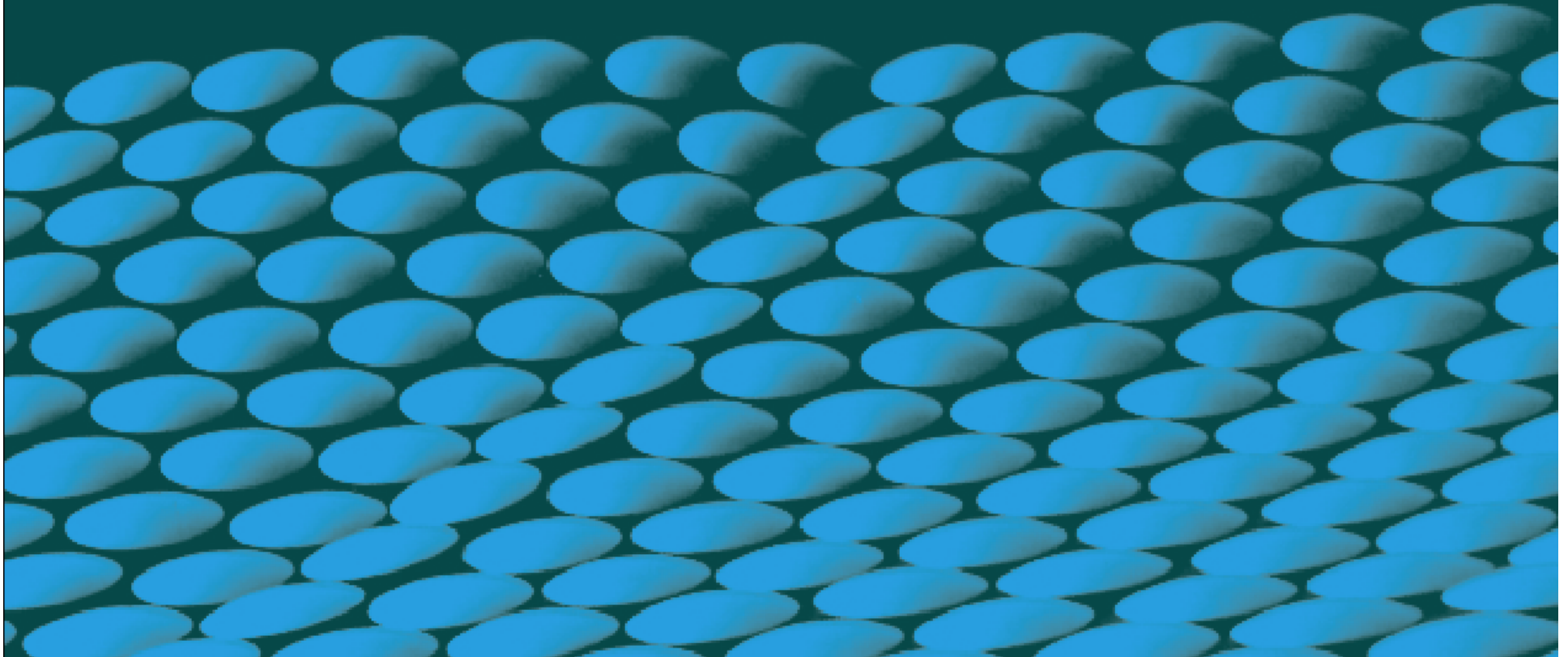


**significance**

quantitative research



## **Impact of land-side accessibility on the competitive position of airports**

18 April 2008

Marco Kouwenhoven, Eric Kroes

# Introduction

## Accessibility

- Land-side accessibility is deteriorating, due to increasing congestion
- Reliability of travel times is becoming a more important aspect of accessibility
- This all influences competitive position of airports

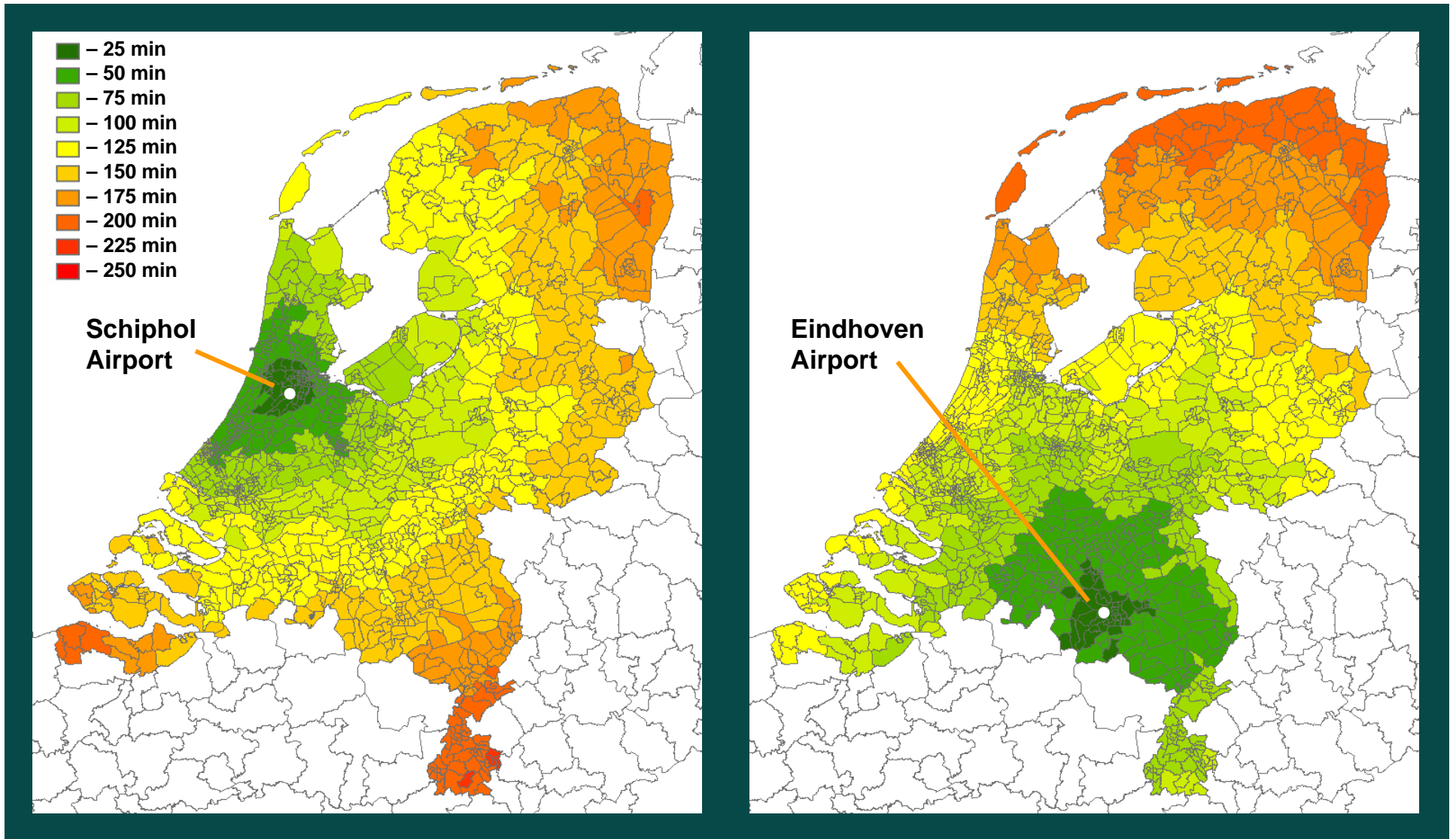
## Models

- Standard transport models are not always suitable for studying the impact of land-side accessibility
- We have therefore developed a simple and strategic model that focuses on this aspect
  - Uses the methodology of the Aeolus model (prev. ACCM: Airport Catchment area and Competition Model)
  - Much more geographical detail (about 1400 zones instead of 20)

# What is Accessibility?

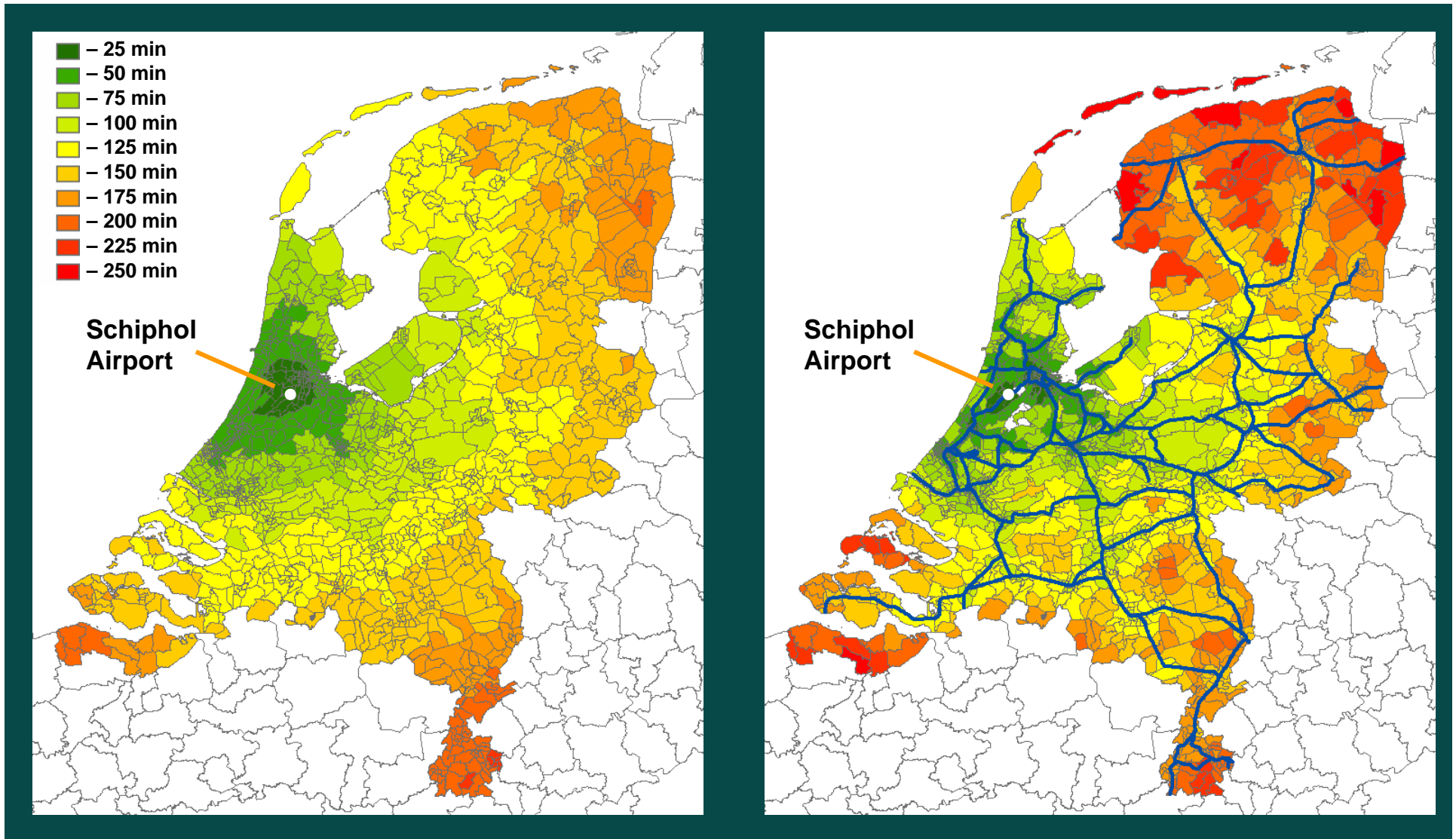
- Simplest definition is based on travel time

# Car travel time map



## Car travel time map

## Train travel time map

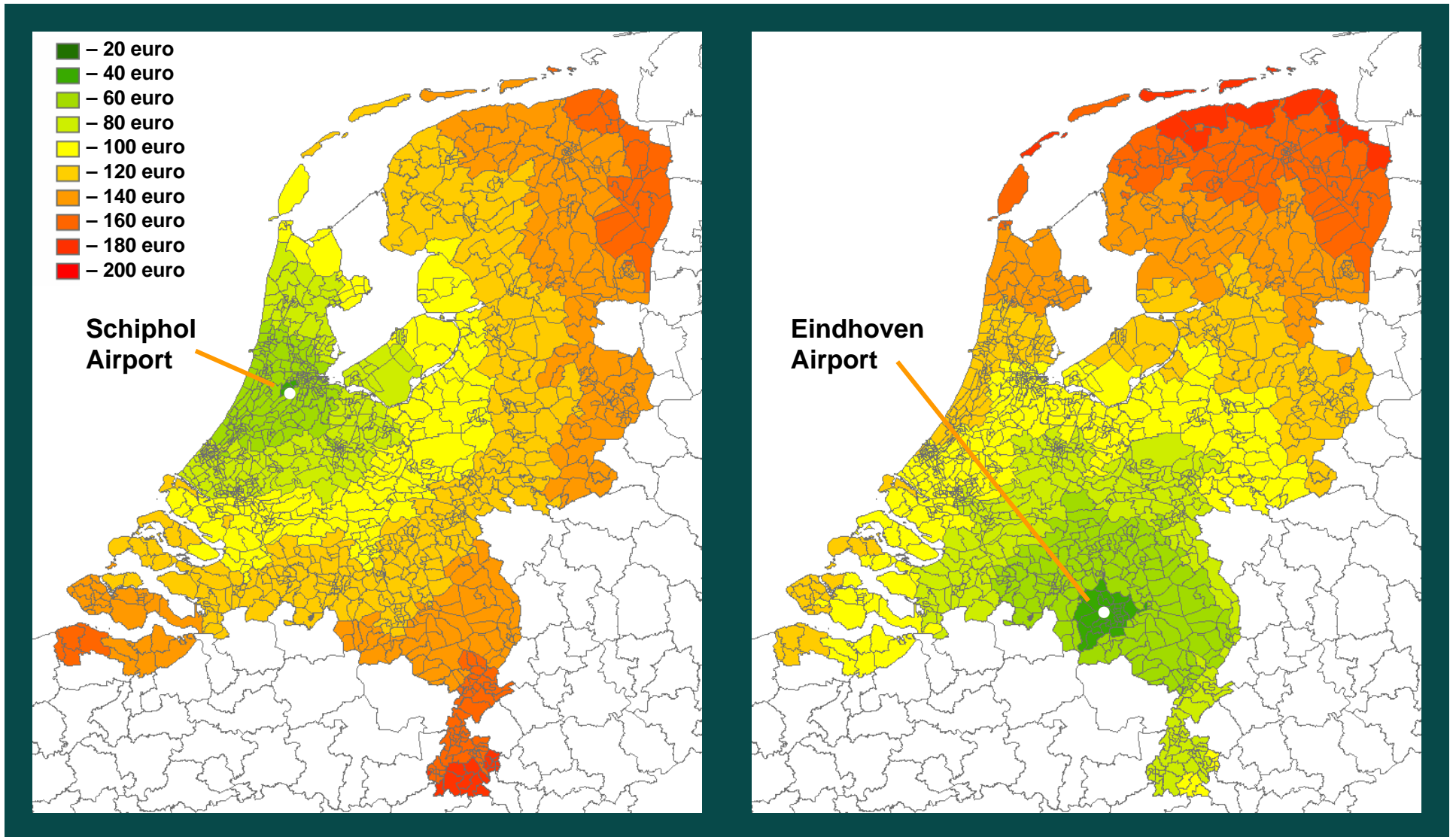


# What is Accessibility?

- Simplest definition is based on (in-vehicle) travel time
- Add other components:
  - Travel costs
  - Parking costs
  - Waiting time
  - Transfer costs
  - Travel time reliability
- Convert all components into monetary value

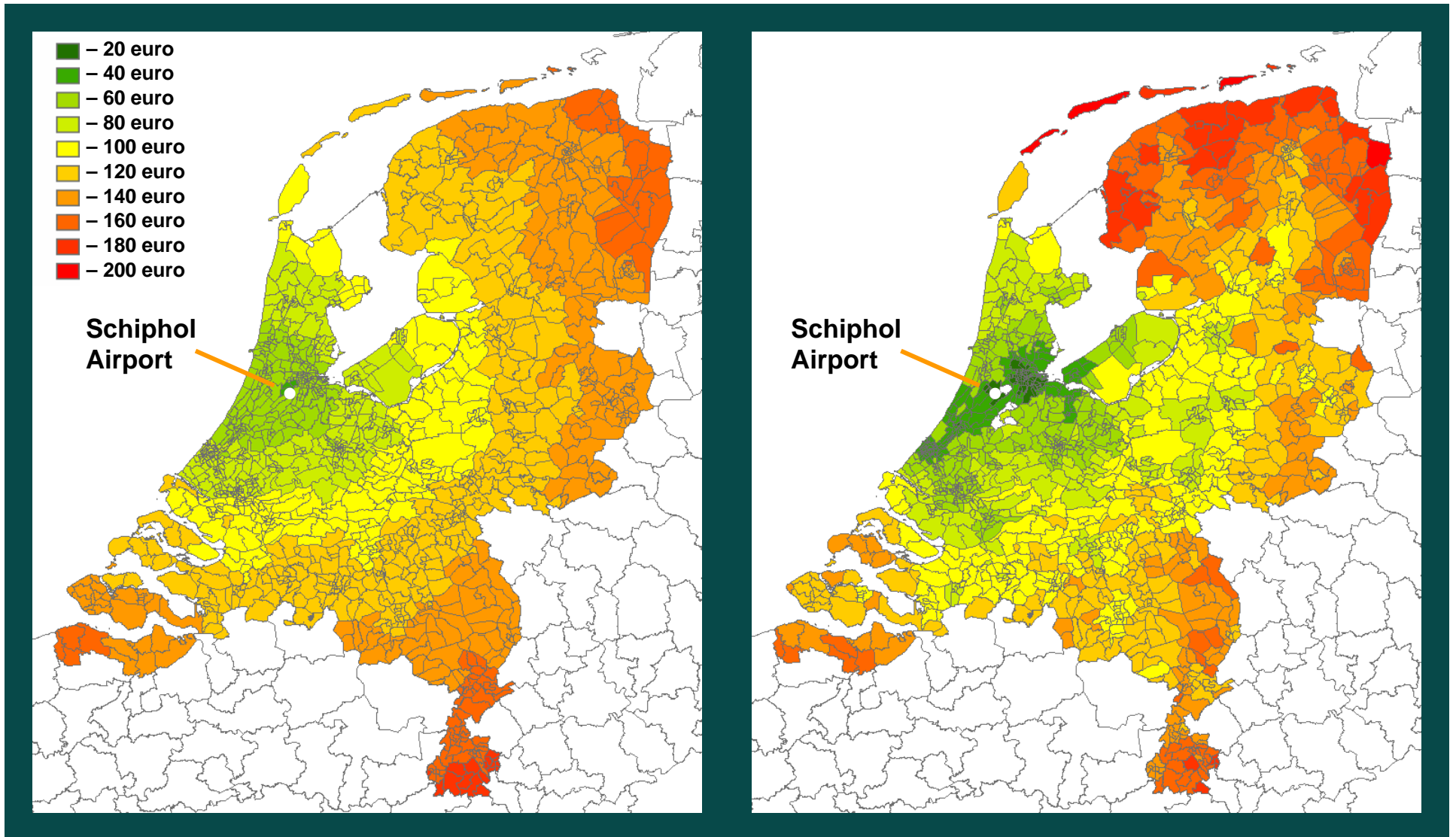
$$\begin{aligned} \text{Generalised costs} &= \text{Travel Cost} \\ &+ \text{Parking Cost} \\ &+ \text{Travel Time} \times \text{Value-of-Time} \\ &+ \text{Waiting Time} \times \text{Value-of-Time} \times \text{Waiting penalty} \\ &+ \text{NumTransfers} \times \text{Transfer penalty} \\ &+ \text{Travel time reliability} \times \text{Value-of-Reliability} \end{aligned}$$

# Car generalised costs



## Car generalised costs

## Train generalised costs

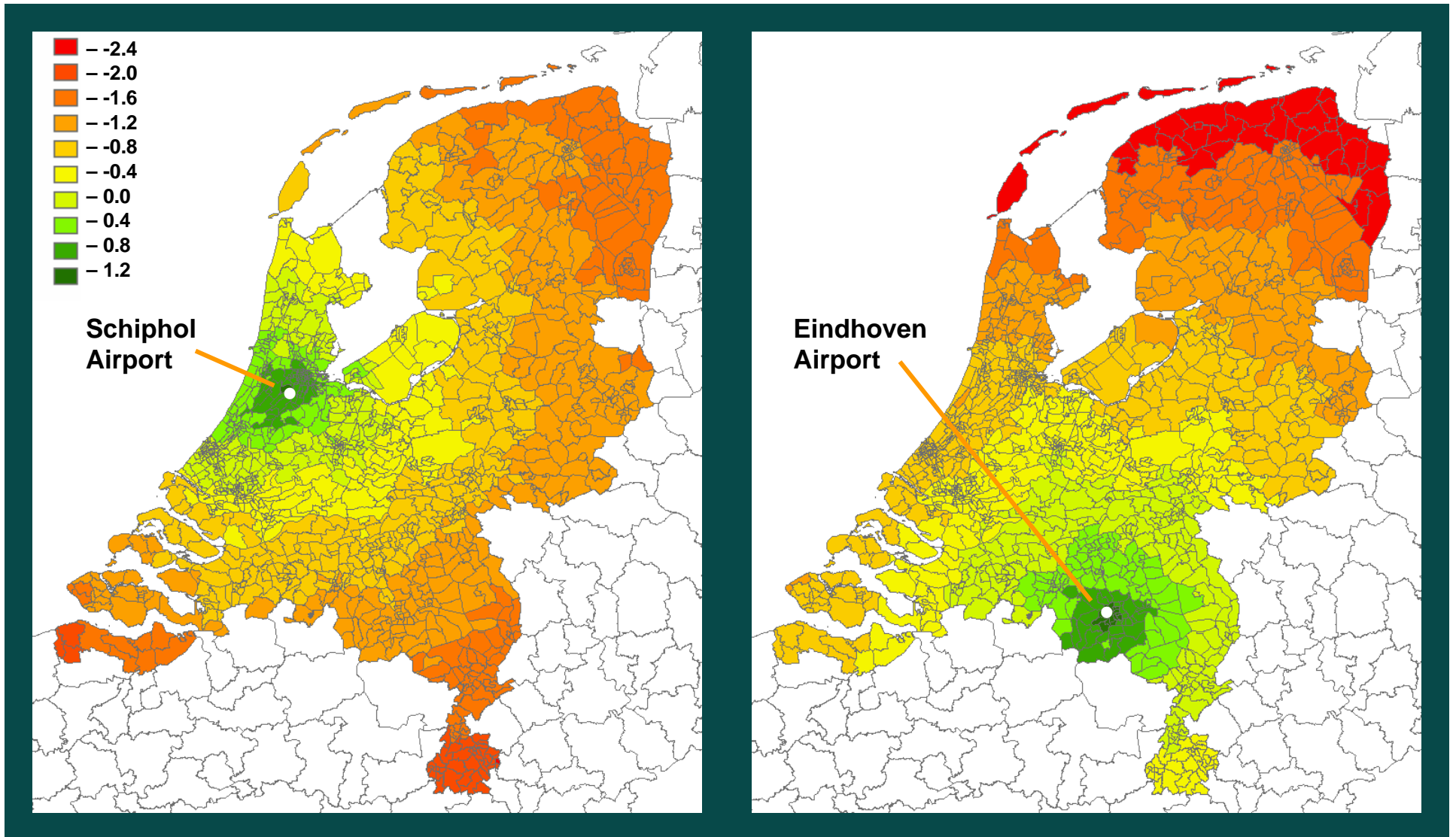


# What is Accessibility?

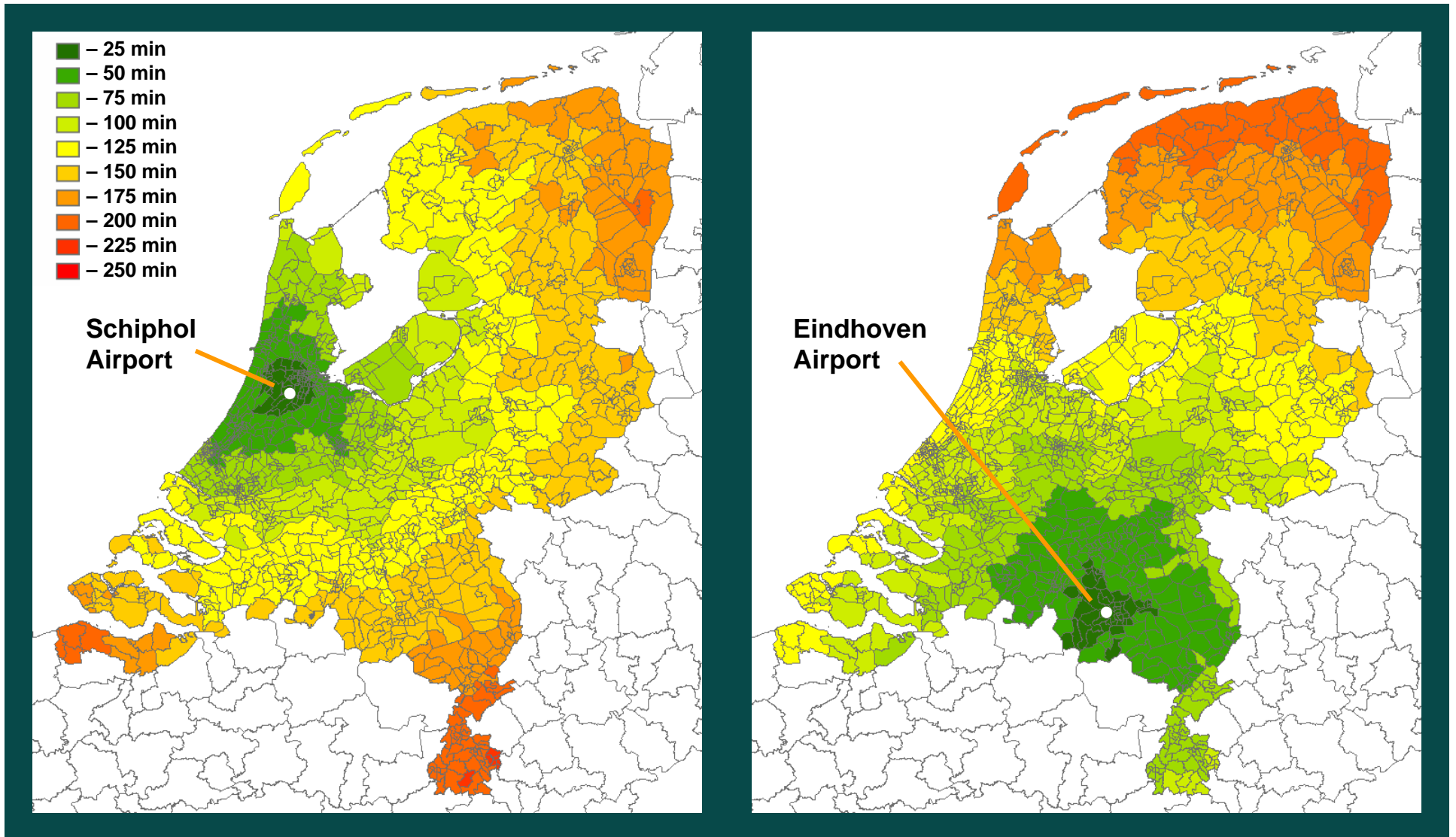
- Simplest definition is based on (in-vehicle) travel time
- Add other components:
  - Travel costs
  - Parking costs
  - Waiting time
  - Transfer costs
  - Travel time reliability
- Convert all components into monetary value (*generalised costs*)
- Combine generalised costs of all modes into LogSum-measure

$$LogSum = \log \left( \sum_{i=mode} e^{-\beta \cdot GenCost(i)} \right)$$

# Accessibility logsum



# Car travel time map



## Simple and strategic model

- Based on level-of-service data generated for the Dutch National Model (*LMS: Landelijk Model Systeem*)
  - baseyear = 2003

### Data-base with Level-of-Service data

- Origin: 1379 geographical zones
- Destination: 7 airports in the Netherlands

## 7 airports



## Simple and strategic model

- Based on level-of-service data generated for the Dutch National Model (*LMS: Landelijk Model Systeem*)
  - baseyear = 2003

### Data-base with Level-of-Service data

- Origin: 1379 geographical zones
- Destination: 7 airports in the Netherlands
- 5 modes:
  - Car driver
  - Car passenger
  - Taxi
  - Train
  - Local public transport (Bus/Tram/Metro)

## 5 Modes



Car driver



NOT AVAILABLE TO FOREIGN VISITORS

## Estimation of competitive position airports

- Competitive position of airports can be assessed by simulating choice behaviour of travellers
- This can be done by Maximum Utility Theory
- To apply this, a indicator for the attractiveness of airports is needed
- The LogSum accessibility measure can be used as such an indicator

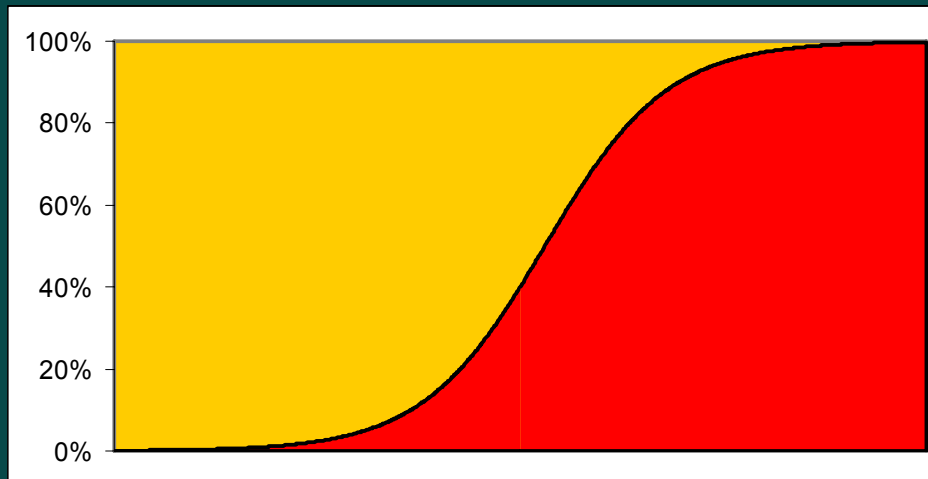
# Logit model



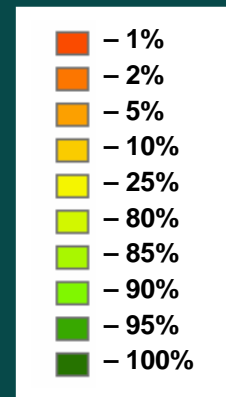
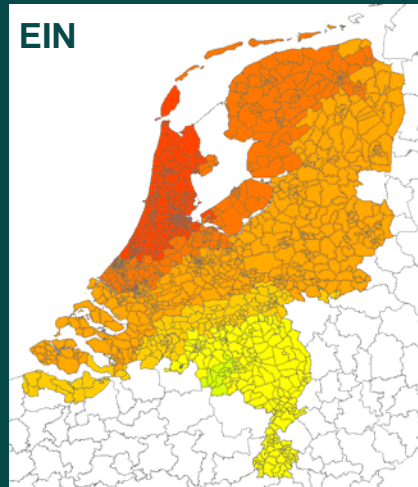
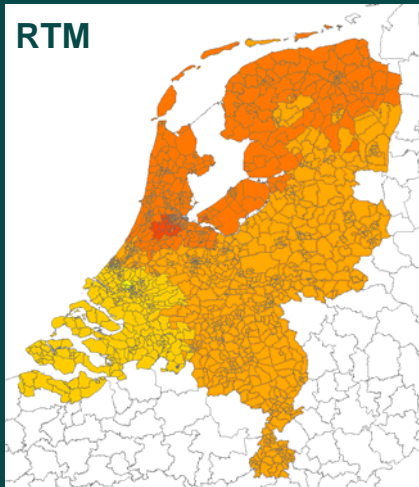
Attractivity (Schiphol)



Attractivity (Rotterdam)



# Market shares



## Two scenarios

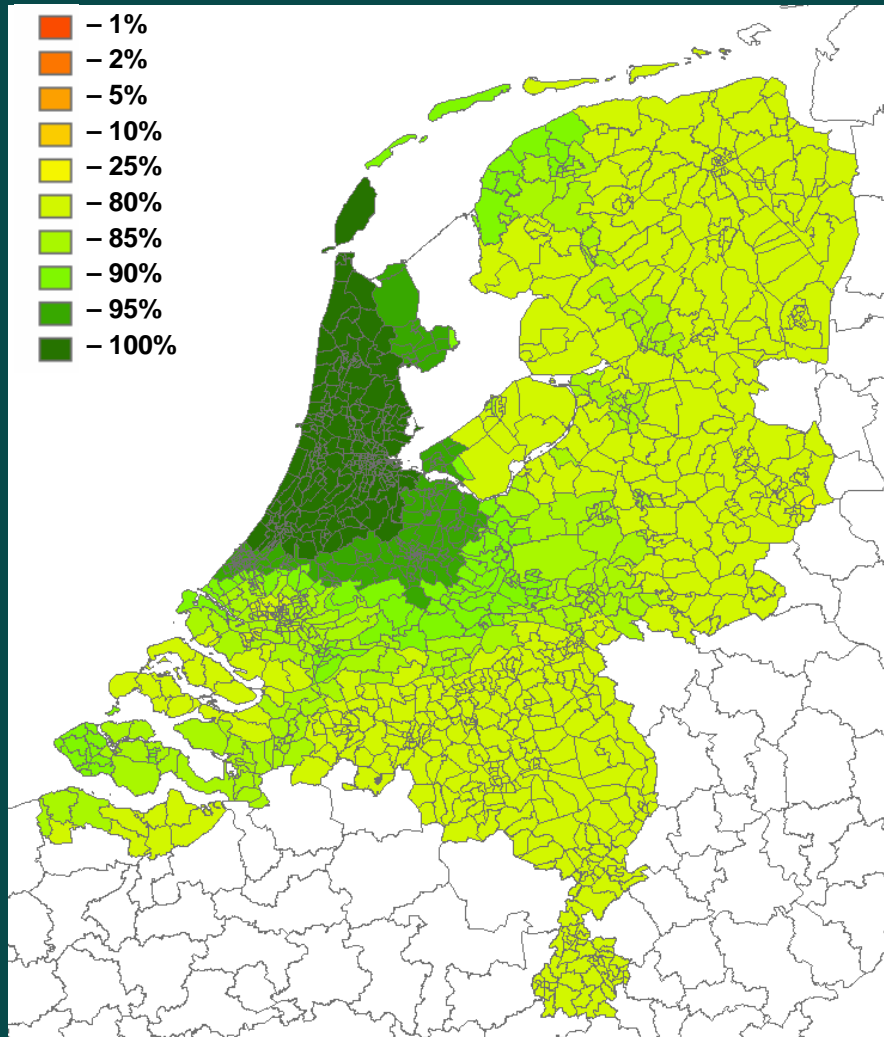
### (Hypothetical) **Scenario 1**

- Strong increase of travel time (congestion)
- Strong increase of costs (increase of oil price)
- Decrease of travel time reliability

### (Hypothetical) **Scenario 2**

- Same assumptions as scenario 1
- Lelystad airport and Twente airport are developed into full regional airports

# Market share of Schiphol airport

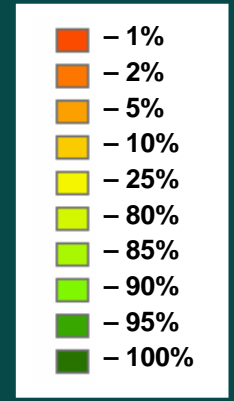
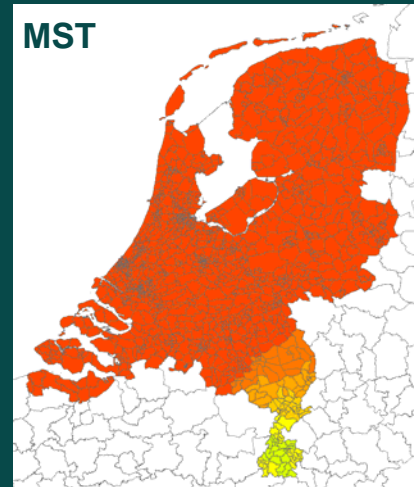
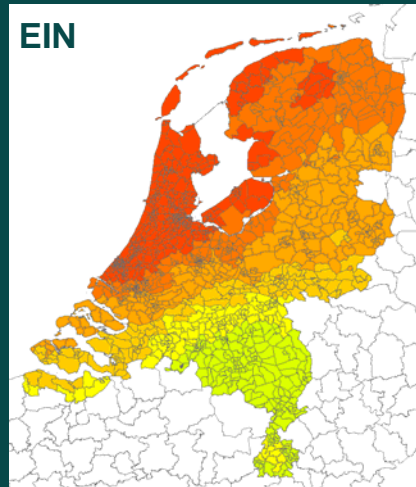
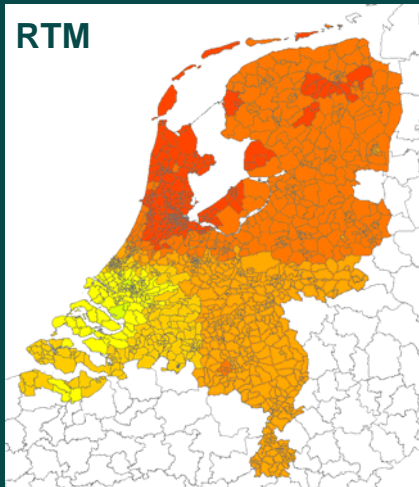
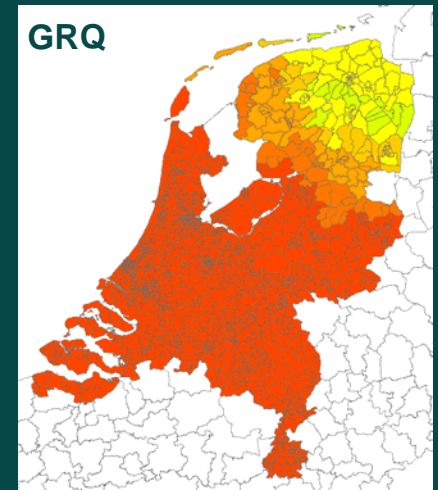
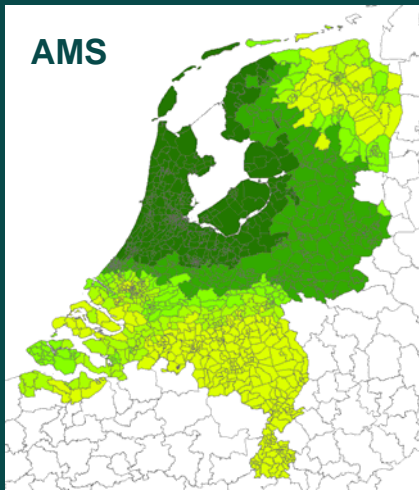


2003

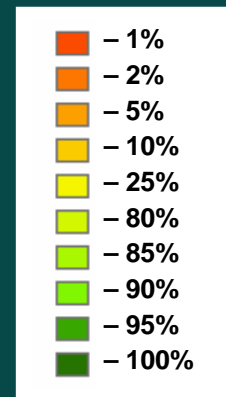
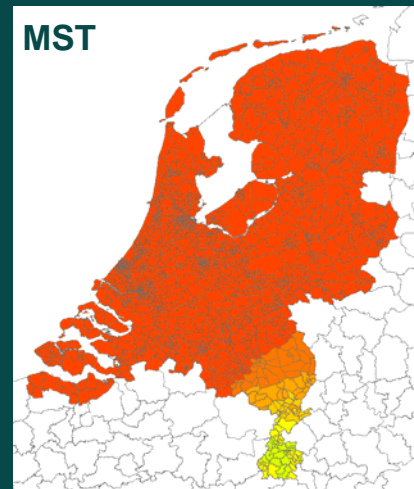
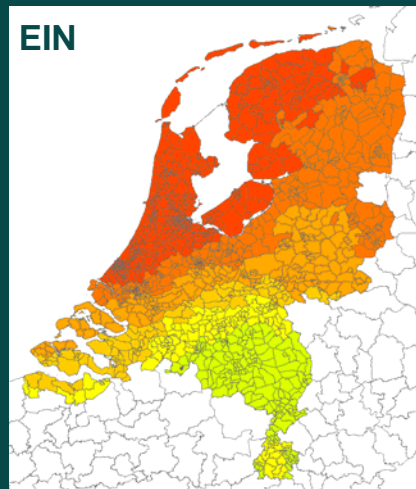
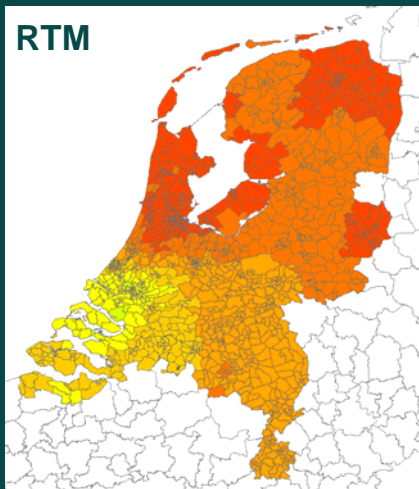
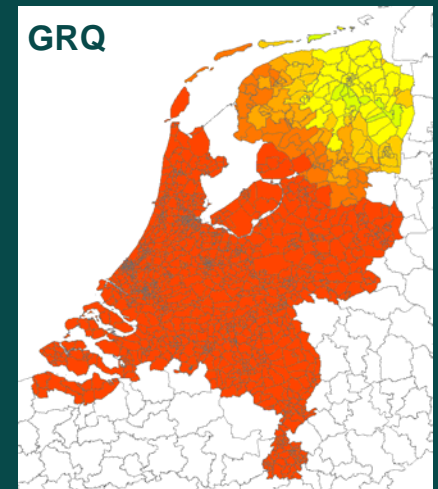
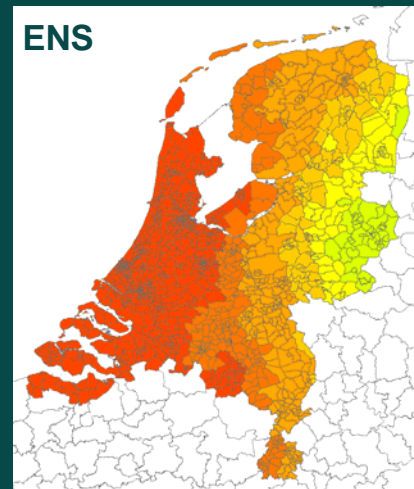
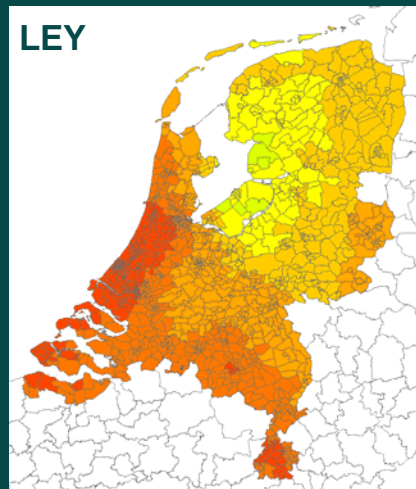
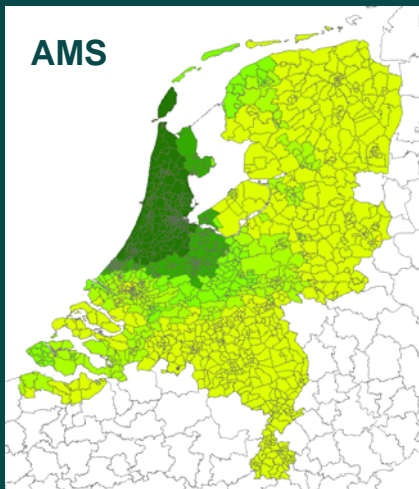
Scenario 1: decrease accessibility

Scenario 2: new regional airports

# Scenario 1: decrease accessibility



## Scenario 2: decrease in accessibility



# Conclusions & further work

## Conclusions

- We have developed simple strategic model to assess the land-side accessibility of airports
- Accessibility is measured using a (powerful) LogSum measure
- Model can be used to assess different scenarios for changes in the land-side accessibility *(including reliability effects)*

## Future work

- Use new LMS scenarios for 2020 and beyond
- Include foreign airports