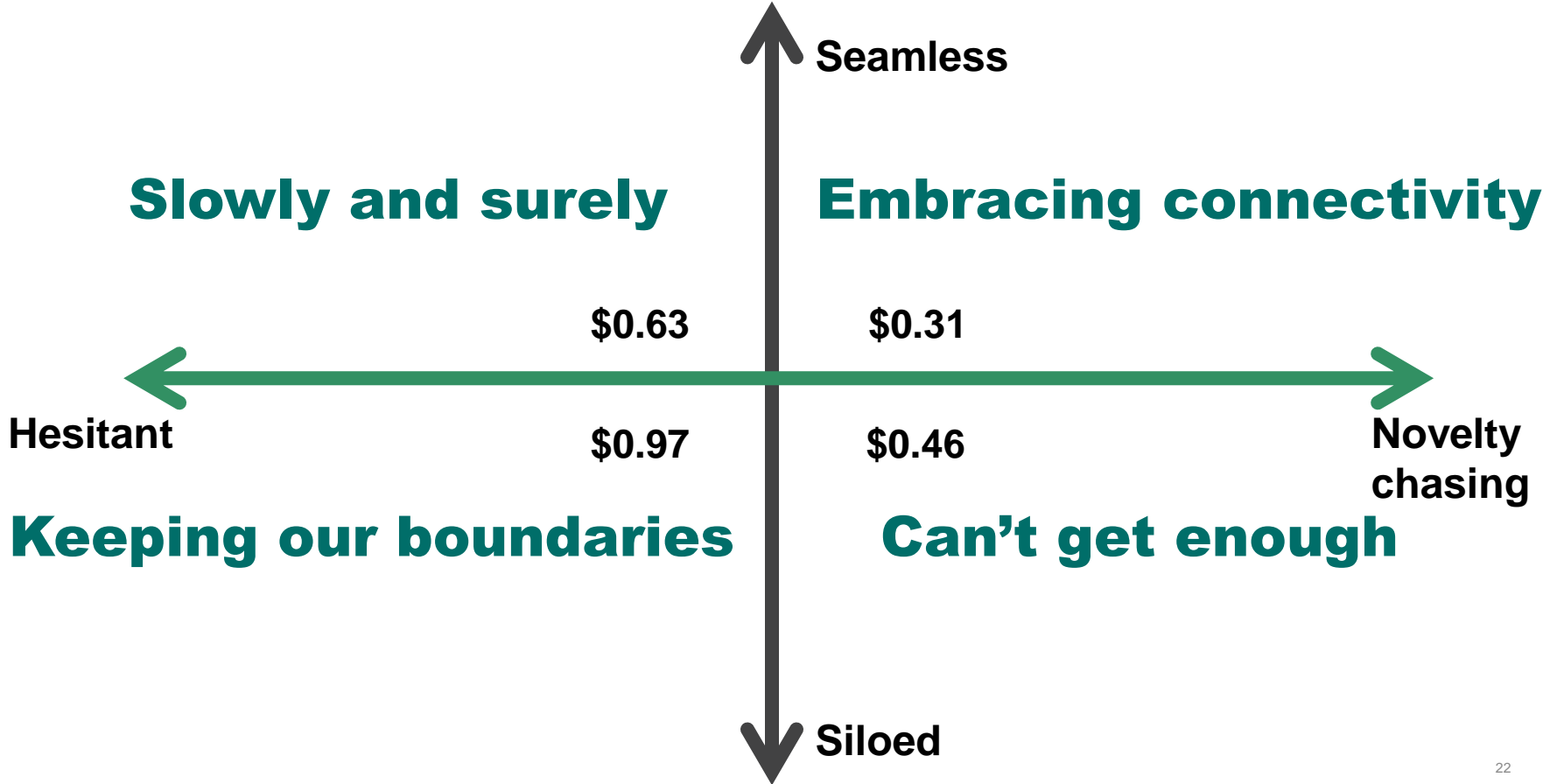
# Disruptions to transport



# Regulation 2025



# Regulation 2025



Agent-based simulation for  
**a real city (Lisbon)**  
real trips on a detailed network model  
(currently only urban core)

# Ride sharing can have a significant impact on the transport task

- In the 3-mode configuration (Metro, Shared Taxis & Taxibuses), no congestion, even at peak
  - VKM at peak 37% lower than current (no congestion !)
- Much lower emissions
  - Short-term due to reduced VKM (34% lower than current)
  - Mid- and long-term even better given faster fleet turnaround (each vehicle travels much more)



# Software

System  
issues

# Performance

- trials to certification
- comply – will it
- stability
- fail safe



# Software

## Human interface

- issue for today
- who is in control
- test of character?

System  
issues



# Software

# Ethics

- who to save
- social and cultural values
- moral and ethical choices are not black and white

# System issues



# Software

## System issues

### System performance

- emergent behaviour
- effectiveness
- stability
- fail safe
- compatibility



**Software**

# **Liability**

- who should pay
- will there be insurance

**System  
issues**



# Security

## System issues

# Data

- who owns the data
- expectations on data sharing
- expectations on data storage
- protection



# Security

## Physical security

- vehicle
- fleet
- management system

## System issues



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Thank you

