Part II
Albatross: applications and experiences

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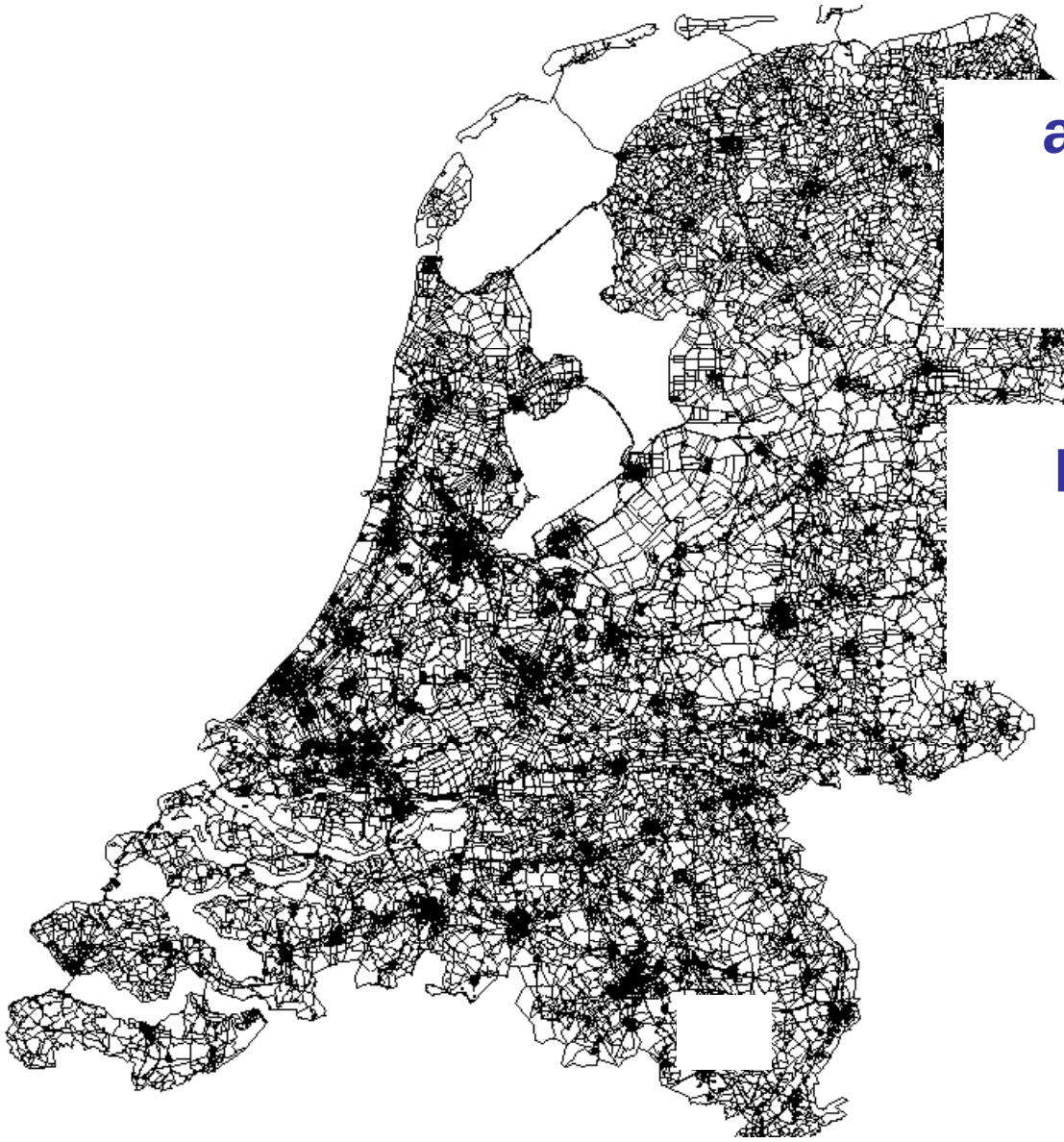
Presentation outline

- Databases and spatial resolution
- Types of scenarios the model can handle
- Model implementation and computation times
- Example of an application
- Strengths of the activity-based approach

Main databases

- Road network entire country
  - All levels except smallest neighborhood streets
  - Length and travel speed by mode for each link
- Postcode area data
  - Employment by sector
  - Parking places and parking tariffs
- Zone x zone matrices:
  - Car travel time delay factors morning and afternoon peak
  - Car travel costs by trip motive and time of day
  - Public transport costs and travel time components



Spatial resolution:
appr. 4000 postcode areas
and detailed road network

Network resolution:
120,436 links
82,235 nodes

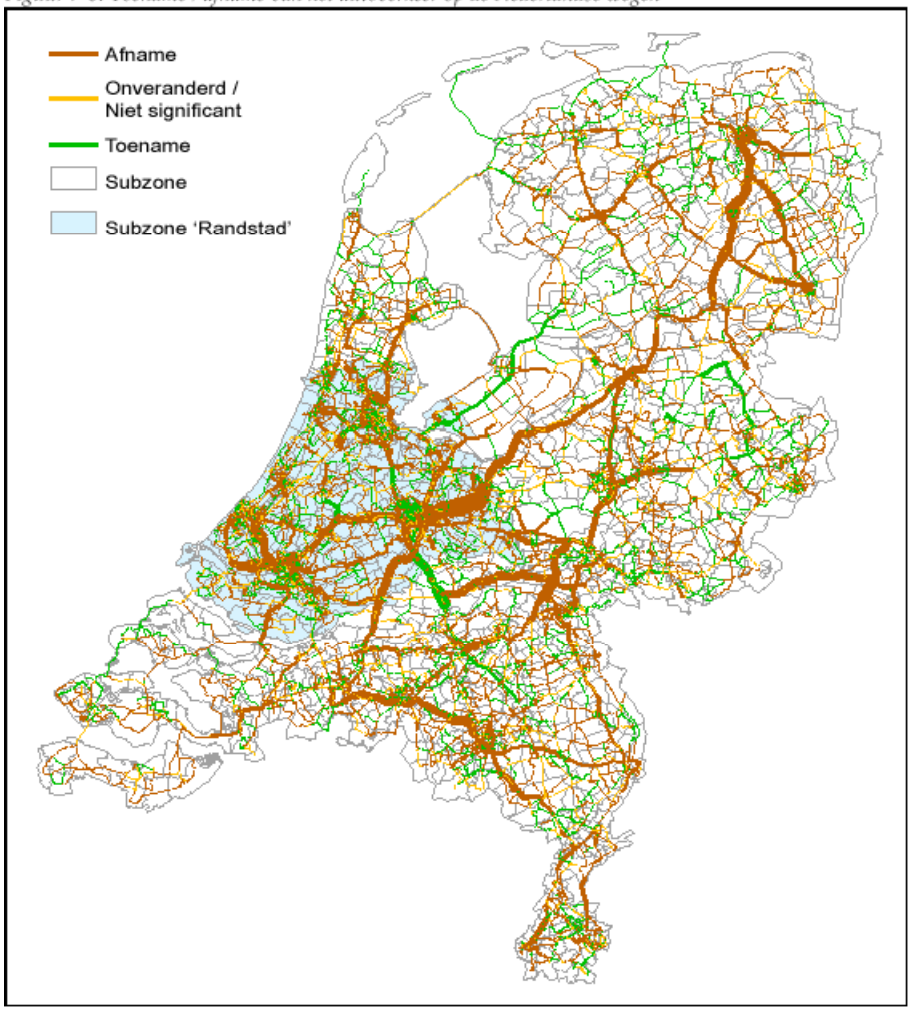
TU/e *Urban planning group*

Trip matrices can be generated and assigned to the road network

Any segmentation of trip matrices can be applied

- Time of day
- Activity
- Transport mode
- Etc.
- Etc.

Figuur 7-6: Toename / afname van het autoverkeer op de Nederlandse wegen



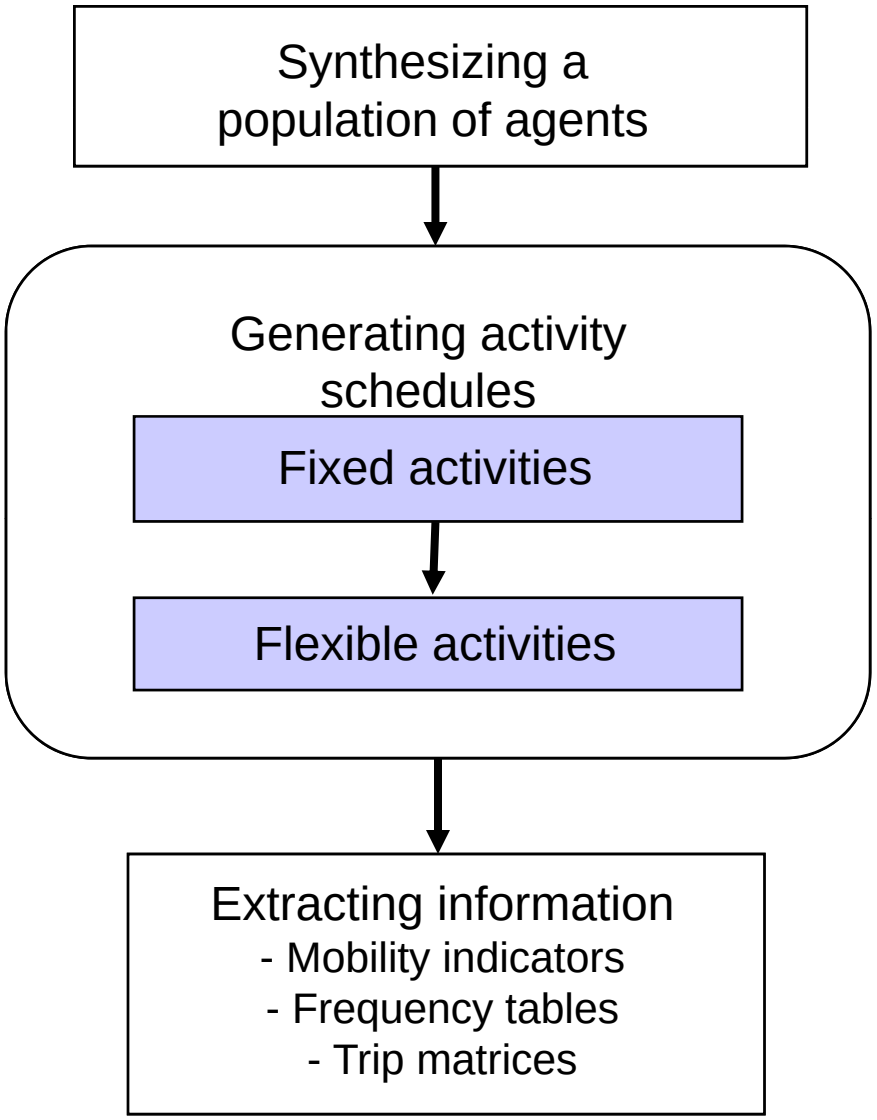
Types of scenarios the model can handle

- Demographic
  - Size, composition, spatial distribution of population
- Land-use system
  - Size, composition, spatial distribution of employment
- Transport system
  - Travel times and travel costs by mode, time-of-day
  - Parking places
- Economic changes
  - Income, price changes
- Institutional changes
  - Opening hours daily and non-daily facilities
  - Schedule skeleton
- Behavioral changes

Implementation of the model

- Written in an object oriented program in C++
- Decision Trees are stored in files; are not hard-coded
- Databases are re-compiled into binary files and optimized for computation time
- The model runs in a Windows application together with modules for:
  - Population synthesis, Scenario management, Data viewing, Data analysis, Generating output reports

Major steps in an application of the model



There are no iterations involved

Uses a jack-kniving type of procedure to derive t-statistics

Computation times

- Synthezising a population of agents
  - A fraction of the Dutch population is synthesized
    - E.g., a 10% fraction means appr. 680,000 – 860,000 households and 1,090,000 – 1,280,000 individuals depending on the scenario
  - Computation time is approximately 9 hours on a standard PC

- Generating activity schedules of agents
  - Computation speed is appr. 85,000 households / hr
  - ➢ A run takes approximately 8 – 10 hours

- Extracting information
  - Computation time of a standard report is appr. 2 hours

Example of an application I

A scenario study conducted to assess mobility effects of an aging population

Aims and approach of the scenario study

- What are the mobility effects of aging of the Dutch population for the foreseeable future (year 2020)?
- Two WLO scenarios developed by Ducth planning agencies were used
  - Global Europe (strong international orientation, reform of collective sector)
  - Regional communities (strong national orientation, no reform of collective sector)
- Congestion pricing policy (congestion and flat km charge)
- Behavioral variants formulated by KIM to account for cohort effects

WLO scenarios

- Demographic developments
- Economic developments
  - Income, car possession
  - Tariffs of public transport and car parking
  - Fuel price and and avarage fuel use of cars
- Land-use developments
- Transport level-of-service developments

Behavioral scenario variants (Jorritsma, Olde Kalter 2007)

- Elderly of 2020 compared to elderly of 2000:
  - More out-of-home activities in particular for leisure and social activities
  - Avoid morning peak hours
  - Choose residence in low density urban areas (55-64 yr) and high density urban areas (65 – 74 yr)

Analysis scheme

	Scenario			Reference			Revealed effect
	Main	Variant	Price policy	Main	Variant	Price policy	
1	GE 2020	None		Base 2000			Basic scenario
2	RC 2020	None		Base 2000			Basic scenario
3	GE	None	X	GE	None		Price policy
4	RC	None	X	RC	None		Price policy
5	GE	VAR1		GE	None		VAR1
6	GE	VAR1	X	GE	VAR1		Price policy
7	GE	VAR1+VAR2		GE	VAR1		VAR2 given VAR1
9	GE	VAR1+VAR2+VAR3		GE	VAR1+VAR2		VAR3 given VAR1 and VAR2
8	GE	VAR 2		GE	None		VAR2 separately
10	GE	VAR 3		GE	None		VAR3 separately
11	GE	VAR1+VAR2+VAR3		Base 2000	None		Scenario+Vars
12	GE	VAR1+VAR2+VAR3	X	Base 2000	None		Scenario+Vars + Price policy

VAR1 = increase out-of-home VAR2 = elderly peak VAR3 = spatial diversity

Example of output: mobility indicators

	m0	m1	m1-m0 (%)	sign
Total travel time (min)	490025	583723	19.12	**
Travel time car driver (min)	238922	299405	25.31	**
Travel time public transport (min)	51883	53286	2.70	
Travel time slow (min)	149727	173474	15.86	**
Travel time car passenger (min)	48591	56056	15.36	**
Number of tours	14235	16956	19.11	**
Number of trips	32298	38639	19.63	**
Ratio trips-tours	2.269	2.279	0.44	**
Ratio single stop tours - all tours	0.803	0.796	-0.83	**
Total travel distance (km)	336848	408173	21.17	**
Distance car driver (km)	252667	312795	23.80	**
Distance car passenger (km)	48384	54677	13.01	**
Distance slow (km)	20259	23542	16.20	**
Distance public transport (km)	15538	17159	10.43	**

GE 2020-Var. 1+2+3 *without* pricing policy versus Base 2000

Example of output: activity frequencies

	m0	m1	m1-m0 (%)	sign
Work	3438	3970	15.46	**
Business	1135	1354	19.32	**
Bring or get	1537	1488	-3.15	
Shop one store	3985	4882	22.52	**
Shop multiple stores	813	945	16.26	**
Service	936	1131	20.87	**
Social	2197	2786	26.83	**
Leisure	2320	2950	27.15	**
Touring	1431	1855	29.64	**
Other	272	322	18.41	**
Total (activities)	18063	21683	20.05	**

GE 2020-Var. 1+2+3 *without* pricing policy versus Base 2000

Example of output

Activity start times

	m0	m1	m1-m0 (%)	sign
<= 10 am	4644	5040	8.54	**
10-12 am	2500	3281	31.24	**
12-2 pm	2378	2896	21.78	**
2-4 pm	2994	3678	22.83	**
4-6 pm	2181	2628	20.48	**
> 6 pm	3366	4161	23.63	**
Total (activities)	18063	21683	20.05	**

Trip chaining

	m0	m1	m1-m0 (%)	sign
Single stop	11433	13505	18.12	**
After stop	2803	3451	23.13	**
Before stop	2803	3451	23.13	**
Between stop	1025	1277	24.63	**
Total (activities)	18063	21683	20.05	**

GE 2020-Var. 1+2+3 *without* pricing policy versus Base 2000

Example of output

Location choice

	m0	m1	m1-m0 (%)	sign
home zone	5459	6489	18.87	**
home municipality	5198	6075	16.87	**
municipality order 1	2794	3071	9.91	**
municipality order 2	1655	2297	38.80	**
municipality order 3	1179	1387	17.59	**
municipality order 4	811	1087	34.01	**
municipality order 5	960	1251	30.36	**
Total (activities)	18063	21683	20.05	**

Mode choice

	m0	m1	m1-m0 (%)	sign
Car driver	6612	8166	23.50	**
Slow mode	5556	6407	15.33	**
Public transport	520	592	13.83	**
Car passenger	1518	1736	14.33	**
Total (tours)	14235	16956	19.11	**

GE 2020-Var. 1+2+3 *without* pricing policy versus Base 2000

Example of an application II

The impacts of a road pricing scenario

Parameters of the pricing policy

- Flat per km price: 3.4 Euro cent per kilometer
- Congestion price: 11.2 Euro cent per kilometer
- Roughly, this implies a doubling of variable costs (if on average half of car kilometers would be subject to the congestion price)
- We compare GE 2020 with and without pricing **policy**

Predicted mobility effects

	m0	m1	m1-m0 (%)	sign
Total travel time (min)	569951	549839	-3.53	**
Travel time car driver (min)	291815	240290	-17.66	**
Travel time public transport (min)	52702	70853	34.44	**
Travel time slow (min)	170106	179378	5.45	**
Travel time car passenger (min)	53679	57716	7.52	**
Number of tours	16600	16318	-1.70	**
Number of trips	37686	36979	-1.88	**
Ratio trips-tours	2.27	2.266	-0.18	**
Ratio single stop tours - all tours	0.802	0.804	0.24	**
Total travel distance (km)	396905	341817	-13.88	**
Distance car driver (km)	304126	236951	-22.09	**
Distance car passenger (km)	52510	58293	11.01	**
Distance slow (km)	23149	24565	6.12	**
Distance public transport (km)	17121	22008	28.55	**

Predicted activity choice effects

	m0	m1	m1-m0 (%)	sign
Work	3948	3913	-0.89	**
Business	1331	1270	-4.59	**
Bring or get	1487	1481	-0.45	
Shop one store	4802	4760	-0.88	**
Shop multiple stores	948	938	-1.06	
Service	1112	1110	-0.17	
Social	2630	2507	-4.65	**
Leisure	2779	2697	-2.95	**
Touring	1723	1684	-2.28	**
Other	326	301	-7.48	**

Predicted travel choice effects (cont'd)

Location choice

	m0	m1	m1-m0 (%)	sign
home zone	6263	6372	1.73	**
home municipality	6023	6104	1.34	**
municipality order 1	2947	2760	-6.36	**
municipality order 2	2202	2066	-6.19	**
municipality order 3	1347	1250	-7.23	**
municipality order 4	1051	959	-8.69	**
municipality order 5	1228	1125	-8.38	**
Total (activities)	21086	20661	-2.02	**

Predicted travel choice effects (cont'd)

Trip chaining choice

	m0	m1	m1-m0 (%)	sign
Single stop	13315	13121	-1.46	**
After stop	3285	3198	-2.66	**
Before stop	3285	3198	-2.66	**
Between stop	1201	1145	-4.68	**
Total (activities)	21086	20661	-2.02	**

Transport mode choice

	m0	m1	m1-m0 (%)	sign
Car driver	8014	7270	-9.29	**
Slow mode	6284	6576	4.64	**
Public transport	587	714	21.63	**
Car passenger	1661	1706	2.71	**
Total (tours)	16600	16318	-1.70	**

Strengths compared to trip/tour-based models

- **Scope:** Allows considering a wider range of scenarios
- **Resolution**: Higher temporal and spatial resolution
- **Sensitivity**: Is more sensitive to shifts in activities and related travel choices
- **Validity**: Is able to predict secondary scheduling effects
- **Information value**: Richer in generated information; supports explanation of mobility effects
- **Predictive ability**: better representation of travel patterns
- **Integrity**: consistent links between choice facets