Inhalt

- The Case Study Area
- The Structure of the Simulation Model
- Common Policies
- Results
The Stuttgart Case Study II

Population:

Region 2,6 mill. inhabitants  
Stuttgart 570,000 inhabitants  
5 administrative districts (Kreise) 148 town quarters (Stadtviertel)  
179 municipalities (Gemeinden)

Economic Situation:

workplaces:

Region 1,24 mill. (513 workplaces per 1000 inhabitants) in 1995  
30 % of the economic power of Baden-Wuerttemberg

industry and research institutes

DaimlerChrysler, Porsche, Siemens Nixdorf, IBM, Hewlett Packard, Kodak,  
2 universities (40,000 students), 6 academies, German Aerospace Centre DLR, Fraunhofer Institute, Max-Planck-Institute  
100 different credit institutes, 133 publishing houses
The Structure of the Urban and Transport Model III

flows
- information
- traffic
- commodity
- etc.

stock variables
- housing stock
- workplaces
- population
- etc.

needs - facilities
demand - supply

short-time development

long-time development

09. Nov. 2004
SCATTER WORKSHOP: Case Study Stuttgart
The Structure of the Urban and Transport Model II

The structure of the integrated transport and urban/regional model

Examples of networking effects of cities

Deterrence parameters between the City of Stuttgart and other districts of Baden-Wuerttemberg

Deterrence parameters between the City of Heilbronn and other districts of Baden-Wuerttemberg
The Structure of the Urban and Transport Model IV

Urban/Transport System
multi-component system with non-linear interactions

micro level
decisions of individual agents:
e.g. trip and migration decisions

macro level
behaviour of macro variables:
trip frequencies, stock variables

master equation
probability in configuration
space: decision pattern

traffic cells

short-time population distribution

$E_1(t) \quad E_2(t) \quad E_3(t) \quad E_L(t)$

$F_{ij}(t)$

Population numbers
Zoning System

Case Study Stuttgart

- Urban centre
- Outer urban ring
- Hinterland

kilometres
Reference Scenarios

- **001S**: without motorway A81 and without extension of the light rail line S1 and without road tunnel (tunnel Kappelberg) of the Bundesstrasse B29, in east-direction Schwäbisch-Gmünd / Aalen
- **002S**: with A81, with S1 and without tunnel Kappelberg
- **003S**: with A81, with S1 and with tunnel Kappelberg
Policy Code 111 to 211

Implementation of a radial transport infrastructure linking centre and periphery: rail infrastructure, motorway, buses, HOV

Extension of the light rail (S-bahn) S1 (parallel to the motorway A81) and/or motorway A81:

111S: without A81 / with S1
112S: with A81 / without S1
113S: with A81 / with S1
114S: with A81 / with S1 / with Park&Ride facilities
115S: 114S and building of a new road tunnel (tunnel Kappelberg) of the Bundesstrasse B29, in east-direction Schwäbisch Gmünd / Aalen

External factor: relocation of work places

211S: Relocation of 10,000 workplaces from Esslingen and Stuttgart to Sindelfingen (due to shift of a production plant of DaimlerChrysler)
Fiscal measures applied to residential developments

311S: annual tax (development impact fee, 670€ / household / year) applied on households locating in non-A-type zones

→ redistribution of the revenue of impact fee to the urban areas, as fiscal incentive to all households located in A-type zones (Stuttgart, Ludwigsburg, Waiblingen, Sindelfingen, Böblingen, Esslingen and Göppingen)

Regulatory measures applied to companies, inspired form the ABC theory

321S: ABC-type policy applied to a part of the tertiary sector:

→ obligation (regulatory measure) for all jobs of the employment sector “business services”, to locate in A-type zone

Fiscal measures applied to companies, inspired form the ABC theory

331S: ABC-type policy applied to a part of the tertiary sector:

→ tax on jobs of the employment sector “business services” locating in non-A-type zone: the tax amounts to 976 €/job

An A zone is a zone of the capital of a district (NUTS3). In general those zones are also served by high quality public transport at regional scale. In these scenario, there are 7 A-zones in the Stuttgart Region
Policy Code 411S to 521S

Measures aiming at a modal shift towards public transport by increasing travel costs or time by private car

411S: increase by 50% of the cost per km for all drivers.

412S: cordon pricing (the cordon is located just inside the city of Stuttgart and the adjacent communes Ludwigsburg, Sindelfingen, Böblingen and Esslingen): tariff: 7.5 €/day applied to all drivers

Measures aiming at a modal shift towards public transport by decreasing travel costs or times by public transport, or by providing P&R facilities

512S decrease of fare by 20%, applied to all public transport users
Policy Code 811S to 813S

Combination of Measures

**811S**: increase by 50% of the private car cost/km applied to all drivers, decrease of PT fare by 20% for all trips, fiscal measure on residential developments: see scenario 311

**812S**: increase by 50% of the private car cost/km applied to all drivers, decrease of PT fare by 20% for all trips, ABC-type policy applied to a part of the tertiary sector: see scenario 331

**813S**: increase by 50% of the private car cost/km applied to all drivers, decrease of PT fare by 20% for all trips, fiscal measure on residential developments: see scenario 311, ABC-type policy applied to a part of the tertiary sector: see scenario 331
Results of the Different Policy Codes

Stuttgart case city: Effects of the policies on the number of households in the urban centre

Type of scenario:
- Transport infrastructures / services
- External factor: relocation of work places
- Land use measures having an influence on urban sprawl
- Measures aiming at a modal shift towards public transport by increasing travel costs or time by private car
- Measures aiming at a modal shift towards public transport by decreasing travel costs or time by public transport, or by providing P&R facilities
- Local investment plan and combinations of measures

* The effect of motorway A81 and light rail S1 (111,112,113,114) is calculated by comparison with scenario 001 (situation without motorway and light rail).
* The effect of tunnel Kappelberg (115) is calculated by comparison with scenario 002 (which is also 114 - situation with motorway A81 and light rail S1).
* The effects of the other measures are calculated in comparison with scenario 003 (present state).
linking centre and periphery:

rail infrastructure S1, P&R

111S: without A81 / with S1
112S: with A81 / without S1
113S: with A81 / with S1
114S: with A81 / with S1 / with Park&Ride facilities

Extension of the light rail S1 and motorway A81
### linking centre and periphery: rail infrastructure S1, motorway A81, P&R

<table>
<thead>
<tr>
<th>Indicator Unit</th>
<th>Number of households in urban zones</th>
<th>Number of households in the urban centre</th>
<th>Number of jobs in urban zones</th>
<th>Number of jobs in the urban centre</th>
<th>Total car mileage in the study area</th>
<th>Average modal share of public transport, in the study area</th>
<th>Average travel time (all modes, all purposes)</th>
<th>Average home-work travel distance (all modes)</th>
<th>Average road traffic speed in the whole study</th>
<th>Number of passenger-kilometers by public transport</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>unit</td>
<td>with S1, with A81</td>
<td>without S1, without A81</td>
<td>with S1, with A81, with P&amp;R-facilities</td>
<td>with S1, with A81</td>
<td>with S1, with A81</td>
<td>with S1, with A81</td>
<td>with S1, with A81</td>
<td>with S1, with A81</td>
<td>with S1, with A81</td>
</tr>
<tr>
<td>Number of households in urban zones</td>
<td>inhabitants</td>
<td>1427566</td>
<td>-0.5%</td>
<td>-0.5%</td>
<td>-0.1%</td>
<td>-0.1%</td>
<td>47.42</td>
<td>-0.4%</td>
<td>-6.7%</td>
<td>-0.4%</td>
</tr>
<tr>
<td>Number of households in the urban centre</td>
<td>inhabitants</td>
<td>594273</td>
<td>-0.1%</td>
<td>0.1%</td>
<td>-0.1%</td>
<td>-0.1%</td>
<td>-0.1%</td>
<td>14.84</td>
<td>-11.7%</td>
<td>-12.2%</td>
</tr>
<tr>
<td>Number of jobs in urban zones</td>
<td>jobs</td>
<td>728453</td>
<td>-1.0%</td>
<td>-1.1%</td>
<td>-0.2%</td>
<td>-0.2%</td>
<td>-0.1%</td>
<td>3.8%</td>
<td>-3.8%</td>
<td>-3.8%</td>
</tr>
<tr>
<td>Number of jobs in the urban centre</td>
<td>jobs</td>
<td>350265</td>
<td>-0.1%</td>
<td>0.2%</td>
<td>-0.1%</td>
<td>-0.1%</td>
<td>-0.1%</td>
<td>-0.1%</td>
<td>1.5%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Total car mileage in the study area</td>
<td>million vehicle-kilometers (day)</td>
<td>47.42</td>
<td>-0.4%</td>
<td>-6.7%</td>
<td>-0.1%</td>
<td>-0.4%</td>
<td>14.84</td>
<td>-11.7%</td>
<td>-12.2%</td>
<td>-13.5%</td>
</tr>
<tr>
<td>Average modal share of public transport, in the study area</td>
<td>%</td>
<td>19.58</td>
<td>1.5%</td>
<td>1.5%</td>
<td>0.9%</td>
<td>1.5%</td>
<td>-1.1%</td>
<td>0.0%</td>
<td>-0.2%</td>
<td>-0.2%</td>
</tr>
<tr>
<td>Average travel time (all modes, all purposes)</td>
<td>minutes</td>
<td>36.8</td>
<td>-0.2%</td>
<td>-0.4%</td>
<td>-0.2%</td>
<td>-0.2%</td>
<td>-0.2%</td>
<td>-0.2%</td>
<td>-0.2%</td>
<td>-0.2%</td>
</tr>
<tr>
<td>Average home-work travel distance (all modes)</td>
<td>kilometers</td>
<td>13.68</td>
<td>-3.8%</td>
<td>-5.4%</td>
<td>-3.8%</td>
<td>-3.8%</td>
<td>-3.8%</td>
<td>-3.8%</td>
<td>-3.8%</td>
<td>-3.8%</td>
</tr>
<tr>
<td>Average road traffic speed in the whole study</td>
<td>kilometers/hour</td>
<td>39.21</td>
<td>-0.2%</td>
<td>-1.1%</td>
<td>0.0%</td>
<td>-0.2%</td>
<td>-0.2%</td>
<td>-0.2%</td>
<td>-0.2%</td>
<td>-0.2%</td>
</tr>
<tr>
<td>Number of passenger-kilometers by public transport</td>
<td>million passenger-kilometers (day)</td>
<td>14.84</td>
<td>-11.7%</td>
<td>-12.2%</td>
<td>-13.5%</td>
<td>-11.7%</td>
<td>-11.7%</td>
<td>-11.7%</td>
<td>-11.7%</td>
<td>-11.7%</td>
</tr>
</tbody>
</table>

### Observations
- Radial transport lines increase urban sprawl.
- Motorways have a bigger effect than light rail systems.
transport infrastructure linking centre and periphery:

Stuttgart Region

Scenario 115S
Tunnel Kappelberg

before

after

Kappelberg

20 km
linking centre and periphery:

Stuttgart Region Szenario Tunnel Kappelberg

travel time decrease from/to Schorndorf [minutes]
-8 <= -6 (0)
-6 <= -4 (4)
-4 <= -2 (6)
-2 <= 0 (10)
no change (159)

Stuttgart Region Szenario Tunnel Kappelberg

travel time decrease from/to Stuttgart [minutes]
-7.5 <= -6 (3)
-6 <= -4 (21)
-4 <= -2 (6)
-2 <= 0 (4)
no change (145)
linking centre and periphery:

Stuttgart Region
Scenario S115
Tunnel Kappelberg

population redistribution

-10,000 <= -500 (1)
-500 <= -100 (1)
-100 <= 100 (140)
100 <= 500 (24)
500 <= 2,000 (9)
2,000 <= 6,000 (4)
### Indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Reference Scenario</th>
<th>S1 with P&amp;R facilities</th>
<th>Changes in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of households in the urban centre</td>
<td>1185</td>
<td>1145</td>
<td>-3%</td>
</tr>
<tr>
<td>Number of households in urban zones</td>
<td>1426</td>
<td>1398</td>
<td>-2%</td>
</tr>
<tr>
<td>Number of jobs in the urban centre</td>
<td>3498</td>
<td>3445</td>
<td>-1%</td>
</tr>
<tr>
<td>Number of jobs in urban zones</td>
<td>727</td>
<td>716</td>
<td>-1%</td>
</tr>
<tr>
<td>Total car mileage in the study area</td>
<td>47,22</td>
<td>49,8</td>
<td>5%</td>
</tr>
<tr>
<td>Average travel time (all modes, all purposes)</td>
<td>36.73</td>
<td>36.75</td>
<td>0.2%</td>
</tr>
<tr>
<td>Average modal share of public transport</td>
<td>11%</td>
<td>7%</td>
<td>-4%</td>
</tr>
<tr>
<td>Average home-work travel distance (all modes)</td>
<td>13.16</td>
<td>12.75</td>
<td>-3%</td>
</tr>
<tr>
<td>Average road traffic speed in the whole study area</td>
<td>39.14</td>
<td>39.96</td>
<td>2%</td>
</tr>
</tbody>
</table>

### Table: Changes to the Reference Scenario in %

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Reference Scenario</th>
<th>S1 with P&amp;R facilities</th>
<th>Changes in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of households in the urban centre</td>
<td>1185</td>
<td>1145</td>
<td>-3%</td>
</tr>
<tr>
<td>Number of households in urban zones</td>
<td>1426</td>
<td>1398</td>
<td>-2%</td>
</tr>
<tr>
<td>Number of jobs in the urban centre</td>
<td>3498</td>
<td>3445</td>
<td>-1%</td>
</tr>
<tr>
<td>Number of jobs in urban zones</td>
<td>727</td>
<td>716</td>
<td>-1%</td>
</tr>
<tr>
<td>Total car mileage in the study area</td>
<td>47,22</td>
<td>49,8</td>
<td>5%</td>
</tr>
<tr>
<td>Average travel time (all modes, all purposes)</td>
<td>36.73</td>
<td>36.75</td>
<td>0.2%</td>
</tr>
<tr>
<td>Average modal share of public transport</td>
<td>11%</td>
<td>7%</td>
<td>-4%</td>
</tr>
<tr>
<td>Average home-work travel distance (all modes)</td>
<td>13.16</td>
<td>12.75</td>
<td>-3%</td>
</tr>
<tr>
<td>Average road traffic speed in the whole study area</td>
<td>39.14</td>
<td>39.96</td>
<td>2%</td>
</tr>
</tbody>
</table>

### Discussion

Radial transport lines increase urban sprawl and linking centre and periphery.
211S: Relocation of 10,000 workplaces from Esslingen and Stuttgart to Sindelfingen (due to shift of a production plant of DaimlerChrysler)
Relocation of Workplaces – population redistribution

Stuttgart Region
Scenario relocation of workplaces

population redistribution
-2,500 =< -1,000 (1)
-1,000 =< -100 (31)
-100 =< 100 (126)
100 =< 1,000 (20)
1,000 =< 2,200 (1)
Results: Relocation of Workplaces

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Unit</th>
<th>reference year 2000</th>
<th>relocation of workplaces change to reference scenario in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of households in urban zones</td>
<td>inhabitants</td>
<td>1486535</td>
<td>-0.3%</td>
</tr>
<tr>
<td>Number of households in the urban centre</td>
<td>inhabitants</td>
<td>583874</td>
<td>-0.4%</td>
</tr>
<tr>
<td>Number of jobs in urban zones</td>
<td>jobs</td>
<td>727097</td>
<td>0.0%</td>
</tr>
<tr>
<td>Number of jobs in the urban centre</td>
<td>jobs</td>
<td>349867</td>
<td>-1.4%</td>
</tr>
<tr>
<td>Total car mileage in the study area</td>
<td>million vehicle-kilometers (day)</td>
<td>48.50</td>
<td>-0.3%</td>
</tr>
<tr>
<td>Average modal share of public transport, in the study area</td>
<td>%</td>
<td>19.30</td>
<td>-0.6%</td>
</tr>
<tr>
<td>Average travel time (all modes, all purposes)</td>
<td>minutes</td>
<td>36.78</td>
<td>-0.2%</td>
</tr>
<tr>
<td>Average home-work travel distance (all modes)</td>
<td>kilometers</td>
<td>13.34</td>
<td>-0.2%</td>
</tr>
<tr>
<td>Average road traffic speed in the whole study</td>
<td>kilometers/hour</td>
<td>39.75</td>
<td>0.1%</td>
</tr>
<tr>
<td>Number of passenger-kilometers by public transport</td>
<td>million passenger-kilometers (day)</td>
<td>12.75</td>
<td>-1.1%</td>
</tr>
</tbody>
</table>

Relocation of workplaces from A-zone to A-zone may lead to a small increase of sprawl, but also to positive effects on mobility.
ABC – type zones

Stuttgart Region
Scenario 311S/321S/333S
regulatory and fiscal measures applied to companies

ABC-type definitions
- A-zones (7)
- non-A-zones (172)
residential developments
population redistribution

Scenario 311S
development of Impact fee in non urban zones

redistribution of inhabitants in %

-5,0 <= -3,0
-3,0 <= -1,0
-1,0 <= 1,0
1,0 <= 3,0
3,0 <= 5,0
residential developments
workplace redistribution

311S: annual tax (development impact fee) applied on households locating in non-A zones

Stuttgart Region
Scenario 311S
development of impact fee in non urban zones

redistribution of workplaces in %

-5.0 <= -3.0
-3.0 <= -1.0
-1.0 <= 1.0
1.0 <= 3.0
3.0 <= 5.0
321S: obligation (regulatory measure) for a part of jobs of the employment sector "business services", to locate in A-type zone.
companies

workplace redistribution

321S: obligation (regulatory measure) for a part of jobs of the employment sector “business services”, to locate in A-type zone.
applied to households and companies (311S and 321S)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Unit</th>
<th>reference 2000</th>
<th>change to the reference scenario in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of households in urban zones</td>
<td>inhabitants</td>
<td>1436535</td>
<td>0.5%</td>
</tr>
<tr>
<td>Number of households in the urban centre</td>
<td>inhabitants</td>
<td>583874</td>
<td>2.2%</td>
</tr>
<tr>
<td>Number of jobs in urban zones</td>
<td>jobs</td>
<td>727097</td>
<td>0.2%</td>
</tr>
<tr>
<td>Number of jobs in the urban centre</td>
<td>jobs</td>
<td>349867</td>
<td>0.7%</td>
</tr>
<tr>
<td>Total car mileage in the study area</td>
<td>million vehicle-kilometers (day)</td>
<td>48.50</td>
<td>0.0%</td>
</tr>
<tr>
<td>Average modal share of public transport, in the study area</td>
<td>%</td>
<td>19.30</td>
<td>2.2%</td>
</tr>
<tr>
<td>Average travel time (all modes, all purposes)</td>
<td>minutes</td>
<td>36.78</td>
<td>0.5%</td>
</tr>
<tr>
<td>Average home-work travel distance (all modes, all purposes)</td>
<td>kilometers</td>
<td>13.34</td>
<td>0.9%</td>
</tr>
<tr>
<td>Average road traffic speed in the whole study area</td>
<td>kilometers/hour</td>
<td>39.73</td>
<td>0.2%</td>
</tr>
<tr>
<td>Number of passenger-kilometers by public transport</td>
<td>million passenger-kilometers (day)</td>
<td>12.75</td>
<td>2.9%</td>
</tr>
<tr>
<td>CO2 emissions</td>
<td>tons per day</td>
<td>11640</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

regulatory and fiscal measures may decrease the effects of sprawl
Policy Code 331S

331S: ABC-type policy applied to a part of the tertiary sector: tax on new jobs of the employment sector “business services” locating in non-A-type zone. The tax amounts to 976 €/job.
Policy Code 331S

331S: ABC-type policy applied to a part of the tertiary sector: tax on new jobs of the employment sector “business services” locating in non-A-type zone. The tax amounts to 976 €/job

Stuttgart Region

Scenario 331S
ABC-type policy
tax applied to a part of the tertiary sector

redistribution of workplaces in %

-6.0 <= -3.0
-3.0 <= -1.0
-1.0 <= 1.0
1.0 <= 3.0
3.0 <= 5.0
Policy Code 411S

411S: Increase by 50% of the cost per km for all drivers

Stuttgart Region

Scenario 411S
increase of the costs per km for all drivers

redistribution of inhabitants in %

-12.0 <= -3.0
-3.0 <= -1.0
-1.0 <= 1.0
1.0 <= 3.0
3.0 <= 5.0
Policy Code 411S

411S: Increase by 50 % of the cost per km for all drivers

Stuttgart Region

Scenario 411S
increase of the costs per km for all drivers

redistribution of workplaces in %

-8.0 <= -3.0
-3.0 <= -1.0
-1.0 <= 1.0
1.0 <= 3.0
3.0 <= 5.0
Policy Code 512S

512S: decrease of fare by 20%, applied to all public transport users (reference scenario 003S)

Stuttgart Region

Scenario 512S
decrease of the public transport costs

redistribution of inhabitants in %

-5.0 <= -3.0
-3.0 <= -1.0
-1.0 <= 1.0
1.0 <= 3.0
3.0 <= 5.0
Policy Code 512S

512S: decrease of fare by 20%, applied to all public transport users (reference scenario 003S)

Stuttgart Region

Scenario 512S
decrease of the public transport costs

redistribution of workplaces in %

-5.0 <= -3.0
-3.0 <= -1.0
-1.0 <= 1.0
1.0 <= 3.0
3.0 <= 5.0
Policy Code 811S

811S: increase by 50% of the private car cost/km applied to all drivers, decrease of PT fare by 20% for all trips, fiscal measure on residential developments: see scenario 311
Policy Code 811S

811S: increase by 50% of the private car cost/km applied to all drivers, decrease of PT fare by 20% for all trips, fiscal measure on residential developments: see scenario 311

Stuttgart Region

Scenario 811S
(311S) development of impact fee in non urban zones
(411S) increase of IT-costs
(512S) decrease of PT-cost:

redistribution of workplaces in %

-7,0 <= -3,0
-3,0 <= -1,0
-1,0 <= 1,0
1,0 <= 3,0
3,0 <= 5,0
Policy Code 812S

812S: increase by 50% of the private car cost/km applied to all drivers, decrease of PT fare by 20% for all trips, ABC-type policy applied to a part of the tertiary sector: see scenario 331
Policy Code 812S

812S: increase by 50% of the private car cost/km applied to all drivers, decrease of PT fare by 20% for all trips, ABC-type policy applied to a part of the tertiary sector: see scenario 331

Stuttgart Region

Scenario 812S
(331S) tax applied to a part of the tertiary sector
(411S) increase of IT-costs
(512S) decrease of PT-costs

redistribution of workplaces in %

<table>
<thead>
<tr>
<th>Change in %</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>-7.0 &lt;= -3.0</td>
<td>dark blue</td>
</tr>
<tr>
<td>-3.0 &lt;= -1.0</td>
<td>blue</td>
</tr>
<tr>
<td>-1.0 &lt;= 1.0</td>
<td>grey</td>
</tr>
<tr>
<td>1.0 &lt;= 3.0</td>
<td>red</td>
</tr>
<tr>
<td>3.0 &lt;= 20.0</td>
<td>orange</td>
</tr>
</tbody>
</table>
813S: increase by 50% of the private car cost/km applied to all drivers, decrease of PT fare by 20% for all trips, fiscal measure on residential developments: see scenario 311, ABC-type policy applied to a part of the tertiary sector: see scenario 331
Policy Code 813S

813S: increase by 50% of the private car cost/km applied to all drivers, decrease of PT fare by 20% for all trips, fiscal measure on residential developments: see scenario 311, ABC-type policy applied to a part of the tertiary sector: see scenario 331
Results of the Different Policy Codes

Stuttgart case city: Effects of the policies on the number of households in the urban centre

Type of scenario:
- Transport infrastructures / services
- External factor: relocation of work places
- Land use measures having an influence on urban sprawl
- Measures aiming at a modal shift towards public transport by increasing travel costs or time by private car
- Measures aiming at a modal shift towards public transport by decreasing travel costs or times by public transport, or by providing P&R facilities
- Local investment plan and combinations of measures

* The effect of motorway A81 and light rail S1 (111,112,113,114) is calculated by comparison with scenario 001 (situation without motorway and light rail).
* The effect of tunnel Kappelberg (115) is calculated by comparison with scenario 002 (which is also 114 - situation with motorway A81 and light rail S1).
* The effects of the other measures are calculated in comparison with scenario 003 (present state).