

# Long term impact of Covid-19 on (active and non-) mobility

“Elk nadeel heb zijn voordeel” - J.C.



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# Impacts Covid-19 on mobility

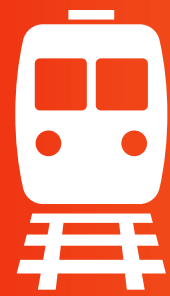
## Enormous changes in demand and model splits

**Decrease of PT use,  
even after re-  
opening of schools  
and unis (-42%)**

**Car-use similar to  
before, more  
spreading over day,  
far less congestion**

**Slightly less walking  
trips, substantial  
increase in distance  
walks (+14%)**

**Large increase in  
number of bike trips  
and distances  
(+54%)**



**Increase in urban  
car ownership**

**Increase in (e-) bike  
and moped sales  
(+348%)**



# Fundamental changes in mobility?

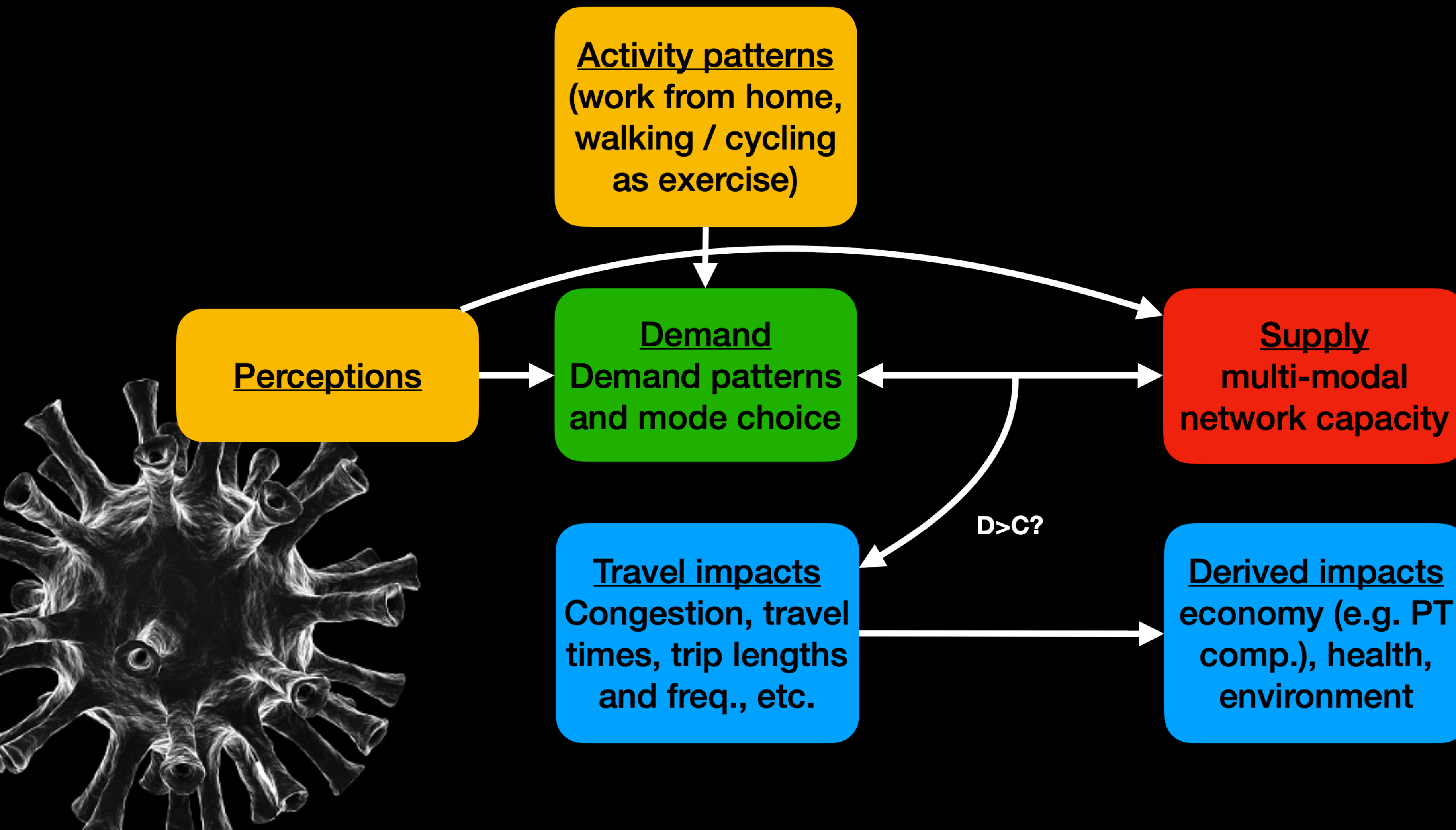
## Changes in demand, mode choice, and non-mobility

- Working from home has increased (from 32% to 67%), people indicate to keep working from home often (~50%), many meetings remote
- Authorities / companies indicate reduction office space (e.g. Amsterdam)
- Increase in active mode use (+12% walking, +20% cycling) of PT users
- **Less (long range) travel, more active mode travel (greener, healthier)**
- Attitude towards PT after crisis unclear
- Increased car use may remain (indicated by +11% of PT users)
- Increases in ownership private mobility is likely to last
- Breyer's law... people moving to locations further from workplace?
- **Relative increase in car traffic reduces or cancels positive impacts of other trends.**



# Simplified conceptual framework

## Relations affected due to Covid-19

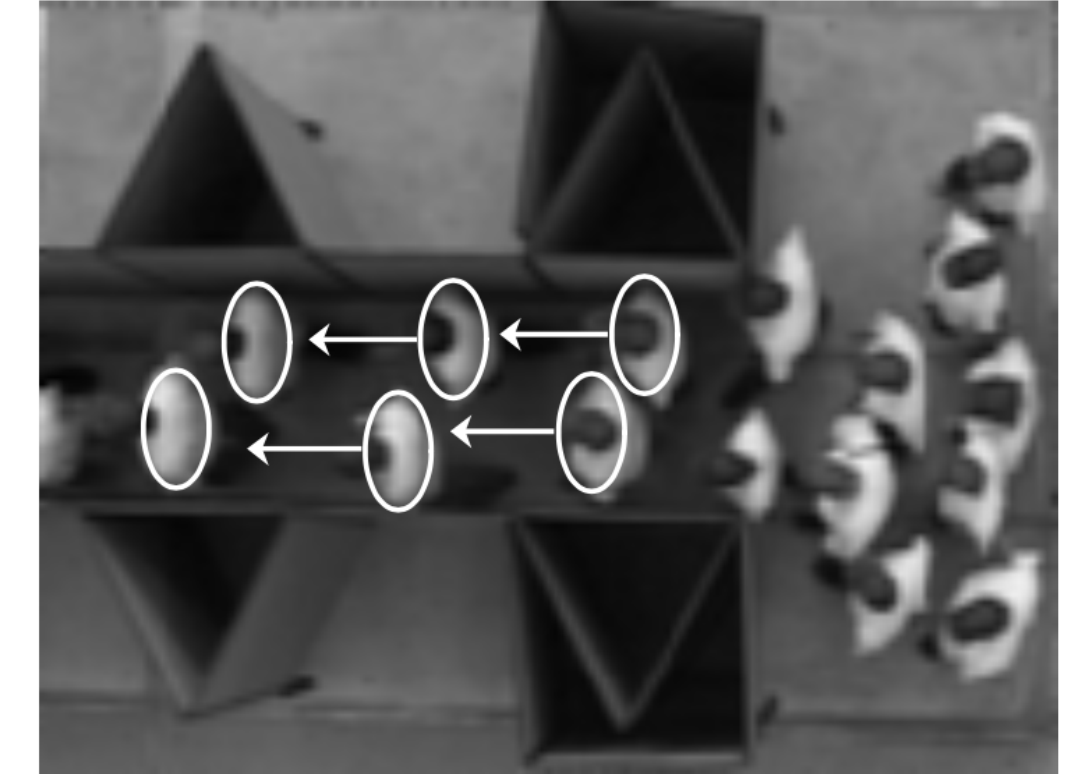
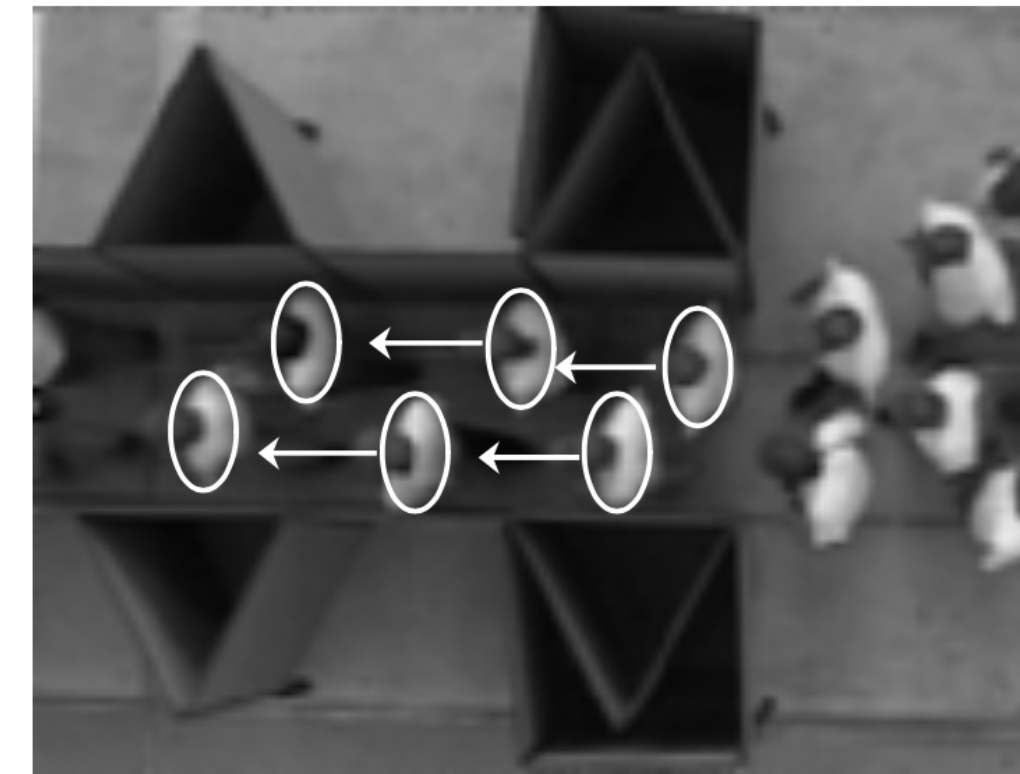




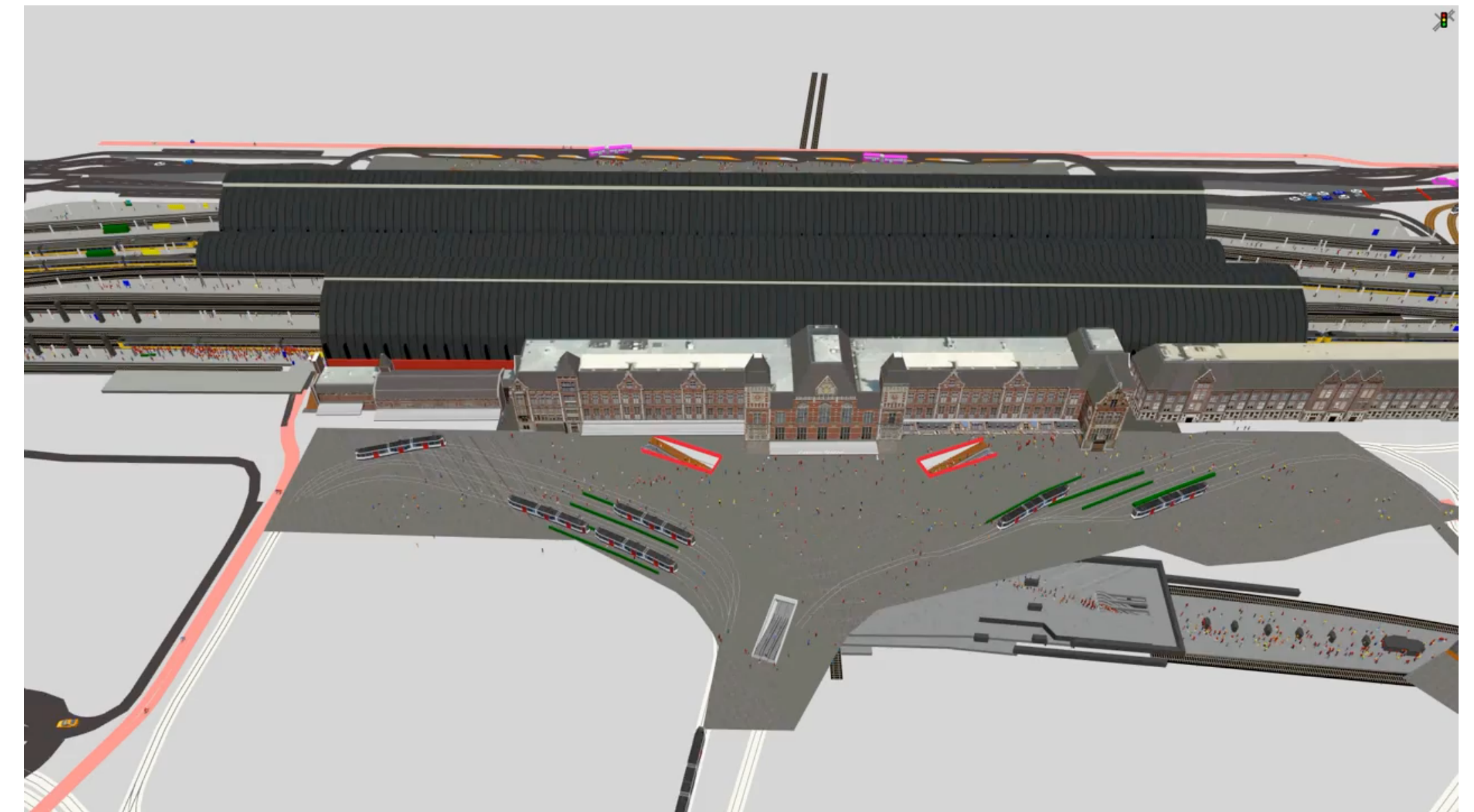
# Impact on supply

## PT vehicles, peds, bicycles

- Changes in supply due to 1,5 m rule:
  - Evident reduction seating capacity PT vehicles (depending on regime)
  - Effective capacity pooled services?
  - Capacity simple (active mode) bottlenecks (via simple calculation) expected around 40%
  - Impact on transfer point capacity (more involved due to interacting processes ) not easy to determine, simulation studies show remaining capacity of ~20%: **transfer hubs become bottlenecks?**
- Role of understanding behaviour!



**Capacity of narrow corridor** is determined by a) number of 'lanes' that are formed and b) the capacity of a single lane. Keeping 1,5 m leaves only space for one lane (50% capacity reduction) and slight reduction of capacity for one lane (1,5 m distance instead of 1,3 m).



**Complex interaction** of processes influenced by keeping 1,5 m distance (capacity reduction of train doors, stairs, escalators, corridor, and queue formation / spill back) causes high reduction in transfer capacity.



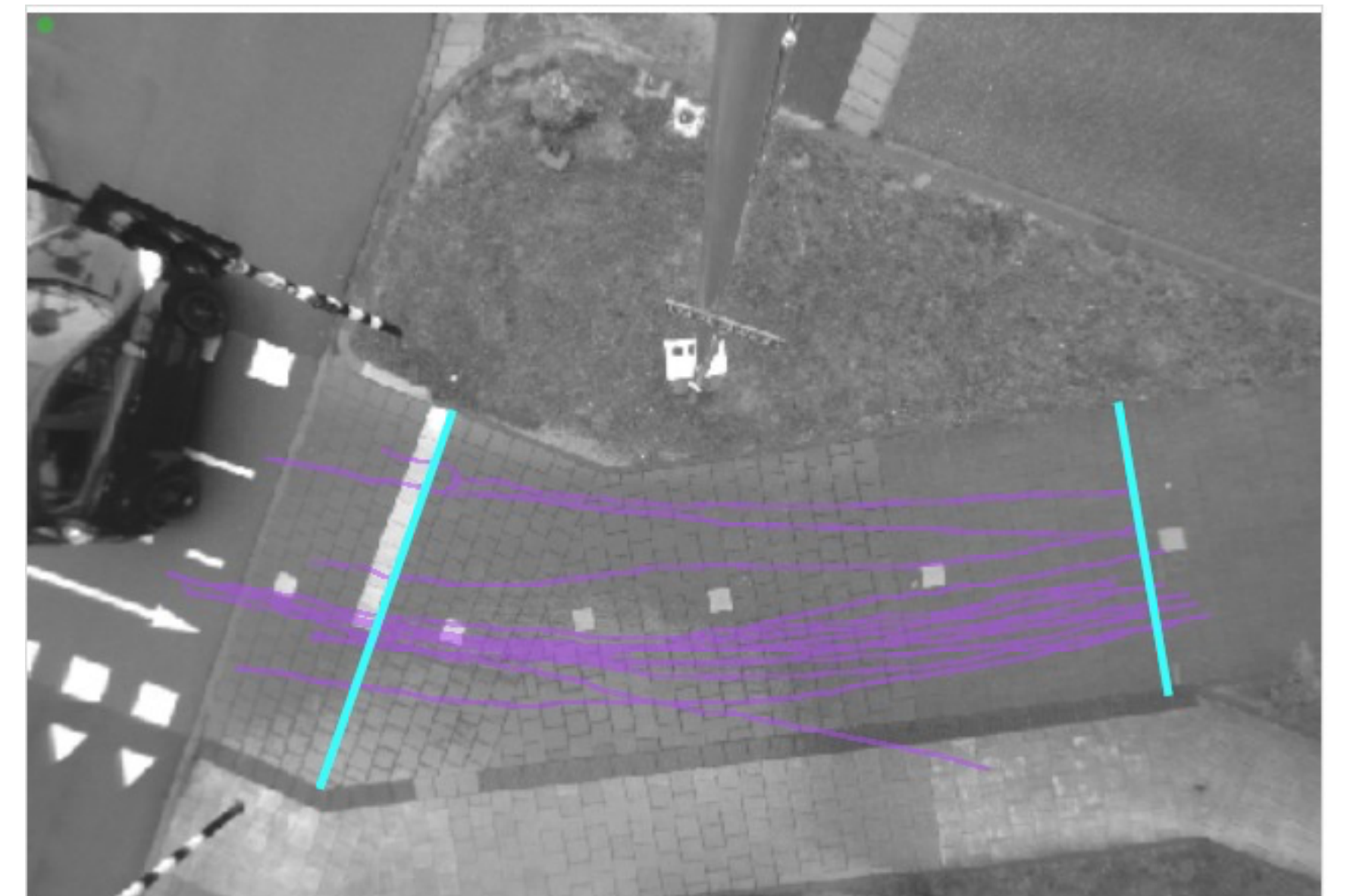
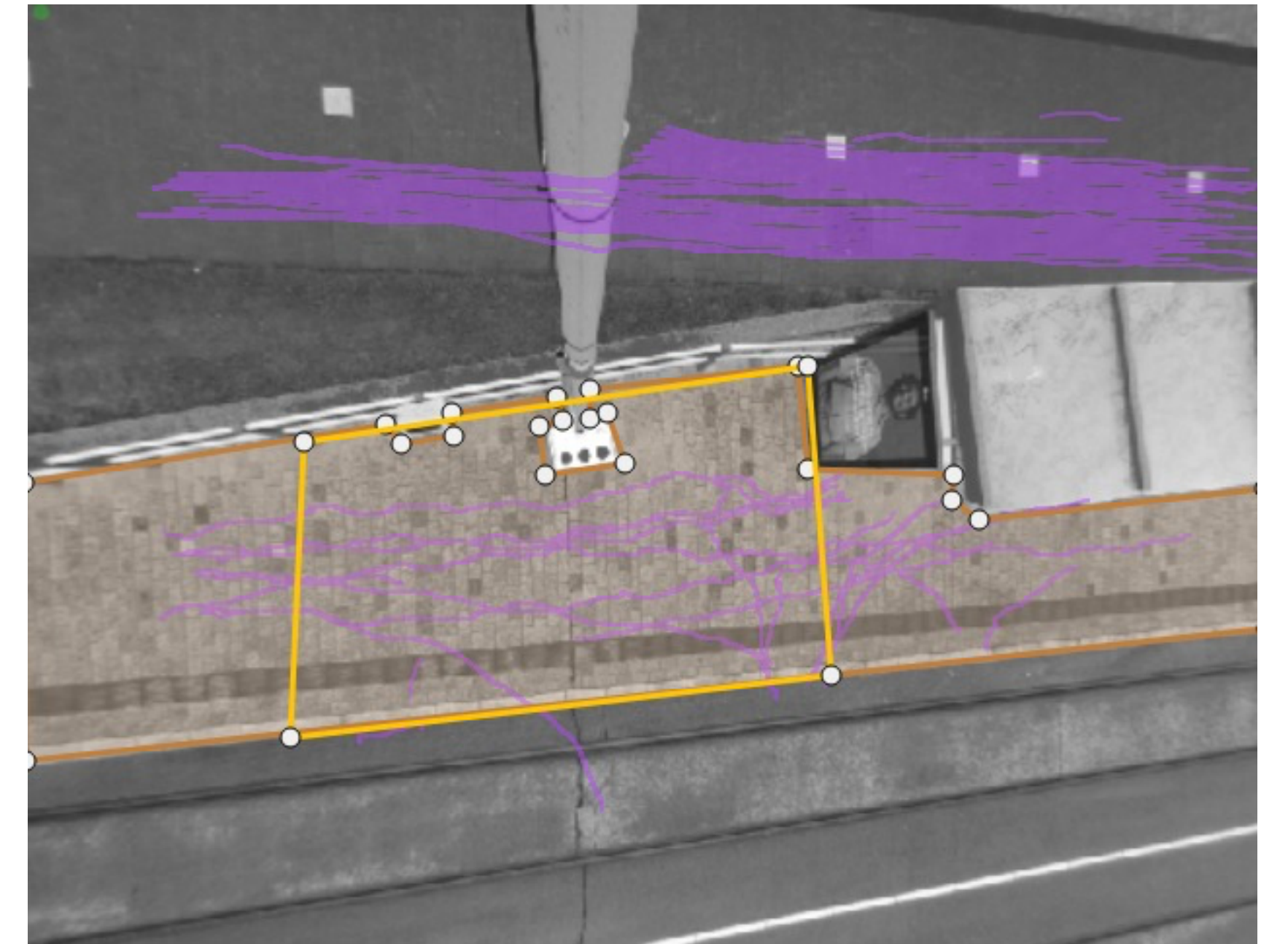




# Role of behaviour

## Supply side impacts of Covid-19

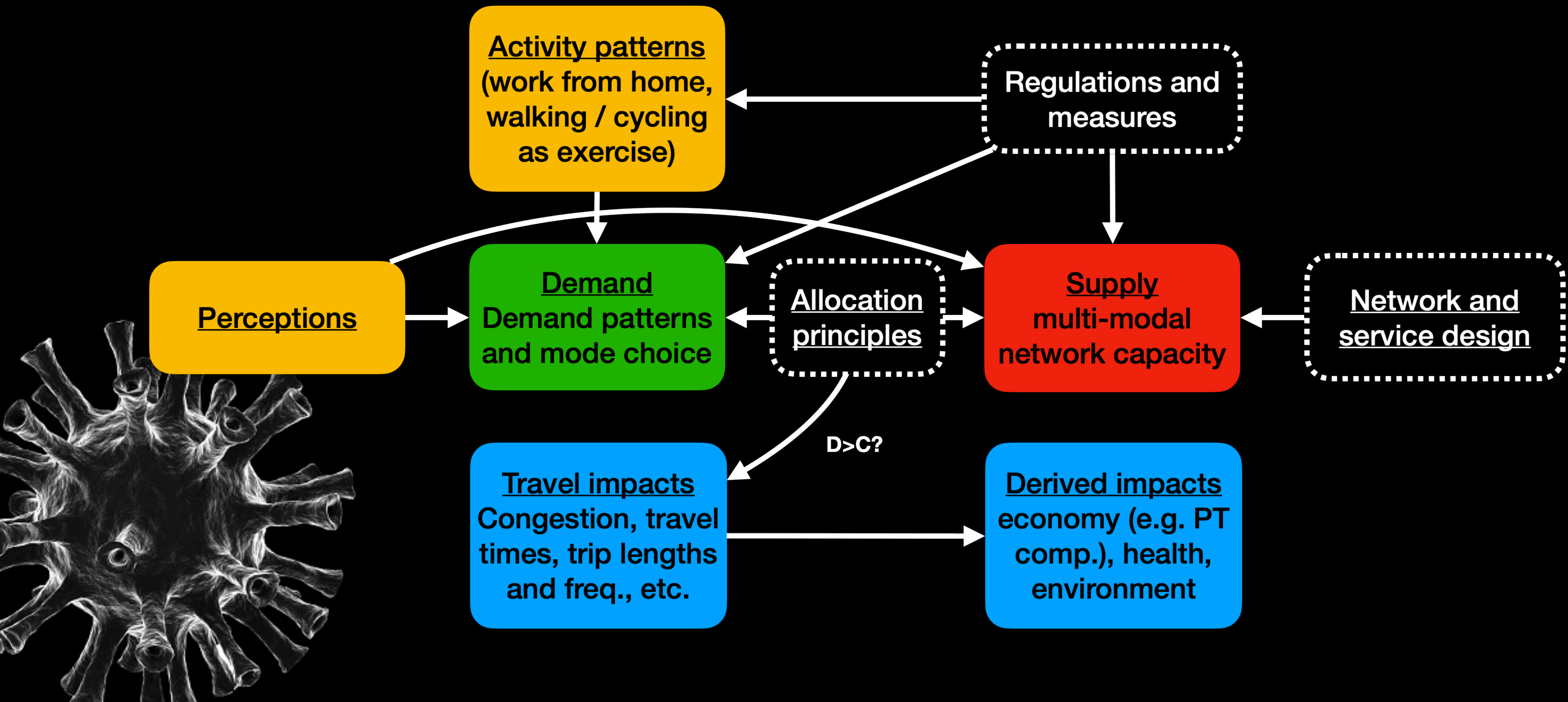
- Covid-19 research (surveys) on use of PT vehicles, airplanes, etc.
- Understanding interaction behaviour of pedestrians and cyclist
- Do people maintain distance according to regulations, and what are the impacts on capacity?
- How does this affect capacity of complex facilities (transfer stations, airports)





# Simplified conceptual framework

## Relations affected due to Covid-19





Network  
design



Milan covering car to bicycle infrastructure

Regulations



Facemasks required in PT vehicles

Measures



Brussels provides less green to cars and more to active modes

Allocation  
principles

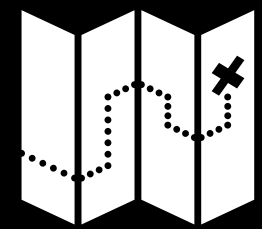


Right to travel (capacity allocation) by priority group, tradable permits, etc.

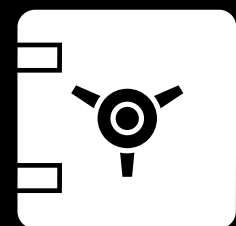


# Designing & testing innovative interventions?

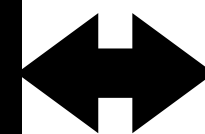
## TU Delft Campus “Mobility Microcosm”



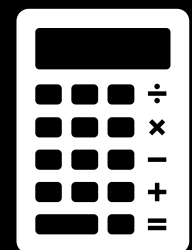
Digital Twin 3D visualisation



Data storage and management



Modelling, prediction, AI  
Agent-based simulation



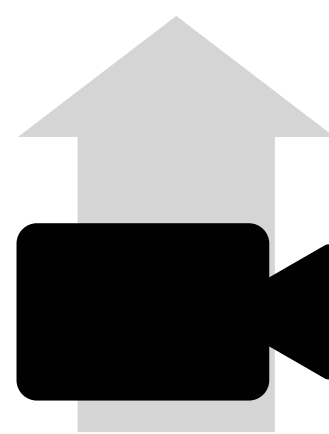
Data processing, fusion  
Computation of KPIs



Number of  
devices “with Wifi  
on” in buildings



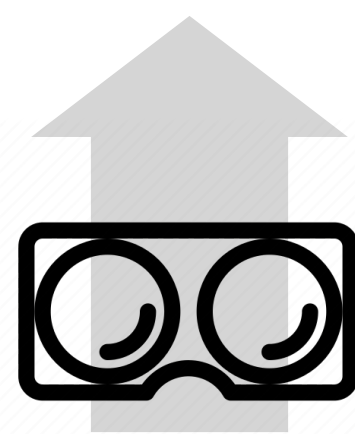
Number of  
people checked  
in at buildings  
(I-project)



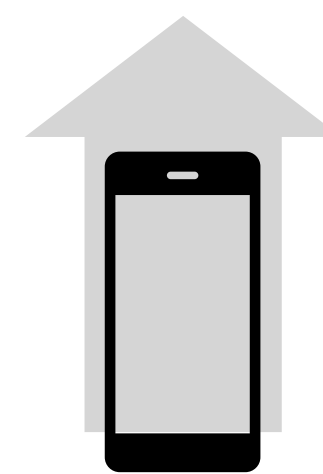
In- and  
outflow  
from  
buildings



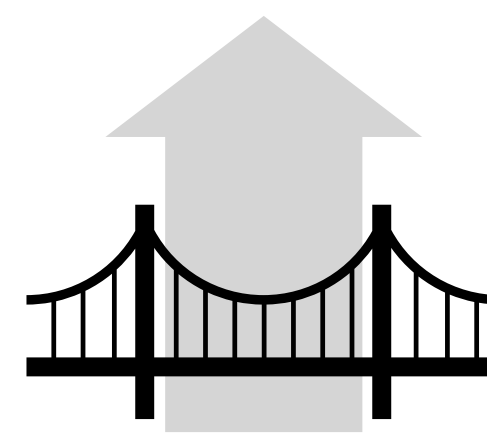
Speed,  
densities, flows  
of bicycles and  
pedestrians



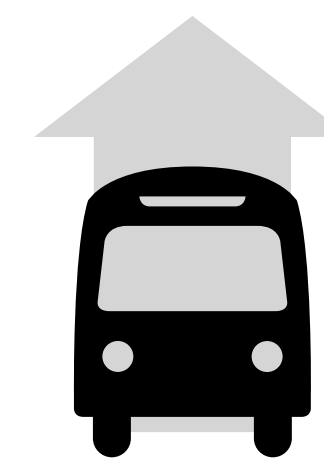
Pedestrian  
microdata at  
pinch points  
and stops



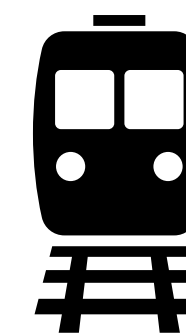
Crowdedness  
notifications  
from stewards  
(UMO app)



Bridge  
openings



Crowdedness in  
PT vehicles



Locations PT  
vehicles



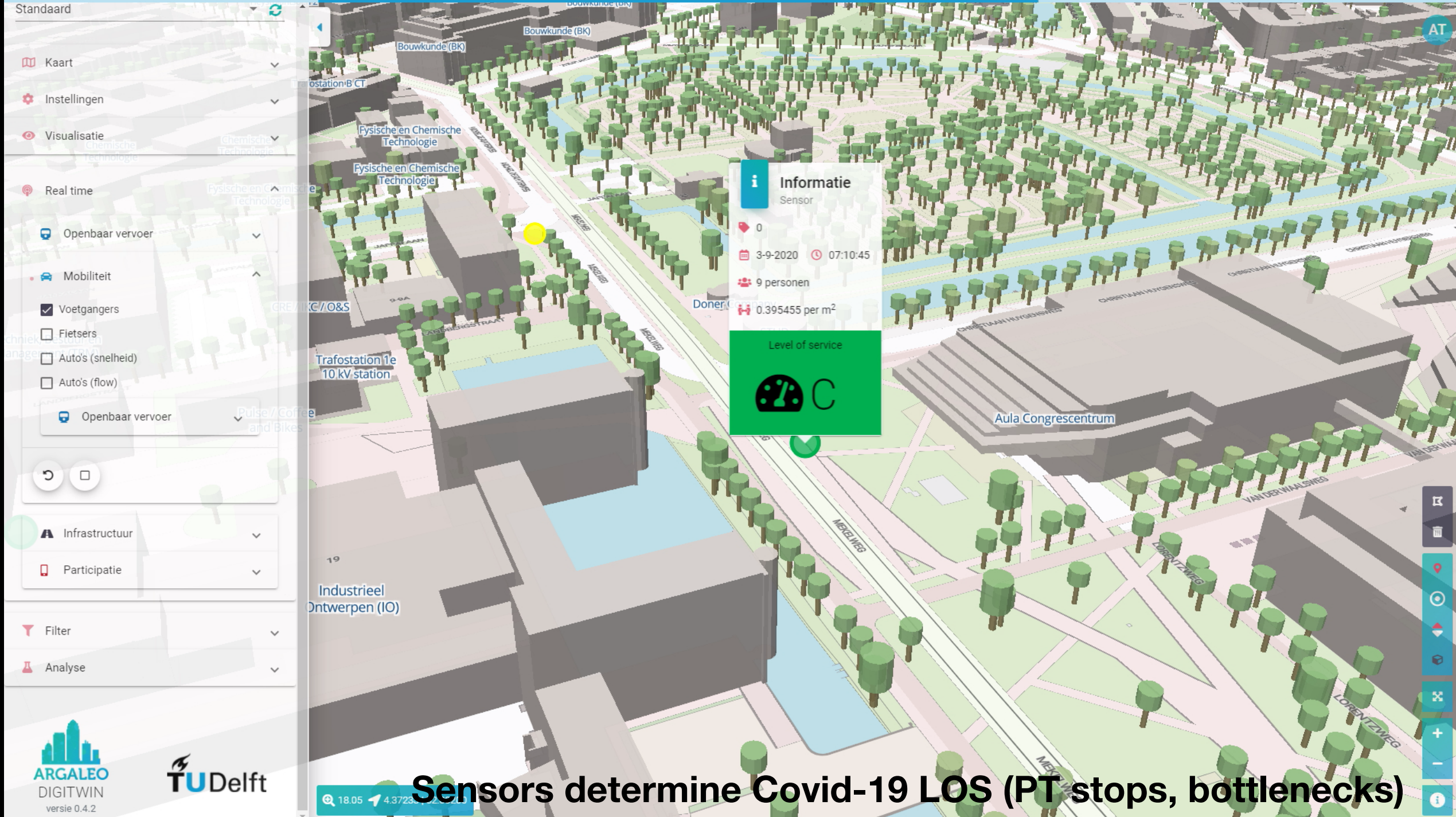
Traffic data  
freeways,  
provincial and  
urban roads



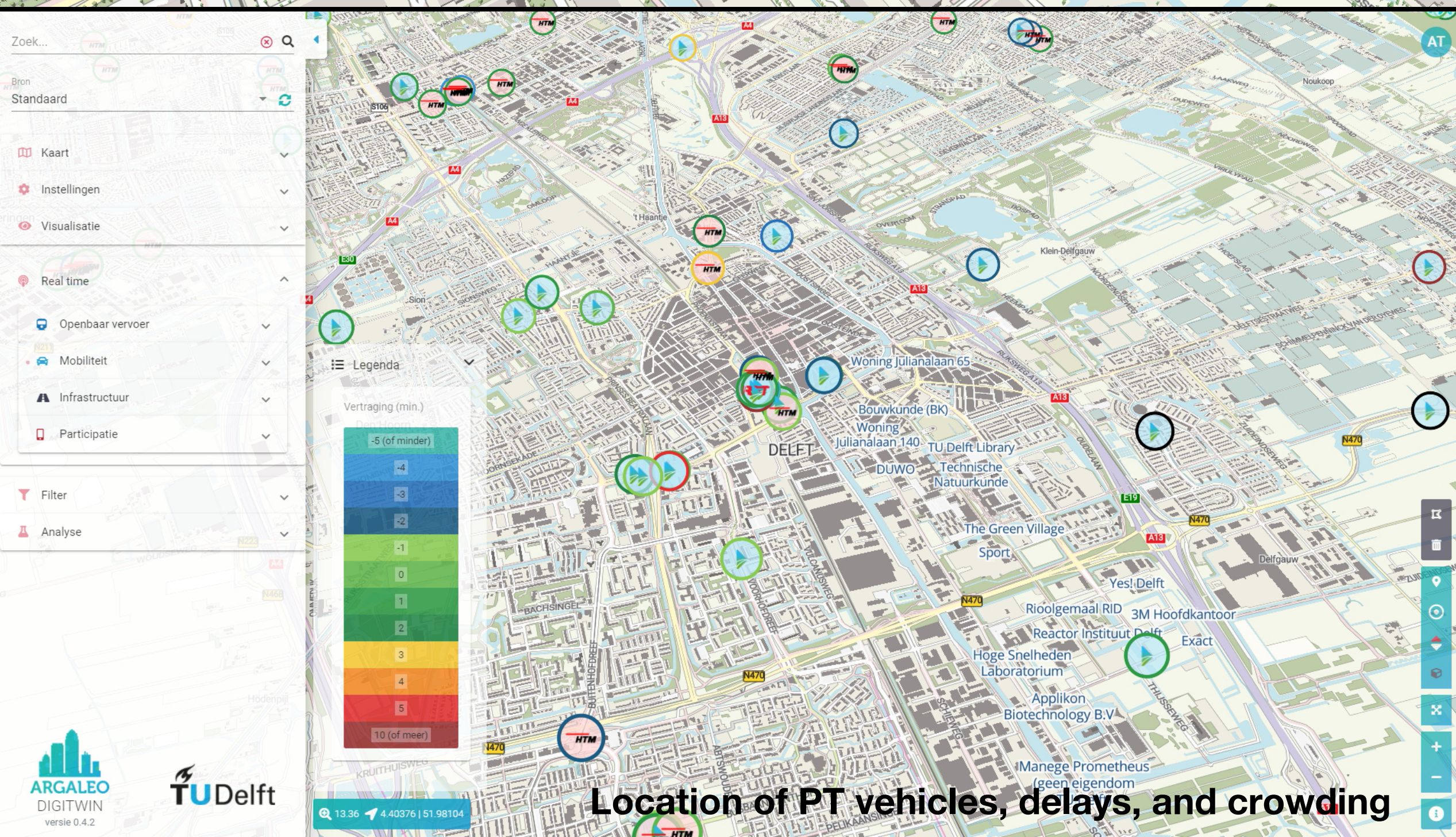




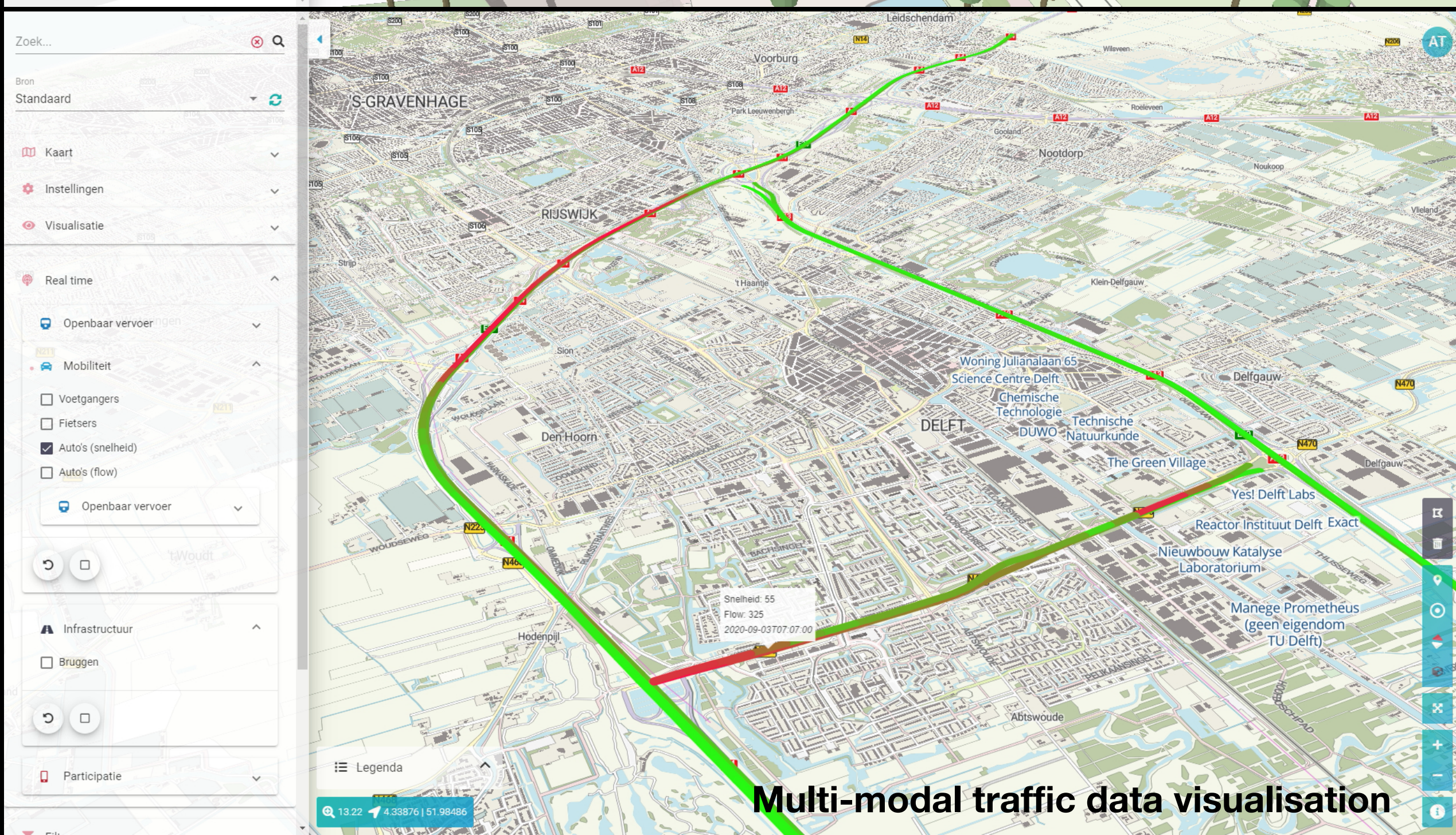
Overview of 3D environment TU Campus



Sensors determine Covid-19 LOS (PT stops, bottlenecks)



Location of PT vehicles, delays, and crowding



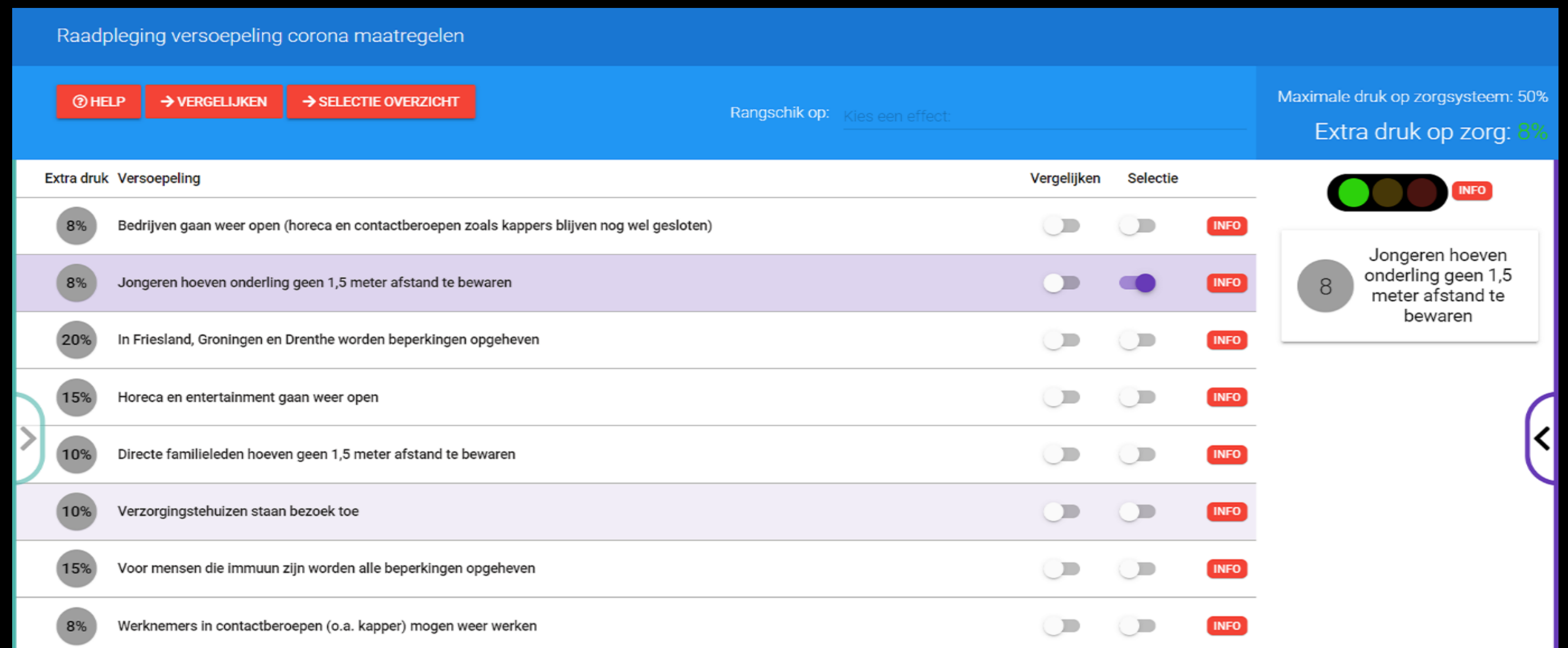
Multi-modal traffic data visualisation



# Testing interventions

## Need from more studies, including international comparison

- Design new and testing measures? Use of digital twin!
- Role of public acceptance? Understanding what people desire including confidence in authorities
- Use of advanced survey methods clarifying impact of decisions while letting people choose sets of measures
- Example exit strategy





# Never waste a good crisis...

## Changing mobility for the better...

- Remaining increase of non-mobility? National surveys indicate that working from home (more) will become the new norm
- More active mode travel that needs to be accommodated, but potentially also more car-traffic
- Reduction in PT remains? Vicious circle: PT companies are in trouble, reduction in PT supply, further decrease in ridership?
- Do these changes remain? We believe so, although previous outbreaks (e.g. SARS) show people return to old habits after a few months

