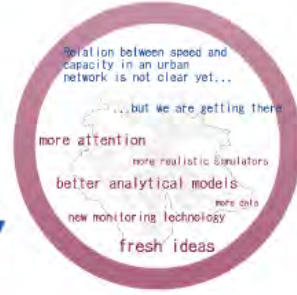


Speed vs. Capacity

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ETH Zurich

SVI, September 16th, 2014



Have speed limits in urban areas improved the urban environment?
...but how do they affect?

Can we improve urban traffic flow by controlling traffic lights?

We are not doing that bad!

According to traffic, you are not doing so well. You are not doing so well. You are not doing so well.

How do we address these issues without reducing our mobility options?
Modify the demand
Modify the supply

...but started in Zurich (one of the first municipalities to implement them in Switzerland) in the early 1990s
Nowadays, over 50% of the streets in Zurich are 30 km/h

Do we also started to look at area speed limits as a sustainable traffic management strategy?

However, area speed limits continue to be highly controversial in Switzerland and abroad

Advantages
Disadvantages

- Reduction of traffic in the city
- Reduction of traffic in the city
- More of the theoretical speed network
- Less of the theoretical speed network

What would happen to traffic in Zurich if all streets were 30km/h?

How does this affect capacity?

How does this affect capacity?

What role does the speed limit play on this?

What role does the speed limit play on this?

...ues without
...ly options?
Modify the supply
(increase efficiency of transport system)
Changes in capacity (???)
Alter road structure (???)
More efficient layouts (e.g.,
...ly efficient alternative
...port systems (e.g.,
... public transport)
... management
... (e.g., perimeter
... use of technology
... to car
... ns)

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Area speed limits were created for multiple purposes: safety, noise, emissions...



...but how do they affect traffic?

Since the invention of the automobile, traffic has been increasing non-stop almost everywhere



This trend is changing our environment

- Urban sprawl & long commutes



- Segregation of activities & isolation



- Safety



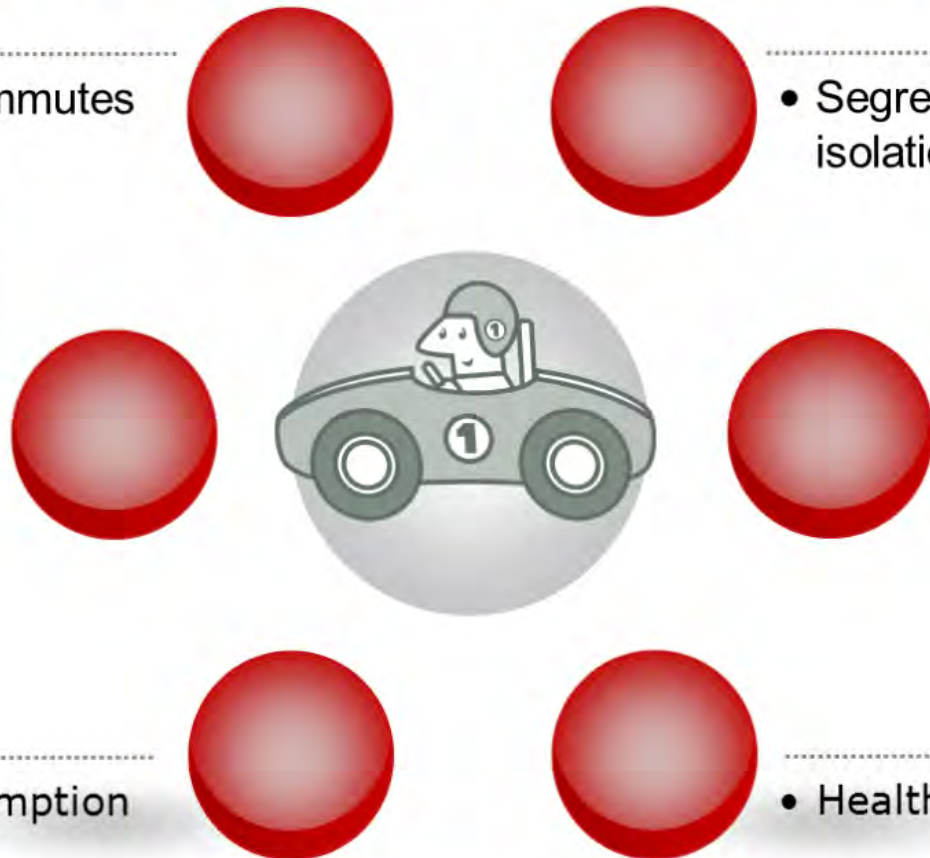
- Urban landscape



- Energy/resources consumption



- Health, pollution & noise





We are not doing that bad!

Most congested cities in the world

According to TomTom



- 1) Moscow, Russia 74%
- 2) Istanbul, Turkey 62%
- 3) Rio de Janeiro, Brazil 55%
- 4) Mexico City, Mexico 54%
- 5) Sao Paulo, Brazil 46%
- 6) Palermo, Italy 39%
- 7) Warsaw, Poland 39%
- 8) Rome, Italy 37%
- 9) Los Angeles, USA 36%
- 10) Dublin, Ireland 35%

Most congested cities in the world

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according to TomTom "data shows that traffic on secondary roads can actually be even more congested than on major arteries these days"

How do we address these issues without reducing our mobility options?

Modify the demand

(change our travel behavior/habits)

- Appropriate pricing (e.g. high tolls, affordable public transport)
- Alternative work schedules
- Telecommuting
- More transport options (e.g. bike lanes)
- Better urban planning (e.g. mixed uses)
- Other car-related policies (e.g. traffic rationing, limited parking)
- ...



Modify the supply

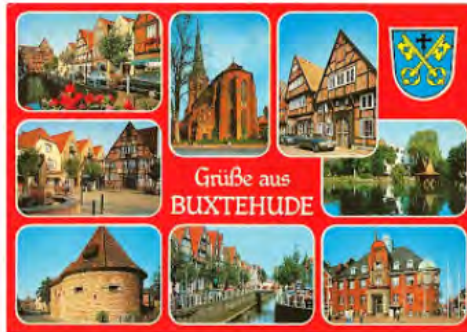
(improve efficiency of transport system)

- Changes in capacity (???)
- Better urban structure (e.g. more efficient layouts)
- Highly efficient alternative transport systems (e.g. reliable public transport)
- Traffic management strategies (e.g. perimeter control)
- Innovative use of technology (e.g. car to car communications)
- ...

We have also started to look at
"area low speed limits"
as a promising
traffic management strategy



30 km/h streets were first implemented over 30 years ago as a test model in Buxtehude, Germany...



...but started in Zurich (one of the first municipalities to implement them in Switzerland) in the early 1990s

Nowadays, over 50% of the streets in Zurich are 30 km/h

However, area speed limits continue to be highly controversial in Switzerland and abroad



(As far as we know, photo is public domain)



...but why?



They have many pros and cons – not all of them are fully understood yet



They have many pros and cons - not all of them are fully understood yet

Advantages

- Safer environment, mostly for pedestrians/bicyclists
- Better quality of urban space
- Less noise
- Less air pollution
- Smoother traffic, with less stop and go, and potentially less energy consumption (???)
- ...

Disadvantages

- Longer travel times
- Extended periods of noise and emissions
- Routing detours, potentially leading to longer trips
- ...

- Redistribution of traffic in the city?
- Homogeneous traffic on different neighborhoods?

Advantages

- Safer environment, mostly for pedestrians/bicyclists
- Better quality of urban space
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Disadvantages

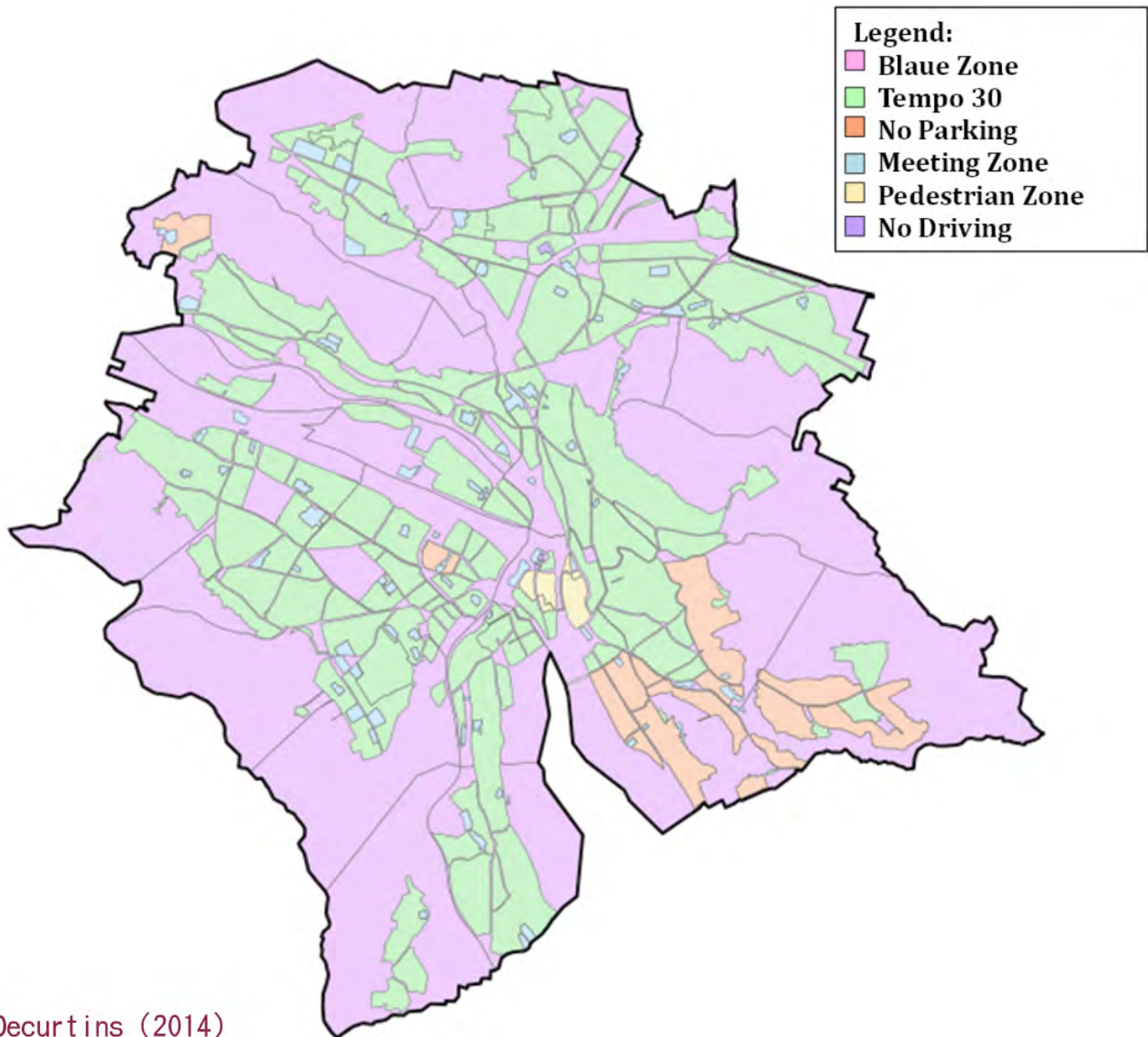
- Longer travel times
- Extended periods of noise and emissions
- Routing detours, potentially leading to longer trips
- ...

- Redistribution of traffic in the city?
- Homogeneous traffic on different neighborhoods?
- More or less hierarchical urban networks?
- Capacity (higher or lower)?

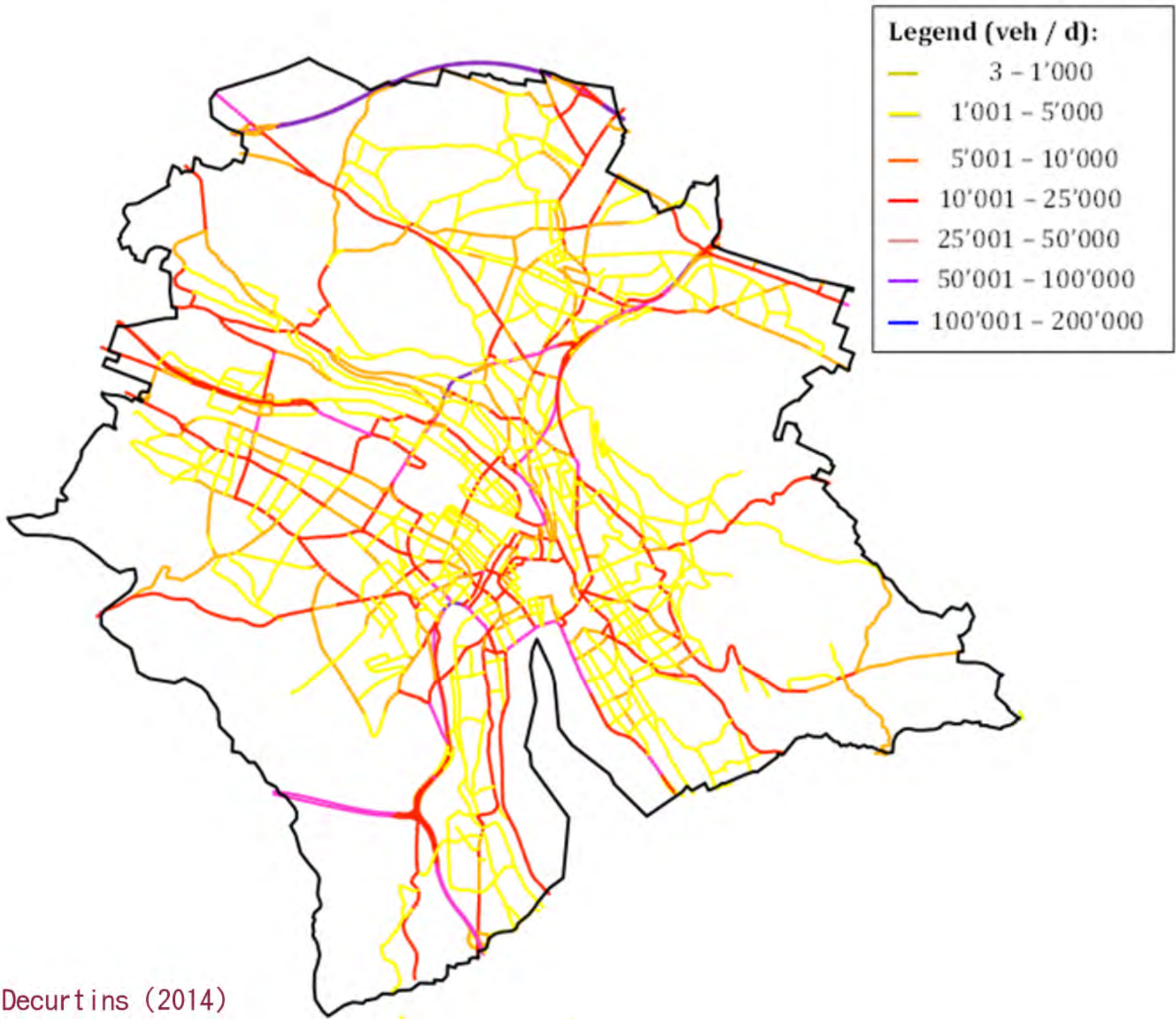
Can area speed limits
cause a redistribution
of traffic in a city?



Source: Decurtins (2014)



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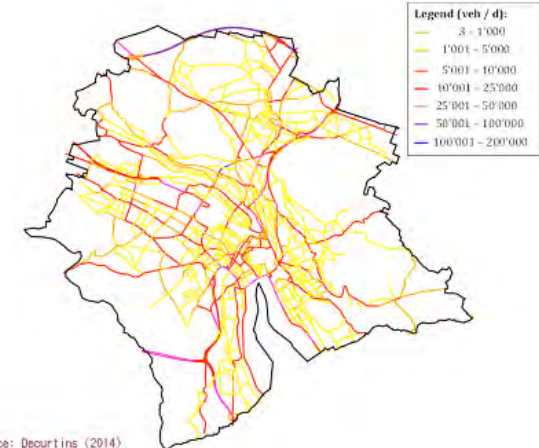
Can area speed limits
cause a redistribution
of traffic in a city?



Source: Decurtins (2014)



Source: Decurtins (2014)



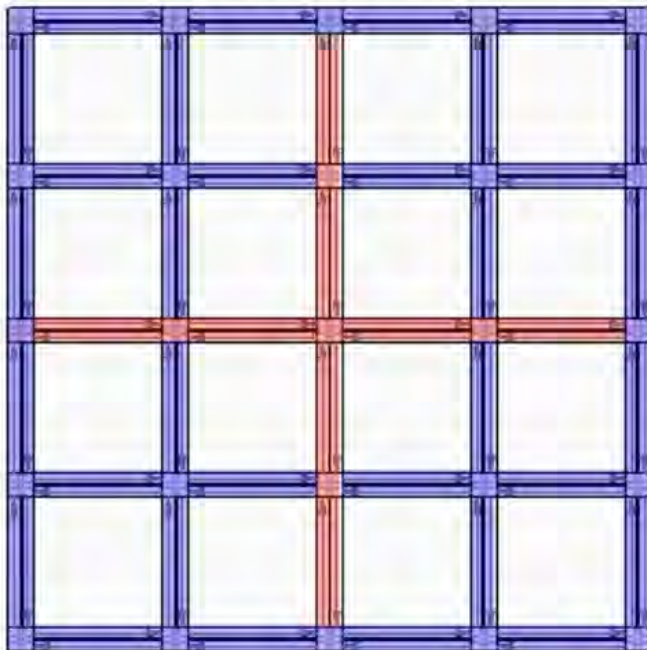
Source: Decurtins (2014)

What would happen to
traffic in Zurich if all
streets were 30km/hr?

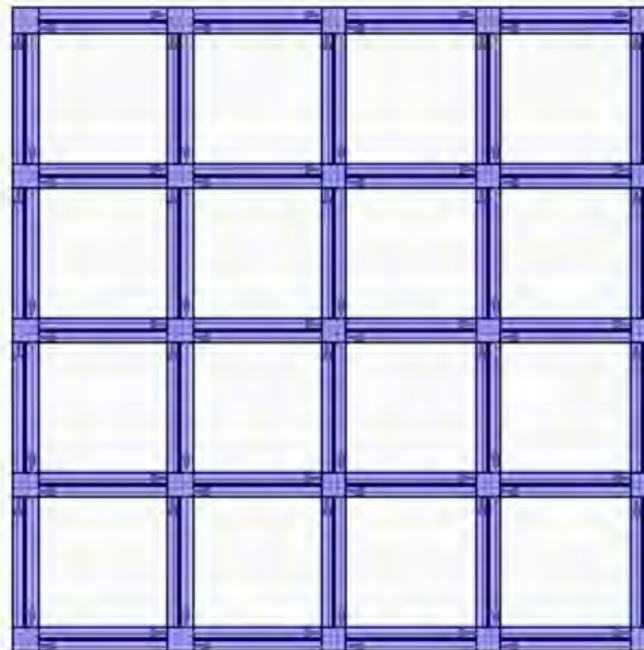
So we did an experiment...

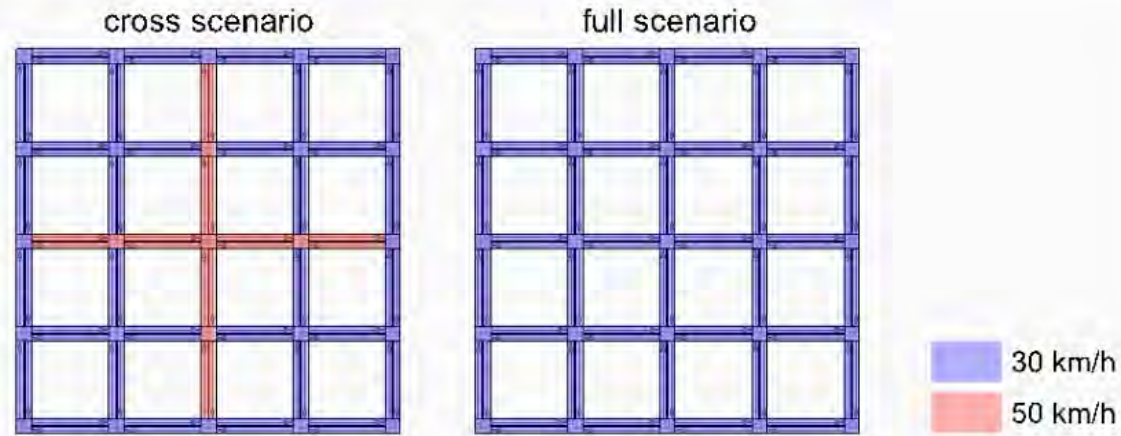
So we did an experiment...

cross scenario

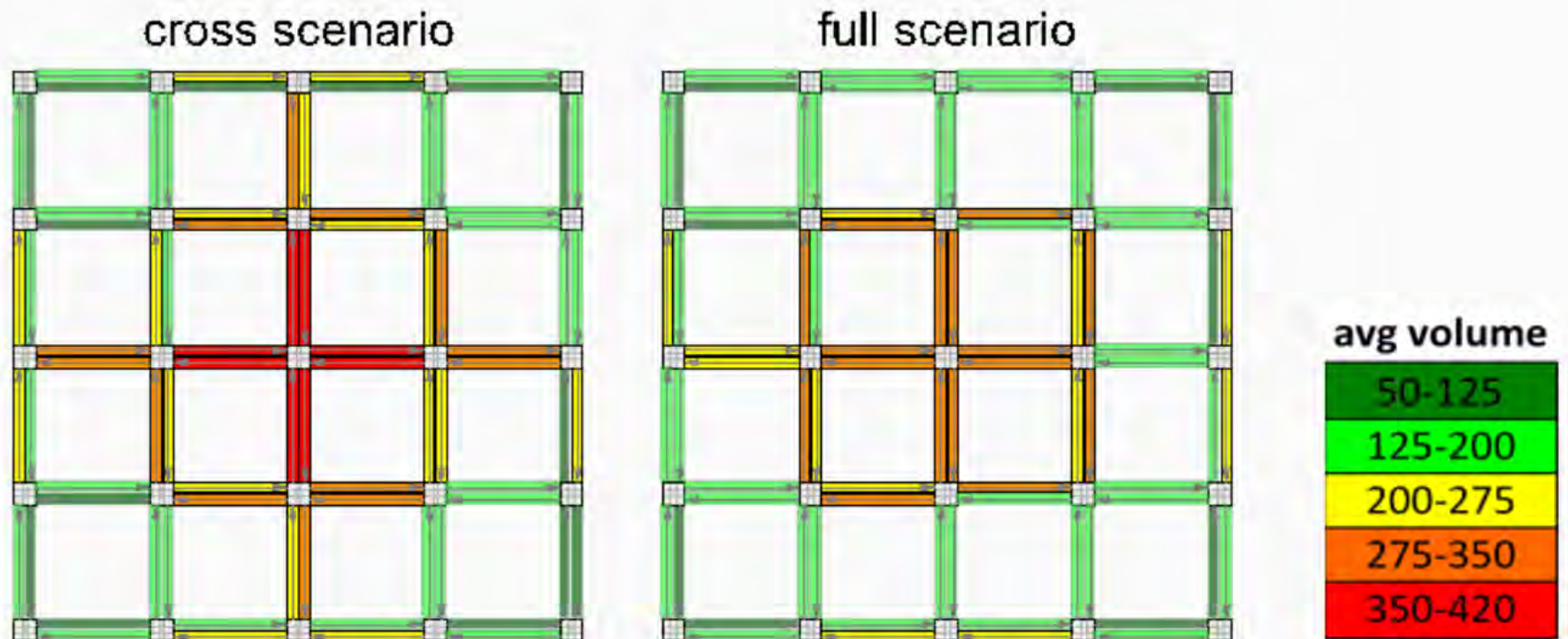


full scenario



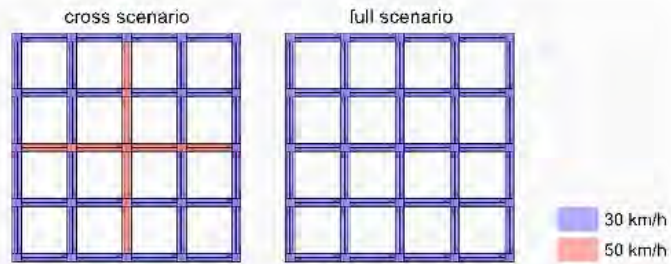


Source: Bergfreund (2014)

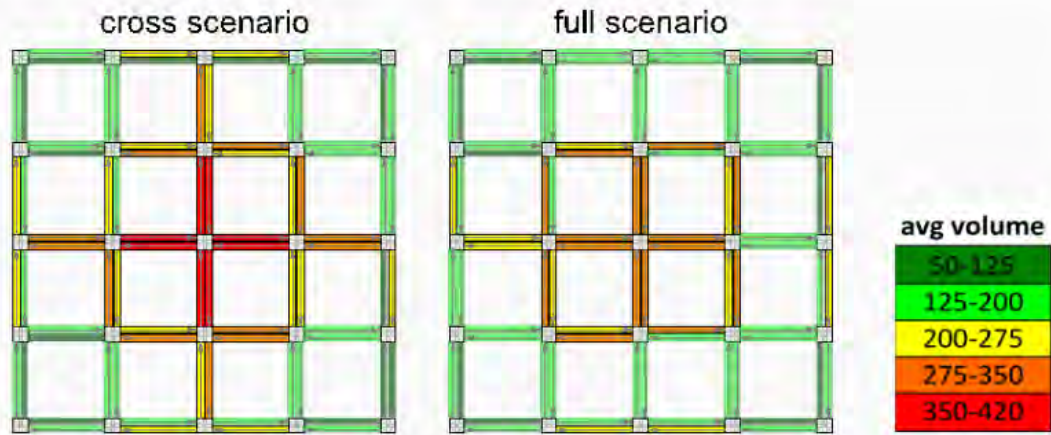


Source: Bergfreund (2014)

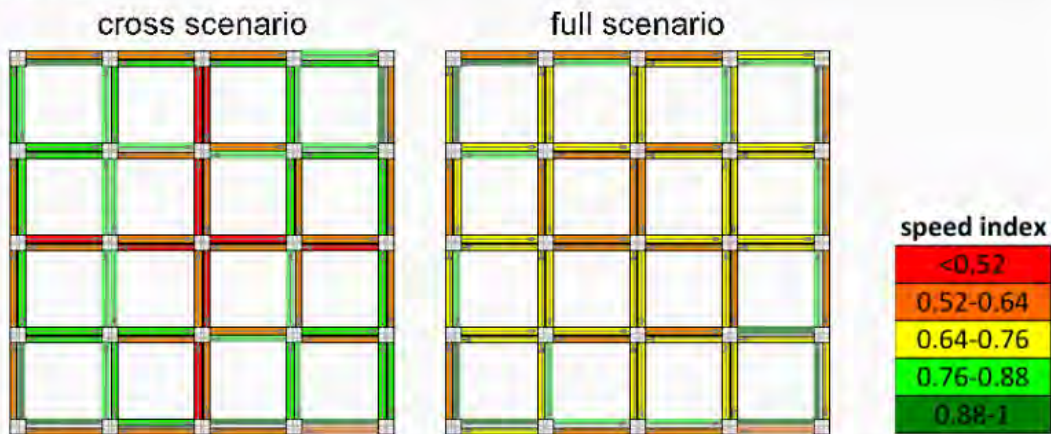
So we did an experiment...



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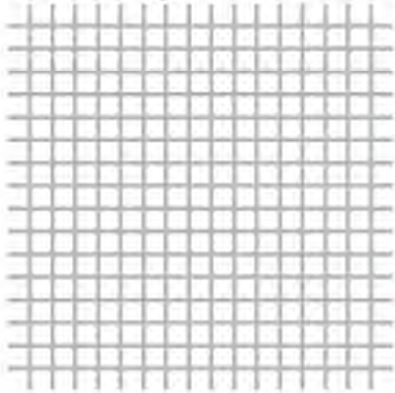


Source: Bergfreund (2014)

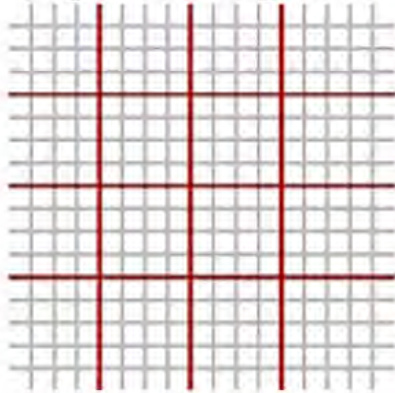
Then... should we try to
achieve more or less
hierarchical urban
network structures?

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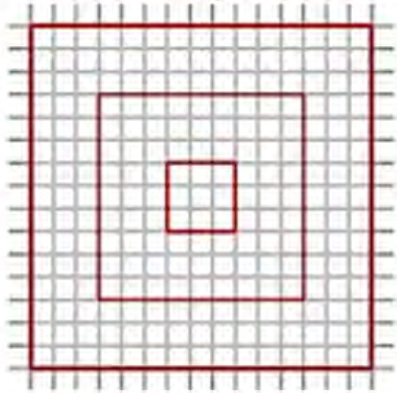
Pattern 1:
grid



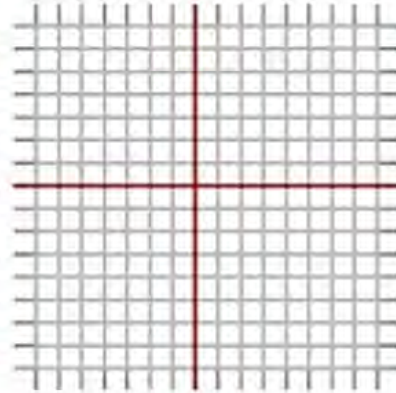
Pattern 2:
grid in a grid



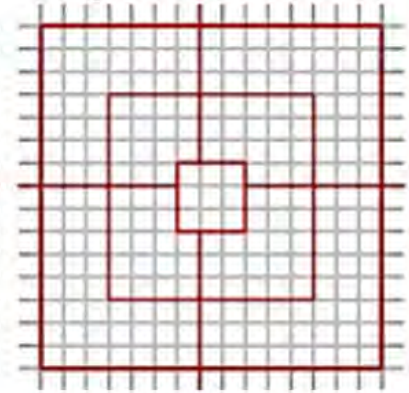
Pattern 3:
rings



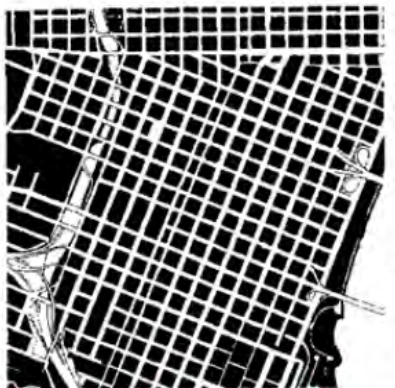
Pattern 4:
radials



Pattern 5:
rings and radials



Portland



Tokyo



Boston



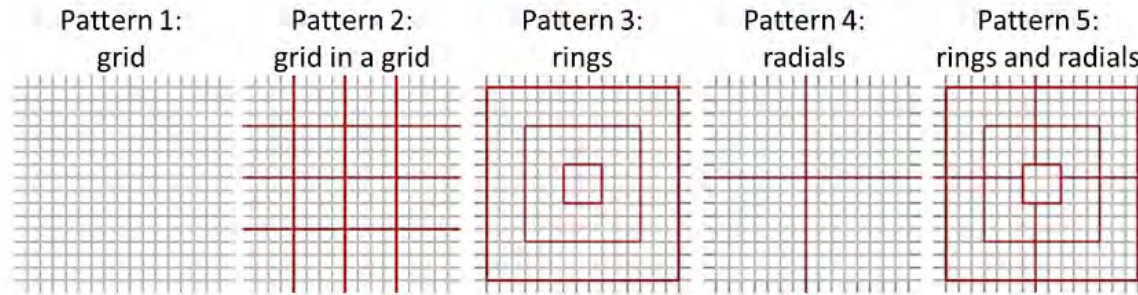
Paris



New Delhi



Then... should we try to achieve more or less hierarchical urban network structures?



Source: Muehlich, Gayah and Menendez (2014)

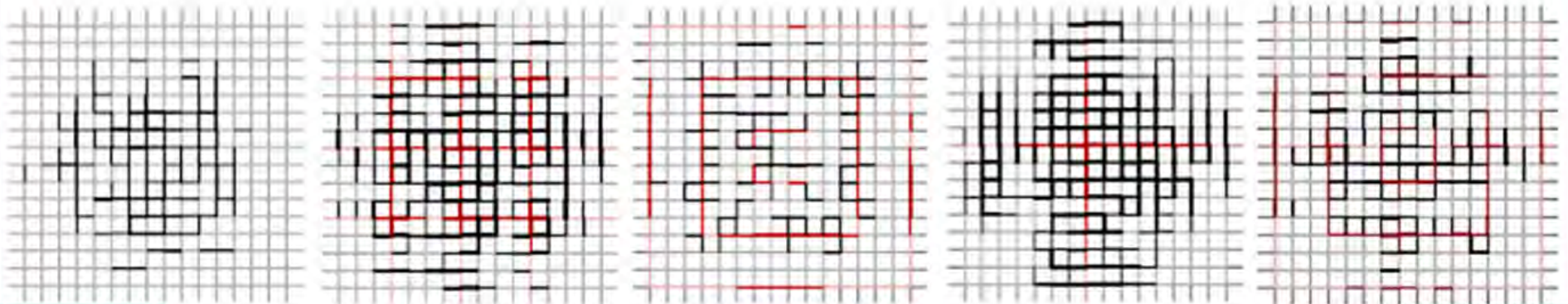
Pattern 1

Pattern 2

Pattern 3

Pattern 4

Pattern 5

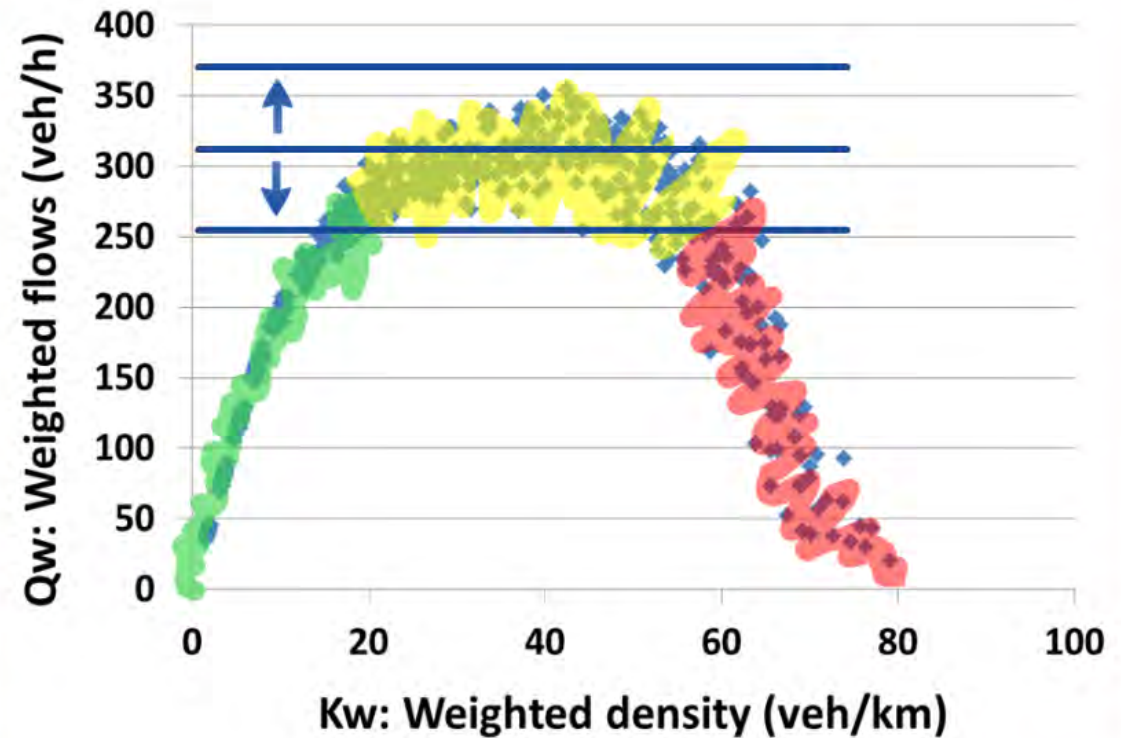
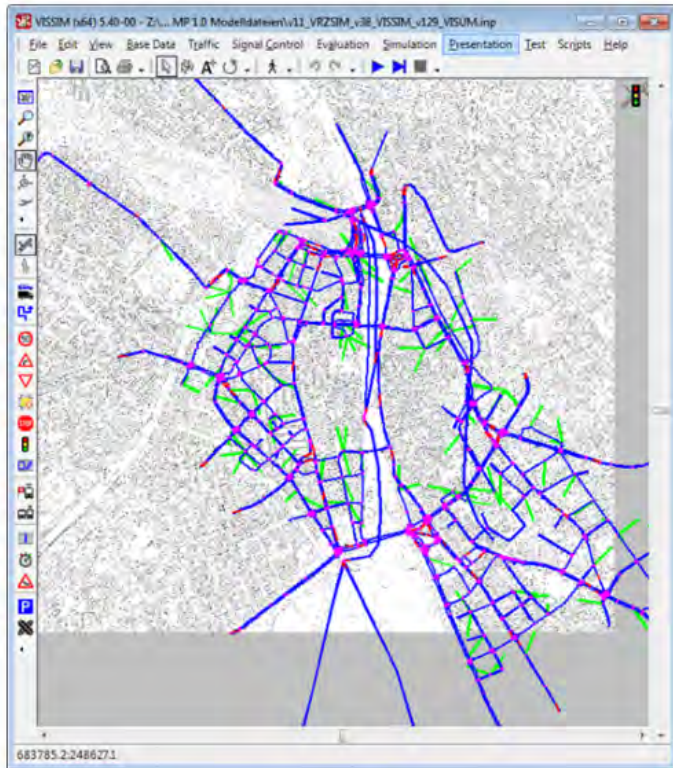


Source: Muehlich, Gayah and Menendez (2014)

How does
this affect
capacity?



How does this affect capacity?

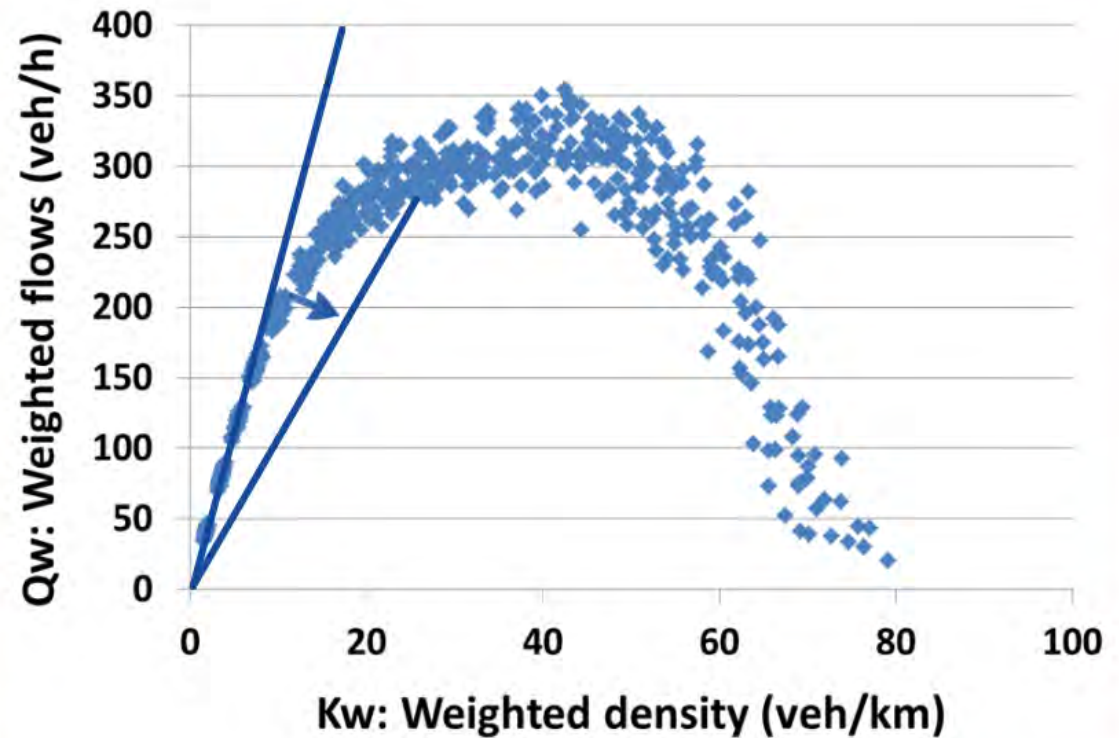
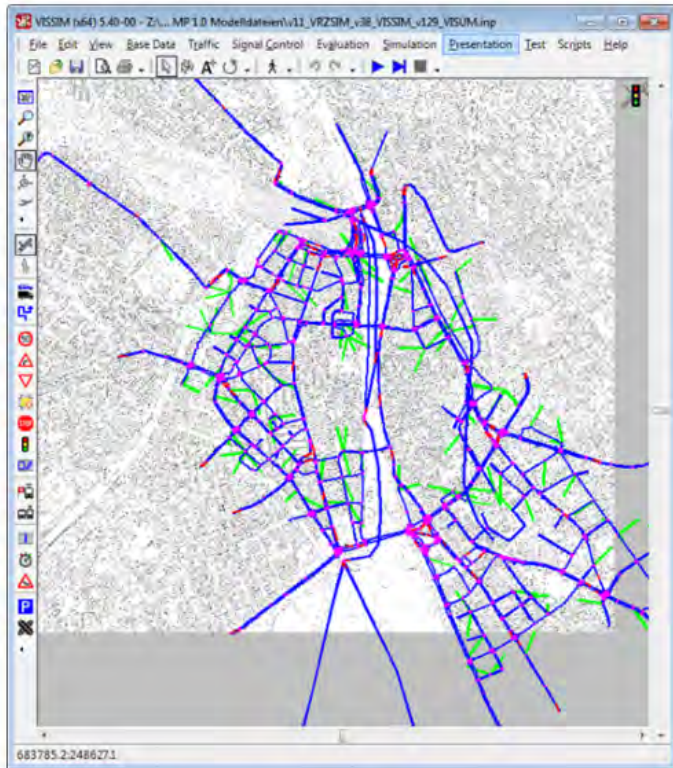


Source: Ortigosa, Menendez and Tapia (2013)

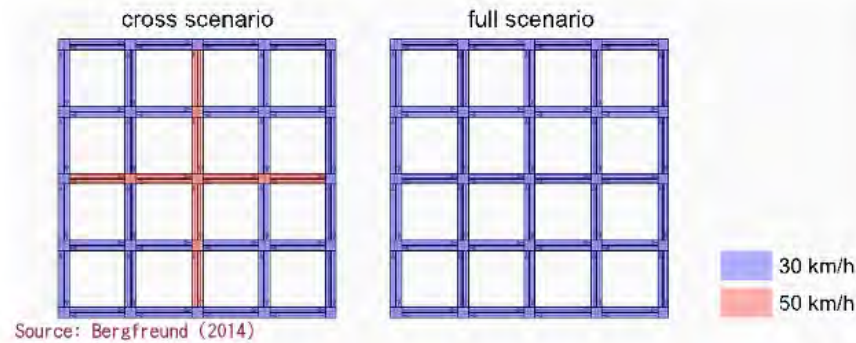
What role does
the speed have
on this?



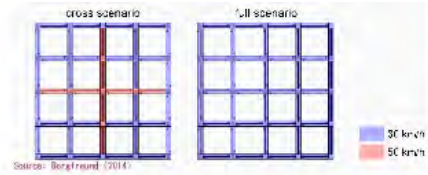
What role does the speed have on this?



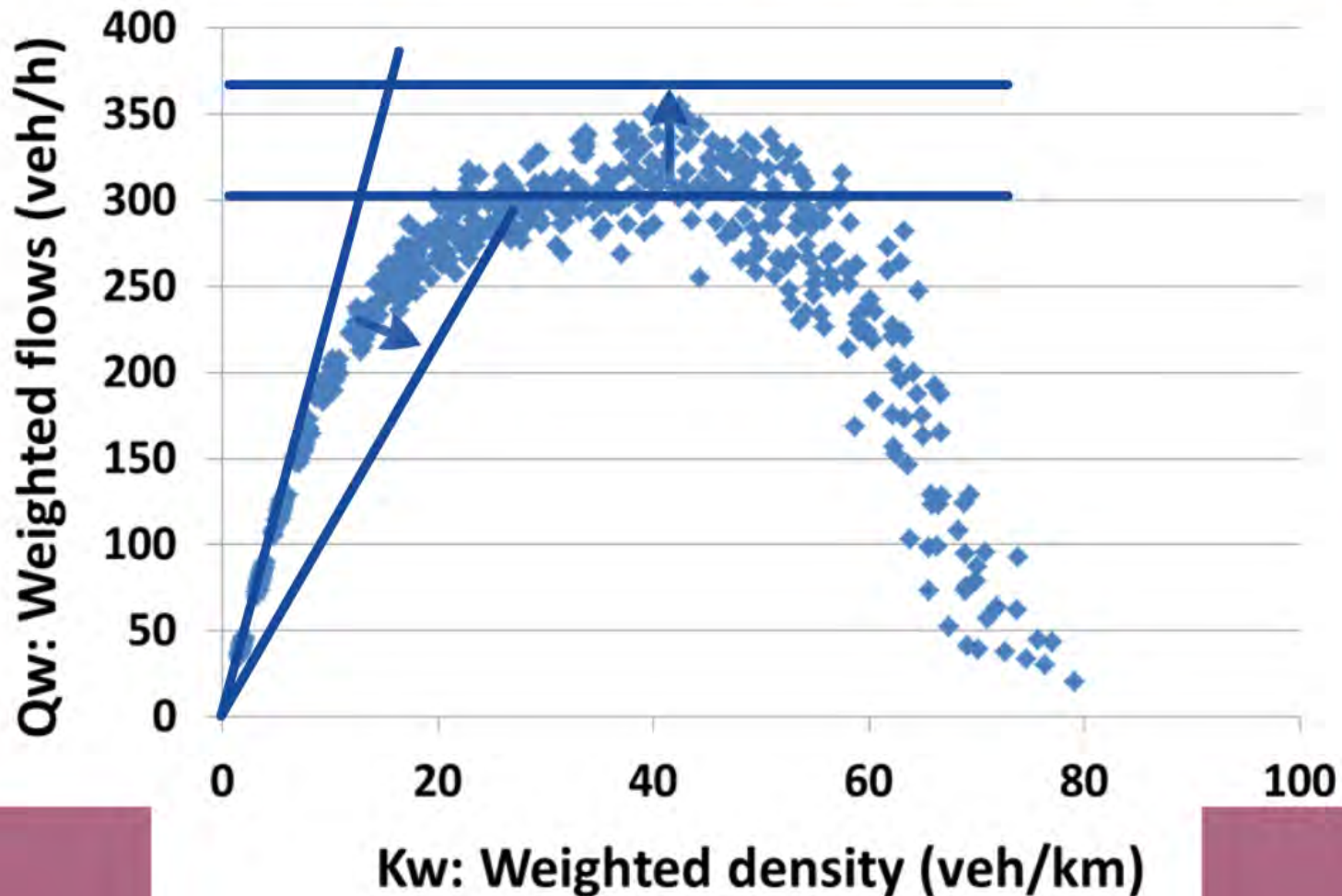
Source: Ortigosa, Menendez and Tapia (2013)



What would happen then to the capacity of the network, for example, if we convert even the arterials to 30km/h?



What would happen then to the capacity of the network, for example, if we convert even the arterials to 30km/h?



Relation between speed and capacity in an urban network is not clear yet...

...but we are getting there

more attention

more realistic simulators

better analytical models

more data

new monitoring technology

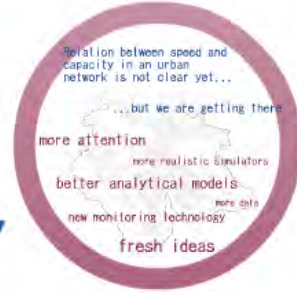
fresh ideas



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...but how do they affect

Can we improve capacity of the network by changing the speed limit?

We are not doing that bad!

According to the Swiss road traffic law, the speed limit is 50 km/h in urban areas and 80 km/h in rural areas.

Do we also started to look at area speed limits as a sustainable traffic management strategy?

How do we address these issues without reducing our mobility options?

- Modify the demand
- Modify the supply

...but started in Zurich (one of the first municipalities to implement them in Switzerland) in the early 1990s

Nowadays, over 50% of the streets in Zurich are 30 km/h

However, area speed limits continue to be highly controversial in Switzerland and abroad

Advantages	Disadvantages
<ul style="list-style-type: none">Reduction of traffic in the cityReduction of traffic in all urban agglomerationsMore of the theoretical capacity networkLess number of accidents	

What would happen to traffic in Zurich if all streets were 30km/h?

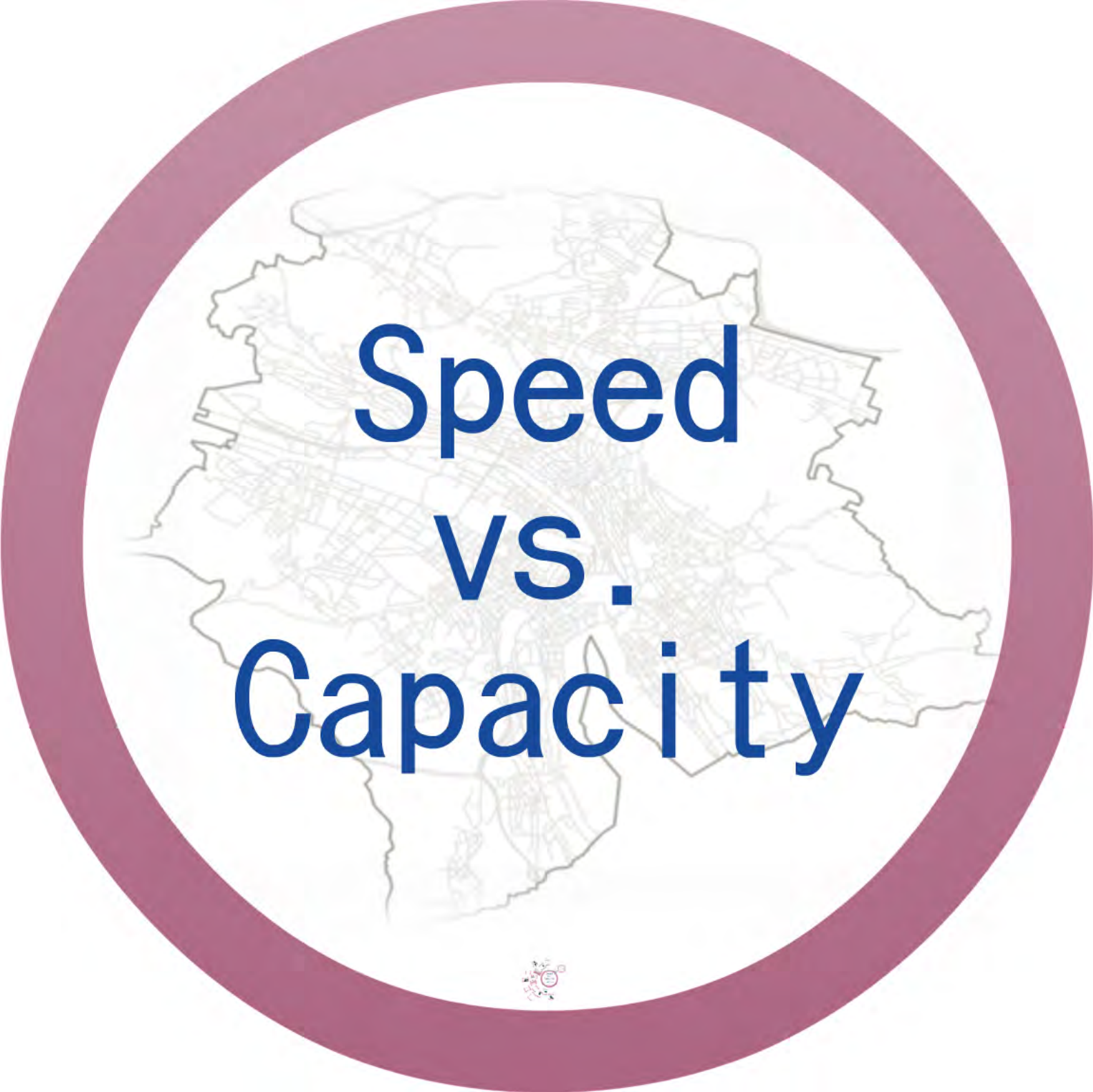
How does this affect capacity?

How does this affect capacity?

What role does the speed limit play on this?

What role does the speed limit play on this?

How does this affect capacity?



**Speed
vs.
Capacity**



Thanks!!!

For more info, you can email me at:

memonica@ethz.ch