‘Multimodal location Rotterdam Noordrand’
- Appendix section -
Table of contents

Appendix A Variables and constraints Nature- and businesspark Schieveen 1
A 1 Descriptive overview of the area 1
A 2 Translation into variables and constraints 2

Appendix B Variables and constraints Rotterdam Airport Business Park 8
B 1 Descriptive overview of the area 8
B 2 Translation into variables and constraints 8

Appendix C Variables and constraints Park Zestienhoven 13
C 1 Descriptive overview of the area 13
C 2 Translation into variables and constraints 13

Appendix D Variables and constraints Rotterdam Noordrand 18
D 1 Rotterdam Noordrand phase 1 18
  D 1.1 Rotterdam Airport Business Park phase 1 18
  D 1.1.1 Endogenous variables 18
  D 1.1.2 Exogenous variables 19
  D 1.1.3 Constraints 20
  D 1.2 Park Zestienhoven phase 1 21
  D 1.2.1 Endogenous variables 21
  D 1.2.2 Exogenous variables 23
  D 1.2.3 Constraints 24
D 2 Rotterdam Noordrand phase 2 26
  D 2.1 Nature- and business park Schieveen phase 2 26
  D 2.1.1 Endogenous variables 26
  D 2.1.2 Exogenous variables 27
  D 2.1.3 Constraints 28
  D 2.2 Rotterdam Airport Business Park phase 2 29
  D 2.2.1 Endogenous variables 29
  D 2.2.2 Exogenous variables 30
  D 2.2.3 Constraints 31
  D 2.3 Park Zestienhoven phase 2 32
  D 2.3.1 Endogenous variables 32
  D 2.3.2 Exogenous variables 34
  D 2.3.3 Constraints 35
D 3 Rotterdam Noordrand phase 3 38
  D 3.1 Nature- and business park Schieveen phase 3 38
D 3.1.1 Endogenous variables  38
D 3.1.2 Exogenous variables  39
D 3.1.3 Constraints  40
D 3.2 Park Zestienhoven phase 3  41
D 3.2.1 Endogenous variables  41
D 3.2.2 Exogenous variables  43
D 3.2.3 Constraints  44
D 4 Rotterdam Noordrand phase 4  46
D 4.1 Nature- and business park Schieveen phase 4  46
D 4.1.1 Endogenous variables  46
D 4.1.2 Exogenous variables  47
D 4.1.3 Constraints  48
D 4.2 Park Zestienhoven phase 4  49
D 4.2.1 Endogenous variables  49
D 4.2.2 Exogenous variables  51
D 4.2.3 Constraints  52

Appendix E Variables and constraints derived from optimisation focuses  54
E 1 Market quality  54
  E 1.1 Industrial space Rotterdam Noordrand  54
  E 1.2 Offices Rotterdam Noordrand  55
  E 1.3 Space for centre-like facilities Rotterdam Noordrand  56
E 2 Spatial quality  58
E 3 Means  60

Appendix F Preference identification for stakeholders 1 & 2  62

Appendix G Interface for valuing hard exogenous variables  63

Appendix H Validating the four-vertex research model  64
Appendix A Variables and constraints Nature- and business park Schieveen

In this appendix, the endogenous and exogenous variables for Nature- and business park Schieveen are identified. This is done with use of the most recent zoning plan for the area: *Ontwerp bestemmingsplan 1e fase Natuur- en businesspark Schieveen*.¹

A 1 Descriptive overview of the area

The future development of polder Schieveen concerns 2,000,000 m² free accessible nature reserves, 900,000 m² science & businesspark and 28 residences and is entitled ‘Nature- and businesspark Schieveen’. In addition, 120,000 m² will be reserved for the realization of the A13/A16 highway connection.

The sub-development of the science & businesspark is of importance for this research. This economic area will contain a total of 600,000 m² Gross Floor Area (Bruto Vloer Oppervlak, ‘GFA’), and a number of 2,000 full-time employees are expected for the year 2018.

The development of Nature- and businesspark Schieveen is divided into three phases that each have a time-span of 10 years. Until this moment, only a zoning plan for the first phase was constructed and prescribed the following numbers:

- Over 73,000 m² nature reserves;
- 120,000 m² rural area as reservation for the future A13/A16 highway connection;
- 256,000 m² science & businesspark; and
- 28 residences in the east of the development area.

Furthermore, the first phase of the science & businesspark will contain a maximum of 100,000 m² GFA. A total of 50,000 m² GFA is reserved for industrial functions. The remaining non-industrial floor space (with a maximum of 50% of the total GFA) consists of offices and several facilities:

1. offices, with a maximum of 50,000 m² GFA;
2. communal facilities, with a maximum of 15,000 m² GFA;
3. recreational facilities, with a maximum of 5,000 m² GFA;
4. catering industry facilities, with a maximum of 2,500 m² GFA;
5. a hotel, with a maximum of 10,000 m² GFA; and
6. retail facilities, with a maximum of 1,000 m² GFA.

¹ Gemeente Rotterdam (2009).
The zoning plan prescribes a maximum of 35% of the 256,000m$^2$ science & business park area as Built-On Area (Bruto Bebouwd Oppervlak, 'BOA',) and a minimum of 35% as the destination ‘green and water’. A total of 20% of the area will be denoted as the destination ‘pavement’.

### A 2 Translation into variables and constraints

**Description:**

The future development of polder Schieveen concerns 2,000,000m$^2$ free accessible nature reserves, 900,000m$^2$ science & businesspark and 28 residences and is entitled ‘Nature- and businesspark Schieveen’. In addition, 120,000m$^2$ will be reserved for the realization of the A13/A16 highway connection. These contents will be developed in three phases.

**Endogenous variables:**

- $A_{DA\_SCH\_TOT}$: Total development area Nature- and businesspark Schieveen (m$^2$)
- $A_{DA\_SCH\_P_i}$: Total development area Nature- and businesspark Schieveen phase $i$ (m$^2$)$^2$
- $A_{DA\_SCH\_NAT\_TOT}$: Total development area nature reserve Schieveen realized (m$^2$)
- $A_{DA\_SCH\_NAT\_P_i}$: Total development area reserve Schieveen phase $i$ realized (m$^2$)
- $A_{DA\_SCH\_RUR\_TOT}$: Total development area rural area Schieveen realized (m$^2$)
- $A_{DA\_SCH\_RUR\_P_i}$: Total development area rural area Schieveen phase $i$ realized (m$^2$)
- $A_{DA\_SCH\_BUS\_TOT}$: Total development area science & businesspark Schieveen realized (m$^2$)
- $A_{DA\_SCH\_BUS\_P_i}$: Total development area science & businesspark Schieveen phase $i$ realized (m$^2$)
- $N_{RES\_SCH\_TOT}$: Total number of residences Schieveen realized (#)
- $N_{RES\_SCH\_P_i}$: Total number of residences Schieveen phase $i$ realized (#)

**Exogenous variables:**

- $a_{da\_sch\_nat\_tot}$: Total development area nature reserve Schieveen (2,000,000m$^2$)

---

2 Note that $i$ is an index with the values 1-3.
a_da_sch_rur_tot: Total development area rural area Schieveen (120,000m²)
a_da_sch_bus_tot: Total development area science & businesspark Schieveen (900,000m²)
n_res_sch_tot Total number of residences Schieveen (28)

Constraints:
\[ A_{DA\_SCH\_TOT} = A_{DA\_SCH\_NAT\_TOT} + A_{DA\_SCH\_RUR\_TOT} + A_{DA\_SCH\_BUS\_TOT} \]
\[ A_{DA\_SCH\_TOT} = \sum A_{DA\_SCH\_P_i} \]

\[ A_{DA\_SCH\_P1} = A_{DA\_SCH\_NAT\_P1} + A_{DA\_SCH\_RUR\_P1} + A_{DA\_SCH\_BUS\_P1} \]
\[ A_{DA\_SCH\_P2} = A_{DA\_SCH\_NAT\_P2} + A_{DA\_SCH\_RUR\_P2} + A_{DA\_SCH\_BUS\_P2} \]
\[ A_{DA\_SCH\_P3} = A_{DA\_SCH\_NAT\_P3} + A_{DA\_SCH\_RUR\_P3} + A_{DA\_SCH\_BUS\_P3} \]

\[ A_{DA\_SCH\_NAT\_TOT} = \sum A_{DA\_SCH\_NAT\_P_i} \]
\[ A_{DA\_SCH\_RUR\_TOT} = \sum A_{DA\_SCH\_RUR\_P_i} \]
\[ A_{DA\_SCH\_BUS\_TOT} = \sum A_{DA\_SCH\_BUS\_P_i} \]

\[ A_{DA\_SCH\_NAT\_TOT} = a_{da\_sch\_nat\_tot} \]
\[ A_{DA\_SCH\_RUR\_TOT} = a_{da\_sch\_rur\_tot} \]
\[ A_{DA\_SCH\_BUS\_TOT} = a_{da\_sch\_bus\_tot} \]

\[ N_{RES\_SCH\_TOT} = n_{res\_sch\_tot} \]

Description:
The science & businesspark will contain a total of 600,000m² Gross Floor Area ('GFA').

Endogenous variables:
\[ A_{GFA\_SCH\_TOT}: \quad \text{Total Gross Floor Area science & businesspark Schieveen (m}^2) \]
\[ A_{GFA\_SCH\_P_i}: \quad \text{Total Gross Floor Area science & businesspark Schieveen phase } i \text{ realized (m}^2) \]

Exogenous variables:
\[ a_{gfa\_sch\_tot}: \quad \text{Total Gross Floor Area science & businesspark Schieveen (600,000m}^2) \]

Constraints:
\[ A_{GFA\_SCH\_TOT} = \sum A_{GFA\_SCH\_P_i} \]
A_GFA_SCH_TOT = a_gfa_sch_tot

Description:
The first phase will enhance (i) over 730,000 m² nature reserves, (ii) 120,000 m² rural area as reservation for the future A13/A16 highway connection, (iii) 256,000 m² science & businesspark, and (iv) 28 residences.

Endogenous variables:
- A_DA_SCH_P1: Total development area Nature- and businesspark Schieveen phase 1 (m²)
- A_DA_SCH_NAT_P1: Total development area nature reserve Schieveen phase 1 realized (m²)
- A_DA_SCH_RUR_P1: Total development area rural area Schieveen phase 1 realized (m²)
- A_DA_SCH_BUS_P1: Total development area science & businesspark Schieveen phase 1 realized (m²)
- N_RES_SCH_P1: Total number of residences Schieveen phase 1 realized (#)

Exogenous variables:
- a_da_sch_nat_p1: Total development area nature reserve Schieveen phase 1 (730,000m²)
- a_da_sch_rur_p1: Total development area rural area Schieveen phase 1 (120,000m²)
- a_da_sch_bus_p1: Total development area science & businesspark Schieveen phase 1 (256,000m²)
- n_res_sch_p1: Total number of residences Schieveen phase 1 (28)

Constraints:
A_DA_SCH_P1 = A_DA_SCH_NAT_P1 + A_DA_SCH_RUR_P1 + A_DA_SCH_BUS_P1
A_DA_SCH_NAT_P1 ≥ a_da_sch_nat_p1
A_DA_SCH_RUR_P1 = a_da_sch_rur_p1
A_DA_SCH_BUS_P1 = a_da_sch_bus_p1
N_RES_SCH_P1 = n_res_sch_p1

Description:
The first phase of the science & businesspark will contain a maximum of 100,000 m² GFA.
Endogenous variables:
A_GFA_SCH_P1: Total Gross Floor Area science & businesspark Schieveen phase 1 realized (m²)
A_GFA_SCH_P1_IND: Total Gross Floor Area industrial functions phase 1 realized (m²)
A_GFA_SCH_P1_N_IND: Total Gross Floor Area non-industrial functions phase 1 realized (m²)
A_GFA_SCH_P1_N_IND_OFF: Total Gross Floor Area offices phase 1 realized (m²)
A_GFA_SCH_P1_N_IND_FAC: Total Gross Floor Area facilities phase 1 realized (m²)

Exogenous variables:
a_gfa_sch_p1: Total Gross Floor Area science & businesspark Schieveen phase 1 (100,000m²)
a_gfa_sch_p1_ind: Total Gross Floor Area industrial functions phase 1 (50,000m²)
a_gfa_sch_p1_n_ind_off: Total Gross Floor Area offices phase 1 (50,000m²)
p_gfa_sch_p1_n_ind: Total percentage Gross Floor Area non-industrial functions phase 1 (50%)

Constraints:
A_GFA_SCH_P1 = A_GFA_SCH_P1_IND + A_GFA_SCH_P1_N-IND
A_GFA_SCH_P1_N_IND = A_GFA_SCH_P1_N-IND_OFF + A_GFA_SCH_P1_N-IND_FAC
A_GFA_SCH_P1_N_IND = a_gfa_sch_p1_ind
A_GFA_SCH_P1_N_IND ≤ p_gfa_sch_p1_n-ind * A_GFA_SCH_P1

Description:
A total of 50,000m² of this maximum GFA is reserved for industrial function. The remaining non-industrial floor space (with a maximum of 50% of the total GFA) consists of offices (with a maximum of 50,000m² GFA) and several facilities.
Description:
The facilities consist of: (i) communal facilities (max. 15,000m$^2$), (ii) recreation facilities (max. 5,000m$^2$), (iii) catering industry facilities (max. 2,500m$^2$), (iv) a hotel (max. 10,000m$^2$), and (v) retail facilities (max. 1,000m$^2$).

Endogenous variables:
- $A_{GFA\_SCH\_P1\_N\_IND\_FAC}$: Total Gross Floor Area facilities phase 1 realized (m$^2$)
- $A_{GFA\_SCH\_P1\_N\_IND\_FAC\_COM}$: Total Gross Floor Area communal facilities phase 1 realized (m$^2$)
- $A_{GFA\_SCH\_P1\_N\_IND\_FAC\_REC}$: Total Gross Floor Area recreational facilities phase 1 realized (m$^2$)
- $A_{GFA\_SCH\_P1\_N\_IND\_FAC\_CAT}$: Total Gross Floor Area catering industry facilities phase 1 realized (m$^2$)
- $A_{GFA\_SCH\_P1\_N\_IND\_FAC\_HOT}$: Total Gross Floor Area hotel facilities phase 1 realized (m$^2$)
- $A_{GFA\_SCH\_P1\_N\_IND\_FAC\_RET}$: Total Gross Floor Area retail facilities phase 1 realized (m$^2$)

Exogenous variables:
- $a_{gfa\_sch\_p1\_n\_ind\_fac\_com}$: Total Gross Floor Area communal facilities phase 1 (15,000m$^2$)
- $a_{gfa\_sch\_p1\_n\_ind\_fac\_rec}$: Total Gross Floor Area recreational facilities phase 1 (5,000m$^2$)
- $a_{gfa\_sch\_p1\_n\_ind\_fac\_cat}$: Total Gross Floor Area catering industry facilities phase 1 (2,500m$^2$)
- $a_{gfa\_sch\_p1\_n\_ind\_fac\_hot}$: Total Gross Floor Area hotel facilities phase 1 (10,000m$^2$)
- $a_{gfa\_sch\_p1\_n\_ind\_fac\_ret}$: Total Gross Floor Area retail facilities phase 1 (1,000m$^2$)

Constraints:
\[
A_{GFA\_SCH\_P1\_N\_IND\_FAC} = A_{GFA\_SCH\_P1\_N\_IND\_FAC\_COM} + A_{GFA\_SCH\_P1\_N\_IND\_FAC\_REC} + A_{GFA\_SCH\_P1\_N\_IND\_FAC\_CAT} + A_{GFA\_SCH\_P1\_N\_IND\_FAC\_HOT} + A_{GFA\_SCH\_P1\_N\_IND\_FAC\_RET}
\]
\[
A_{GFA\_SCH\_P1\_N\_IND\_FAC\_COM} \leq a_{gfa\_sch\_p1\_n\_ind\_fac\_com}
\]
\[
A_{GFA\_SCH\_P1\_N\_IND\_FAC\_REC} \leq a_{gfa\_sch\_p1\_n\_ind\_fac\_rec}
\]
\[
A_{GFA\_SCH\_P1\_N\_IND\_FAC\_CAT} \leq a_{gfa\_sch\_p1\_n\_ind\_fac\_cat}
\]
\[ \text{A\_GFA\_SCH\_P1\_N\_IND\_FAC\_HOT} \leq \text{a\_gfa\_sch\_p1\_n\_ind\_fac\_hot} \]
\[ \text{A\_GFA\_SCH\_P1\_N\_IND\_FAC\_RET} \leq \text{a\_gfa\_sch\_p1\_n\_ind\_fac\_ret} \]

Description:
The zoning plan prescribes a maximum of 35% of the 256,000m² science & business park area as Built-On Area and a minimum of 35% as the destination 'green and water'. A total of 20% of the area will be denoted as the destination 'pavement'.

Endogenous variables:
\[ \text{A\_DA\_SCH\_BUS\_P1}: \quad \text{Total development area science & businesspark Schieveen phase 1 realized (m²)} \]
\[ \text{A\_DA\_SCH\_BUS\_P1\_BOA}: \quad \text{Total Built-on Area science & businesspark Schieveen phase 1 realized (m²)} \]
\[ \text{A\_DA\_SCH\_BUS\_P1\_G\_W}: \quad \text{Total area green&water science & businesspark Schieveen phase 1 realized (m²)} \]
\[ \text{A\_DA\_SCH\_BUS\_P1\_PAV}: \quad \text{Total area pavement science & businesspark Schieveen phase 1 realized (m²)} \]

Exogenous variables:
\[ \text{p\_da\_sch\_bus\_p1\_boa}: \quad \text{Total percentage Built On Area science & businesspark Schieveen phase 1 (35%)} \]
\[ \text{p\_da\_sch\_bus\_p1\_g\_w}: \quad \text{Total percentage green/water science & businesspark Schieveen phase 1 (35%)} \]
\[ \text{p\_da\_sch\_bus\_p1\_pav}: \quad \text{Total percentage pavement science & businesspark Schieveen phase 1 (20%)} \]

Constraints:
\[ \text{A\_DA\_SCH\_BUS\_P1} = \text{A\_DA\_SCH\_BUS\_P1\_BOA} + \text{A\_DA\_SCH\_BUS\_P1\_G\_W} + \text{A\_DA\_SCH\_BUS\_P1\_HA} \]
\[ \text{A\_DA\_SCH\_BUS\_P1\_BOA} \leq \text{p\_da\_sch\_bus\_p1\_boa} \times \text{A\_DA\_SCH\_BUS\_P1} \]
\[ \text{A\_DA\_SCH\_BUS\_P1\_G\_W} \geq \text{p\_da\_sch\_bus\_p1\_g\_w} \times \text{A\_DA\_SCH\_BUS\_P1} \]
\[ \text{A\_DA\_SCH\_BUS\_P1\_PAV} = \text{p\_da\_sch\_bus\_p1\_pav} \times \text{A\_DA\_SCH\_BUS\_P1} \]
Appendix B Variables and constraints Rotterdam Airport Business Park

In this appendix, the endogenous and exogenous variables for Rotterdam Airport Business Park are identified. This is done with use of the most recent zoning plan for the area: Voorontwerp bestemmingsplan Rotterdam Airport. ³

B 1 Descriptive overview of the area

Rotterdam Airport Vastgoed B.V. develops a high-value businesspark on the grounds of Rotterdam The Hague Airport. The development is entitled ‘Rotterdam Airport Business Park’.

Rotterdam The Hague Airport contains an area with a surface of 2,230,000m² and is divided into two sub-areas: (i) ‘Luchtzijde’ (1,720,000m²) and (ii) ‘Landzijde’. At Luchtzijde, the developments of ‘Luchthaven1’ and ‘Luchthaven2’ are scheduled. The zoning plan prescribes for the area of Luchthaven1 in adding a maximum of 500m² Built-on Area. This surface is reserved for the accommodation of several buildings that are required for air traffic and therefore this surface can be measured as 500m² GFA. A maximum of 23,000m² GFA may be realized within the area of Luchthaven2.

The Landzijde area enhances the development of ‘Gemengde Bebouwing’. This development foresees in a maximum of 206,500m² GFA. Because the existing Bell-Air office building covers 6,500m² of the total GFA, this results in the construction of a maximum of 200,000m² GFA that consists of:

- a maximum of 60% (equal to 120,000m² GFA) industrial functions;
- a maximum of 40% (equal to 80,000m² GFA) offices;
- a maximum of 2,000m² GFA airport supporting facilities;
- a maximum of 5,000m² GFA communal facilities, including the expulsion centre (uitzetcentrum); and
- a maximum of 25,000 m² GFA as a hotel with not more than 400 rooms.

I must mention that the airport supporting facilities and communal facilities are part of the (maximum) 120,000m² GFA industrial function.

B 2 Translation into variables and constraints

Description:

Rotterdam The Hague Airport contains an area with a surface of 2,230,000m² and is divided into two sub-areas: (i) ‘Luchtzijde’ (1,720,000m²) and (ii) ‘Landzijde’.

Endogenous variables:

A_DA_RTM_TOT: Total development area Rotterdam The Hague Airport (m²)
A_DA_RTM_LUCHT: Total development area Rotterdam The Hague Airport Lucht zijde (m²)
A_DA_RTM_LAND: Total development area Rotterdam The Hague Airport Land zijde (m²)

Exogenous variables:

a_da_rtm_tot: Total development area Rotterdam The Hague Airport (2,230,000m²)
a_da_rtm_lucht: Total Lucht zijde development area Rotterdam The Hague Airport (1,720,000m²)

Constraints:

A_DA_RTM_TOT = A_DA_RTM_LUCHT + A_DA_RTM_LAND
A_DA_RTM_TOT = a_da_rtm_tot
A_DA_RTM_LUCHT = a_da_rtm_lucht

Description:

At Lucht zijde, the developments of ‘Luchthaven1’ and ‘Luchthaven2’ are scheduled.

Endogenous variables:

A_DA_RTM_LUCHT: Total development area Rotterdam The Hague Airport Lucht zijde (m²)
A_DA_RTM_LUCHT1: Total development area Rotterdam The Hague Airport Luchthaven1 realized (m²)
A_DA_RTM_LUCHT2: Total development area Rotterdam The Hague Airport Luchthaven2 realized (m²)

Constraints:

A_DA_RTM_LUCHT = A_DA_RTM_LUCHT1 + A_DA_RTM_LUCHT2

Description:

The zoning plan prescribes for the area of Luchthaven1 in adding a maximum of 500m² Built-on Area. This surface is reserved for the accommodation of several buildings that are required for air traffic and therefore this surface can be measured as 500m² GFA. A maximum of 23,000m² GFA may be realized within the area of Luchthaven2.

Endogenous variables:

A_DA_RTM_LUCHT1: Total development area Rotterdam Airport Business Park Luchthaven1 realized (m²)
A_DA_RTM_LUCHT1_BOA: Total Built-On Area RABP Luchthaven1 realized (m²)
A_GFA_RTM_LUCHT1: Total Gross Floor Area RABP Luchthaven1 realized (m²)
A_DA_RTM_LUCHT2: Total development area RABP Luchthaven2 realized (m²)
A_GFA_RTM_LUCHT2: Total Gross Floor Area RABP Luchthaven2 realized (m²)

Exogenous variables:
a_da_rtm_lucht1_boa: Total Built-On Area RABP Luchthaven1 (500m²)
a_gfa_rtm_lucht1: Total Gross Floor Area RABP Luchthaven1 (500m²)
a_gfa_rtm_lucht2: Total Gross Floor Area RABP Luchthaven2 (23,000m²)

Constraints:
A_DA_RTM_LUCHT1_BOA ≤ a_da_rtm_lucht1_boa
A_GFA_RTM_LUCHT1 ≤ a_gfa_rtm_lucht1
A_GFA_RTM_LUCHT2 ≤ a_gfa_rtm_lucht2

Description:
The Landzijde area enhances the development of ‘Gemengde Bebouwing’. This development foresees in a maximum of 206,500m² GFA. Because the existing Bell-Air office building covers 6,500m² of the total GFA, this results in the construction of a maximum of 200,000m² GFA.

Endogenous variables:
A_DA_RTM_LAND: Total development area RABP Landzijde (m²)
A_GFA_RTM_GB: Total Gross Floor Area RABP ‘Gemengde Bebouwing’ realized (m²)
A_GFA_RTM_GB_BELLAIR: Total Gross Floor Area existing Bell-Air building (m²)
A_GFA_RTM_GB_NEW: Total Gross Floor Area ‘Gemengde Bebouwing’ new realized (m²)

Exogenous variables:
a_gfa_rtm_gb: Total Gross Floor Area RABP ‘Gemengde Bebouwing’ (206,500m²)
a_gfa_rtm_gb_bellair: Total Gross Floor Area existing Bell-Air building (6,500m²)

Constraints:
A_GFA_RTM_GB = A_GFA_RTM_GB_BELLAIR + A_GFA_RTM_GB_NEW
\[ A_{\text{GFA}_\text{RTM}_\text{GB}} \leq a_{\text{gfa}_\text{rtm}_\text{gb}} \]
\[ A_{\text{GFA}_\text{RTM}_\text{GB}_{\text{BELLAIR}}} = a_{\text{gfa}_\text{rtm}_\text{gb}_{\text{bellair}}} \]

**Description:**
The new GFA at the Gemengde Bebouwing development consist of: (i) a maximum of 60% industrial functions, (ii) a maximum of 40% offices, (iii) a maximum of 2,000m² airport supporting facilities, (iv) a maximum of 5,000m² communal facilities and (v) a maximum of 25,000m² GFA as a hotel with not more than 400 rooms. The airport supporting facilities and communal facilities are positioned within the maximum of 60% industrial functions.

**Endogenous variables:**
- \( A_{\text{GFA}_\text{RTM}_\text{GB}_{\text{NEW}}} \): Total Gross Floor Area ‘Gemengde Bebouwing’ new realized (m²)
- \( A_{\text{GFA}_\text{RTM}_\text{GB}_{\text{NEW}_\text{OFF}}} \): Total Gross Floor Area offices at ‘Gemengde Bebouwing’ realized (m²)
- \( A_{\text{GFA}_\text{RTM}_\text{GB}_{\text{NEW}_\text{HOT}}} \): Total Gross Floor Area hotel at ‘Gemengde Bebouwing’ realized (m²)
- \( A_{\text{GFA}_\text{RTM}_\text{GB}_{\text{NEW}_\text{OTH}}} \): Total Gross Floor Area other functions at ‘Gemengde Bebouwing’ realized (m²)
- \( A_{\text{GFA}_\text{RTM}_\text{GB}_{\text{NEW}_\text{OTH}_\text{IND}}} \): Total Gross Floor Area industrial functions at ‘GB’ realized (m²)
- \( A_{\text{GFA}_\text{RTM}_\text{GB}_{\text{NEW}_\text{OTH}_\text{AIR}}} \): Total Gross Floor Area airport supporting facilities ‘GB’ realized (m²)
- \( A_{\text{GFA}_\text{RTM}_\text{GB}_{\text{NEW}_\text{OTH}_\text{COM}}} \): Total Gross Floor Area communal facilities ‘GB’ realized (m²)

**Exogenous variables:**
- \( p_{\text{gfa}_\text{rtm}_\text{gb}_{\text{NEW}_\text{OFF}}} \): Total percentage Gross Floor Area offices ‘GB’ (40%)
- \( p_{\text{gfa}_\text{rtm}_\text{gb}_{\text{NEW}_\text{OTH}}} \): Total percentage Gross Floor Area other functions ‘GB’ (60%)
- \( a_{\text{gfa}_\text{rtm}_\text{gb}_{\text{NEW}_\text{HOT}}} \): Total Gross Floor Area hotel ‘GB’ (25,000m²)
- \( p_{\text{gfa}_\text{rtm}_\text{gb}_{\text{NEW}_\text{OTH}_\text{IND}}} \): Total percentage Gross Floor Area industrial functions ‘GB’ (60%)
a_gfa_rtn_gb_new_oth_air: Total Gross Floor Area airport supporting functions ‘GB’ (2,000m²)

a_gfa_rtn_gb_new_oth_com: Total Gross Floor Area communal functions ‘GB’ (5,000m²)

Constraints:

\[
A_{\text{GFA\_RTM\_GB\_NEW}} = A_{\text{GFA\_RTM\_GB\_NEW\_OFF}} + A_{\text{GFA\_RTM\_GB\_NEW\_HOT}} + A_{\text{GFA\_RTM\_GB\_NEW\_OTH}} \\
A_{\text{GFA\_RTM\_GB\_NEW\_OFF}} \leq p_{\text{gfa\_rtn\_gb\_new\_off}} \times A_{\text{GFA\_RTM\_GB\_NEW}} \\
A_{\text{GFA\_RTM\_GB\_NEW\_HOT}} \leq a_{\text{gfa\_rtm\_gb\_new\_hot}} \\
A_{\text{GFA\_RTM\_GB\_NEW\_OTH}} \leq p_{\text{gfa\_rtn\_gb\_new\_oth}} \times A_{\text{GFA\_RTM\_GB\_NEW}} \\
A_{\text{GFA\_RTM\_GB\_NEW\_OTH}} = A_{\text{GFA\_RTM\_GB\_NEW\_OTH\_IND}} + A_{\text{GFA\_RTM\_GB\_NEW\_OTH\_AIR}} + A_{\text{GFA\_RTM\_GB\_NEW\_OTH\_COM}} \\
A_{\text{GFA\_RTM\_GB\_NEW\_OTH\_IND}} \leq p_{\text{gfa\_rtn\_gb\_new\_oth\_ind}} \times A_{\text{GFA\_RTM\_GB\_NEW}} \\
A_{\text{GFA\_RTM\_GB\_NEW\_OTH\_AIR}} \leq a_{\text{gfa\_rtn\_gb\_new\_oth\_air}} \\
A_{\text{GFA\_RTM\_GB\_NEW\_OTH\_COM}} \leq a_{\text{gfa\_rtn\_gb\_new\_oth\_com}}
\]
Appendix C Variables and constraints Park Zestienhoven

In this appendix, the endogenous and exogenous variables for Park Zestienhoven are identified. This is done with use of the most recent zoning plan for the area: *Bestemmingsplan Polder Zestienhoven*.4

C 1 Descriptive overview of the area

The municipality of Rotterdam develops a mixed-use area within polder Zestienhoven that is entitled ‘Park Zestienhoven’. This development covers an area of 2,000,000m² and consists of the sub-areas Laag-Zestienhoven (1,024,100m²), Midden-Zestienhoven (363,000m²), and Hoog-Zestienhoven.

Regarding the sub-development of Laag-Zestienhoven, the following numbers are provided:

- a maximum of 85 ‘Parkwoningen’ residences;
- a maximum of 557 ‘Woningen1’ residences;
- 300-330 allotments;
- a maximum of 6 sports fields;
- several sports- and recreational facilities;
- a maximum of 750m² GFA catering industry; and
- a maximum of 1,250m² GFA communal facilities.

Midden-Zestienhoven reserves a total of 75,000m² for industrial functions and the programme consists of the following elements: (i) a maximum of 540 Woningen2 residences, (ii) a maximum of 597 ‘Gemengde Doeleinden’ residences, 2,500-5,000m² GFA retail- and communal facilities, and (iv) a total of 43,000m² GFA industrial functions.

As written in section 1.2 of the thesis, initiatives for the development of the sub-area of Hoog-Zestienhoven will not be presented before 2015, when the current zoning plan loses its validation. Considering my research, I make a distinction between the areas of ‘Hoog-Zestienhoven South’ and ‘Hoog-Zestienhoven North’.

C 2 Translation into variables and boundary conditions

Description:

*The development of Park Zestienhoven covers an area of 2,000,000m² and consists of the sub-areas Laag-Zestienhoven (1,024,100m²), Midden-Zestienhoven (363,000m²), and Hoog-Zestienhoven.*

---

Endogenous variables:
A_DA_16H_TOT: Total development area Park Zestienhoven (m²)
A_DA_16H_P1_LZ: Total development area ‘Laag-Zestienhoven’ (m²)
A_DA_16H_MZ: Total development area ‘Midden-Zestienhoven’ (m²)
A_DA_16H_HZ: Total development area ‘Hoog-Zestienhoven’ (m²)

Exogenous variables:
a_da_16h_tot: Total development area polder Zestienhoven (2,000,000m²)
a_da_16h_lz: Total development area Laag-Zestienhoven (1,024,100m²)
a_da_16h_mz: Total development area Midden-Zestienhoven (363,000m²)

Constraints:
A_DA_16H_TOT = A_DA_16H_LZ + A_DA_16H_MZ + A_DA_16H_HZ
A_DA_16H_LZ = a_da_16h_tot
A_DA_16H_MZ = a_da_16h_lz
A_DA_16H_HZ = a_da_16h_mz

Description:
The following numbers are provided regarding the development of ‘Laag-Zestienhoven’: (i) a maximum of 85 Parkwoningen residences, (ii) a maximum of 557 Woningen2 residences, (iii) 300-330 allotments, (iv) a maximum of 6 sports fields, (v) several sports-and recreational facilities, (vi) a maximum of 750m² GFA catering industry, and (vii) a maximum of 1,250m² GFA communal facilities.

Endogenous variables:
N_RES_16H_LZ_PW: Total number of Parkwoningen residences Laag-Zestienhoven (#)
N_RES_16H_LZ_WI: Total number of Woningen2 residences Laag-Zestienhoven (#)
N_ALL_16H_LZ: Total number of allotments Laag-Zestienhoven (#)
N_FAC_16H_LZ_SF: Total number of sports fields facilities Laag-Zestienhoven (#)
A_GFA_16H_LZ_FAC_REC: Total Gross Floor Area sports- and recreational facilities Laag-Zestienhoven (m²)
A_GFA_16H_LZ_FAC_CAT: Total Gross Floor Area catering industry facilities Laag-Zestienhoven (m²)
A_GFA_16H_LZ_FAC_COM: Total Gross Floor Area communal facilities Laag-Zestienhoven (m²)

Exogenous variables:

n_res_16h_lz_PW_max: Maximum number of Parkwoningen residences Laag-Zestienhoven (85)

n_res_16h_lz_WI_max: Maximum number of WoningenI residences Laag-Zestienhoven (557)

n_all_16h_lz_min: Minimum number of WoningenI residences Laag-Zestienhoven (300)

n_all_16h_lz_max: Maximum number of WoningenI residences Laag-Zestienhoven (330)

n_fac_16h_lz_sf_max: Maximum number of sports fields Laag-Zestienhoven (6)

a_gfa_16h_lz_fac_cat: Total Gross Floor Area catering industry facilities Laag-Zestienhoven (750m²)

a_gfa_16h_lz_fac_com: Total Gross Floor Area communal facilities Laag-Zestienhoven (1,250m²)

Constraints:

\[ N_{RES\_16H\_LZ\_PW} \leq n_{res\_16h\_lz\_pw\_max} \]
\[ N_{RES\_16H\_LZ\_WI} \leq n_{res\_16h\_lz\_wi\_max} \]
\[ N_{ALL\_16H\_LZ} \geq n_{all\_16h\_lz\_min} \]
\[ N_{ALL\_16H\_LZ} \leq n_{all\_16h\_lz\_max} \]
\[ N_{FAC\_16H\_LZ\_SF} \leq n_{fac\_16h\_lz\_sf\_max} \]

\[ A\_GFA\_16H\_LZ\_FAC\_CAT \leq a\_gfa\_16h\_lz\_fac\_cat \]
\[ A\_GFA\_16H\_LZ\_FAC\_COM \leq a\_gfa\_16h\_lz\_fac\_com \]

Description:

*Midden-Zestienhoven reserves a total of 75,000m² for industrial functions.*

Endogenous variables:

A_DA_16H_MZ_IND: Total development area industrial functions Midden-Zestienhoven (m²)

a_da_16h_mz_ind: Total development area industrial functions Midden-Zestienhoven (75,000m²)
Constraints:
\[ A_{DA\_16H\_MZ\_IND} = a_{da\_16h\_mz\_ind} \]

Description:
The programme of ‘Midden-Zestienhoven’ consists of the following elements: (i) a maximum of 540 Woningen2 residences, (ii) a maximum of 597 ‘Gemengde Doeleinden’ residences, 2,500-5,000m² GFA retail- and communal facilities, and (iv) a total of 43,000m² GFA industrial functions.

Endogenous variables:
- \( N_{RES\_16H\_MZ\_WII} \): Total number of Woningen2 residences Midden-Zestienhoven (#)
- \( N_{RES\_16H\_MZ\_GD} \): Total number of ‘Gemengde Doeleinden’ residences Midden-Zestienhoven (#)
- \( A_{GFA\_16H\_MZ\_FAC\_TOT} \): Total Gross Floor Area facilities Midden-Zestienhoven (m²)
- \( A_{GFA\_16H\_MZ\_FAC\_RET} \): Total Gross Floor Area retail facilities Midden-Zestienhoven (m²)
- \( A_{GFA\_16H\_MZ\_FAC\_COM} \): Total Gross Floor Area communal facilities Midden-Zestienhoven (m²)
- \( A_{GFA\_16H\_MZ\_IND} \): Total Gross Floor Area industrial functions in Midden-Zestienhoven (m²)
- \( n_{res\_16h\_mz\_wii\_max} \): Maximum number of WoningenII residences Midden-Zestienhoven (540)
- \( n_{res\_16h\_mz\_gd\_max} \): Maximum number of Gemengde Doeleinden residences Midden-Zestienhoven (597)
- \( a_{gfa\_16h\_mz\_fac\_tot\_min} \): Minimum Gross Floor Area facilities Midden-Zestienhoven (2,500m²)
- \( a_{gfa\_16h\_mz\_fac\_tot\_max} \): Maximum Gross Floor Area facilities Midden-Zestienhoven (5,000m²)
- \( a_{gfa\_16h\_mz\_fac\_ret\_min} \): Minimum Gross Floor Area retail facilities Midden-Zestienhoven (2,500m²)
- \( a_{gfa\_16h\_mz\_fac\_ret\_max} \): Maximum Gross Floor Area retail facilities Midden-Zestienhoven (5,000m²)
- \( a_{gfa\_16h\_mz\_fac\_com\_min} \): Minimum Gross Floor Area communal facilities Midden-Zestienhoven (2,500m²)
- \( a_{gfa\_16h\_mz\_fac\_com\_max} \): Maximum Gross Floor Area communal facilities Midden-Zestienhoven (5,000m²)
a_gfa_16h_mz_ind: Total Gross Floor Area industrial functions Midden-Zestienhoven (43,000m²)

Constraints:
N_RES_16H_MZ_WII ≤ n_res_16h_mz_wii_max
N_RES_16H_MZ_GD ≤ n_res_16h_mz_gd_max

A_GFA_16H_MZ_FAC_TOT = A_GFA_16H_MZ_FAC_RET + A_GFA_16H_MZ_FAC_RET

A_GFA_16H_MZ_FAC_TOT ≥ a_gfa_16h_mz_fac_tot_min
A_GFA_16H_MZ_FAC_TOT ≤ a_gfa_16h_mz_fac_tot_max
A_GFA_16H_MZ_FAC_RET ≥ a_gfa_16h_mz_fac_ret_min
A_GFA_16H_MZ_FAC_RET ≤ a_gfa_16h_mz_fac_ret_max
A_GFA_16H_MZ_FAC_RET ≥ a_gfa_16h_mz_fac_com_min
A_GFA_16H_MZ_FAC_RET ≤ a_gfa_16h_mz_fac_com_max

A_GFA_16H_MZ_IND = a_gfa_16h_mz_ind

Description:
The area of Hoog-Zestienhoven is differentiated into ‘Hoog-Zestienhoven South’ and ‘Hoog-Zestienhoven North’.

Endogenous variables:
A_DA_16H_HZ: Total development area ‘Hoog-Zestienhoven’ (m²)
A_DA_16H_HZ_S Total development area ‘Hoog-Zestienhoven South’ (m²)
A_DA_16H_HZ_N Total development area ‘Hoog-Zestienhoven North’ (m²)

Constraints:
A_DA_16H_HZ = A_DA_16H_HZ_S + A_DA_16H_HZ_N
Appendix D Variables and constraints Rotterdam Noordrand

D 1 Rotterdam Noordrand phase 1

D 1.1 Rotterdam Airport Business Park phase 1

D 1.1.1 Endogenous variables

A_DA_RTM_P1 Total development area Rotterdam The Hague Airport phase 1 (m²)

A_DA_RTM_P1_LUCHT Total development area Rotterdam The Hague Airport phase 1 luchtzijde (m²)

A_DA_RTM_P1_LUCHT_BOA Total development area Rotterdam The Hague Airport phase 1 luchtzijde Built-on Area (m²)

A_DA_RTM_P1_LUCHT_BOA_IND Total development area Rotterdam The Hague Airport phase 1 luchtzijde Built-on Area industrial (m²)

A_DA_RTM_P1_LAND Total development area Rotterdam The Hague Airport phase 1 landzijde (m²)

A_DA_RTM_P1_LAND_BOA Total development area Rotterdam The Hague Airport phase 1 landzijde Built-on Area (m²)

A_DA_RTM_P1_LAND_BOA_IND Total development area Rotterdam The Hague Airport phase 1 landzijde Built-on Area industrial (m²)

A_DA_RTM_P1_LAND_BOA_OFF Total development area Rotterdam The Hague Airport phase 1 landzijde Built-on Area offices (m²)

A_DA_RTM_P1_LAND_BOA_FAC Total development area Rotterdam The Hague Airport phase 1 landzijde Built-on Area facilities (m²)

A_DA_RTM_P1_LAND_BOA_FAC_COMM Total development area Rotterdam The Hague Airport phase 1 landzijde Built-on Area communal facilities (m²)

A_DA_RTM_P1_LAND_BOA_FAC_RECR Total development area Rotterdam The Hague Airport phase 1 landzijde Built-on Area recreational facilities (m²)

A_DA_RTM_P1_LAND_BOA_FAC_CAT Total development area Rotterdam The Hague Airport phase 1 landzijde Built-on Area catering industry facilities (m²)

A_DA_RTM_P1_LAND_BOA_FAC_HOT Total development area Rotterdam The Hague Airport phase 1 landzijde Built-on Area hotel facilities (m²)

A_DA_RTM_P1_LAND_BOA_FAC_RET Total development area Rotterdam The Hague Airport phase 1 landzijde Built-on Area retail facilities (m²)

A_DA_RTM_P1_LAND_BOA_FAC_AIR Total development area Rotterdam The Hague Airport phase 1 landzijde Built-on Area airport supporting facilities (m²)

A_DA_RTM_P1_LAND_G_W Total development area Rotterdam The Hague Airport phase 1 landzijde green & water (m²)

A_DA_RTM_P1_LAND_PAV Total development area Rotterdam The Hague Airport phase 1 landzijde pavement (m²)

A_GFA_RTM_P1_TOT Total gross floor area Rotterdam The Hague Airport phase 1 (m²)

A_GFA_RTM_P1_LUCHT Total gross floor area Rotterdam The Hague Airport phase 1 Luchtzijde (m²)
<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Area (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A_GFA_RTM_P1_LUCHT_IND</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 1</td>
<td>Luchtzijde industrial (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P1_LAND</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 1</td>
<td>Landzijde (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P1_LAND_BELLAIR</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 1</td>
<td>Landzijde existing Bellair-building (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P1_LAND_NEW</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 1</td>
<td>Landzijde new-to-build (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P1_LAND_NEW_OFF</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 1</td>
<td>Landzijde new-to-build offices (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P1_LAND_NEW_HOT</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 1</td>
<td>Landzijde new-to-build hotel (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P1_LAND_NEW_OTH</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 1</td>
<td>Landzijde new-to-build other functions (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P1_LAND_NEW_OTH_IND</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 1</td>
<td>Landzijde new-to-built industrial (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P1_LAND_NEW_OTH_FAC</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 1</td>
<td>Landzijde new-to-built facilities (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P1_LAND_NEW_OTH_FAC_COMM</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 1</td>
<td>Landzijde new-to-built communal facilities (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P1_LAND_NEW_OTH_FAC_RECR</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 1</td>
<td>Landzijde new-to-built recreational facilities (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P1_LAND_NEW_OTH_FAC_CAT</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 1</td>
<td>Landzijde new-to-built catering industry facilities (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P1_LAND_NEW_OTH_FAC_RET</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 1</td>
<td>Landzijde new-to-built retail facilities (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P1_LAND_NEW_OTH_FAC_AIR</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 1</td>
<td>Landzijde new-to-built airport supporting facilities (m²)</td>
</tr>
</tbody>
</table>

**D 1.1.2 Exogenous variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Area (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a_da_rtm_p1_lucht</td>
<td>Total development area Rotterdam The Hague Airport phase 1</td>
<td>Luchtzijde (1,720,000m²)</td>
</tr>
<tr>
<td>a_da_rtm_p1_land</td>
<td>Total development area Rotterdam The Hague Airport phase 1</td>
<td>Landzijde (510,000m²)</td>
</tr>
<tr>
<td>a_gfa_rtm_p1_lucht_ind</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 1</td>
<td>Luchtzijde industrial (23,500m²)</td>
</tr>
<tr>
<td>a_gfa_rtm_p1_land</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 1</td>
<td>Landzijde (206,500m²)</td>
</tr>
<tr>
<td>a_gfa_rtm_p1_land_bellair</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 1</td>
<td>Landzijde existing Bellair-building (6,500m²)</td>
</tr>
<tr>
<td>a_gfa_rtm_p1_land_new_off</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 1</td>
<td>Landzijde new-to-build offices (73,000m²)</td>
</tr>
<tr>
<td>a_gfa_rtm_p1_land_new_hot</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 1</td>
<td>Landzijde new-to-build hotel facilities (35,000m²)</td>
</tr>
<tr>
<td>a_gfa_rtm_p1_land_new_oth_ind</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 1</td>
<td>Landzijde new-to-build industrial (100,000m²)</td>
</tr>
<tr>
<td>a_gfa_rtm_p1_land_new_oth_comm</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 1</td>
<td>Landzijde new-to-built communal facilities (5,000m²)</td>
</tr>
</tbody>
</table>
D 1.1.3 Constraints

\[ A_{DA_RTM,P1} = A_{DA_RTM,P1,LUCHT} + A_{DA_RTM,P1,LAND} \]
\[ A_{DA_RTM,P1,LUCHT} = a_{da_rtmg,p1,lucht} \]
\[ A_{DA_RTM,P1,LAND} = a_{da_rtmg,p1,land} \]
\[ A_{DA_RTM,P1,LUCHT,BOA} = A_{DA_RTM,P1,LUCHT,BOA_IND} + A_{DA_RTM,P1,LUCHT,BOA_OFF} + A_{DA_RTM,P1,LUCHT,BOA_FAC} \]
\[ A_{DA_RTM,P1,LUCHT,BOA_IND} = A_{GFA_RTM,P1,LUCHT} \cdot \frac{1}{n_{floors,rtm,p1,ind}} \]
\[ A_{DA_RTM,P1,LUCHT,BOA_OFF} = A_{GFA_RTM,P1,LUCHT} \cdot \frac{1}{n_{floors,rtm,p1,oth}} \]
\[ A_{DA_RTM,P1,LUCHT,BOA_FAC} = A_{GFA_RTM,P1,LUCHT} \cdot \frac{1}{n_{floors,rtm,p1,oth}} \]
\[ A_{DA_RTM,P1,LAND,BOA} = A_{DA_RTM,P1,LAND,BOA_IND} + A_{DA_RTM,P1,LAND,BOA_OFF} + A_{DA_RTM,P1,LAND,BOA_FAC} \]
\[ A_{DA_RTM,P1,LAND,BOA_IND} = A_{GFA_RTM,P1,LAND_New,OTH,IND} \cdot \frac{1}{n_{floors,rtm,p1,ind}} \]
\[ A_{DA_RTM,P1,LAND,BOA_OFF} = A_{GFA_RTM,P1,LAND_New,OTH,OFF} \cdot \frac{1}{n_{floors,rtm,p1,oth}} \]
\[ A_{DA_RTM,P1,LAND,BOA_FAC} = A_{GFA_RTM,P1,LAND_New,OTH,FAC} \cdot \frac{1}{n_{floors,rtm,p1,oth}} \]
\[ A_{DA_RTM,P1,LAND,BOA_FAC_COMM} = A_{GFA_RTM,P1,LAND_New,OTH,FAC,COMM} \cdot \frac{1}{n_{floors,rtm,p1,oth}} \]
\[ A_{DA_RTM,P1,LAND,BOA_FAC_RECR} = A_{GFA_RTM,P1,LAND_New,OTH,FAC_RECR} \cdot \frac{1}{n_{floors,rtm,p1,oth}} \]
\[ A_{DA_RTM,P1,LAND,BOA_FAC_CAT} = A_{GFA_RTM,P1,LAND_New,OTH,FAC,CAT} \cdot \frac{1}{n_{floors,rtm,p1,oth}} \]
\[ A_{DA_RTM,P1,LAND,BOA_FAC_RET} = A_{GFA_RTM,P1,LAND_New,OTH,FAC,RET} \cdot \frac{1}{n_{floors,rtm,p1,oth}} \]
\[ A_{DA_RTM,P1,LAND,BOA_FAC_AIR} = A_{GFA_RTM,P1,LAND_New,OTH,FAC,AIR} \cdot \frac{1}{n_{floors,rtm,p1,oth}} \]
\[ A_{DA_RTM,P1,LAND,BELLAIR} = a_{gfa_rtm_p1_land_bellair} \]
\[ A_{GFA_RTM,P1,LAND} = A_{GFA_RTM,P1,LAND,BELLAIR} + A_{GFA_RTM,P1,LAND,NEW} \]
A\_GFA\_RTM\_P1\_LAND\_NEW = A\_GFA\_RTM\_P1\_LAND\_NEW\_OFF + A\_GFA\_RTM\_P1\_LAND\_NEW\_HOT + A\_GFA\_RTM\_P1\_LAND\_NEW\_OTH

A\_GFA\_RTM\_P1\_LAND\_NEW\_OFF ≤ a\_gfa\_rtm\_p1\_land\_new\_off

A\_GFA\_RTM\_P1\_LAND\_NEW\_HOT ≤ a\_gfa\_rtm\_p1\_land\_new\_hot

A\_GFA\_RTM\_P1\_LAND\_NEW\_OTH = A\_GFA\_RTM\_P1\_LAND\_NEW\_OTH\_IND + A\_GFA\_RTM\_P1\_LAND\_NEW\_OTH\_FAC

A\_GFA\_RTM\_P1\_LAND\_NEW\_OTH\_IND ≤ a\_gfa\_rtm\_p1\_land\_new\_oth\_ind

A\_GFA\_RTM\_P1\_LAND\_NEW\_OTH\_FAC = A\_GFA\_RTM\_P1\_LAND\_NEW\_OTH\_FAC\_COMM + A\_GFA\_RTM\_P1\_LAND\_NEW\_OTH\_FAC\_RECR + A\_GFA\_RTM\_P1\_LAND\_NEW\_OTH\_FAC\_CAT + A\_GFA\_RTM\_P1\_LAND\_NEW\_OTH\_FAC\_RET + A\_GFA\_RTM\_P1\_LAND\_NEW\_OTH\_FAC\_AIR

A\_GFA\_RTM\_P1\_LAND\_NEW\_OTH\_FAC\_COMM ≤ a\_gfa\_rtm\_p1\_land\_new\_oth\_comm

A\_GFA\_RTM\_P1\_LAND\_NEW\_OTH\_FAC\_RECR ≤ a\_gfa\_rtm\_p1\_land\_new\_oth\_recr

A\_GFA\_RTM\_P1\_LAND\_NEW\_OTH\_FAC\_CAT ≤ a\_gfa\_rtm\_p1\_land\_new\_oth\_cat

A\_GFA\_RTM\_P1\_LAND\_NEW\_OTH\_FAC\_RET ≤ a\_gfa\_rtm\_p1\_land\_new\_oth\_ret

A\_GFA\_RTM\_P1\_LAND\_NEW\_OTH\_FAC\_AIR ≤ a\_gfa\_rtm\_p1\_land\_new\_oth\_air

D 1.2 Park Zestienhoven phase 1

D 1.2.1 Endogenous variables

A\_DA\_16H\_TOT = \text{Total development area Park Zestienhoven (m}^2\text{)}

A\_DA\_16H\_P1\_LZ\_TOT = \text{Total development area Park Zestienhoven phase 1 Laag-Zestienhoven (m}^2\text{)}

A\_DA\_16H\_P1\_LZ\_BOA\_TOT = \text{Total development area Park Zestienhoven phase 1 Laag-Zestienhoven Built-on Area (m}^2\text{)}

A\_DA\_16H\_P1\_LZ\_BOA\_PW\_TOT = \text{Total development area Park Zestienhoven phase 1 Laag-Zestienhoven Built-on Area Parkwoningen residences (m}^2\text{)}

A\_DA\_16H\_P1\_LZ\_BOA\_W1\_TOT = \text{Total development area Park Zestienhoven phase 1 Laag-Zestienhoven Built-on Area Woningen1 residences (m}^2\text{)}

A\_DA\_16H\_P1\_LZ\_BOA\_ALL\_TOT = \text{Total development area Park Zestienhoven phase 1 Laag-Zestienhoven Built-on Area allotments (m}^2\text{)}

A\_DA\_16H\_P1\_LZ\_BOA\_FAC\_TOT = \text{Total development area Park Zestienhoven phase 1 Laag-Zestienhoven Built-on Area facilities (m}^2\text{)}

A\_DA\_16H\_P1\_LZ\_BOA\_FAC\_COMM\_TOT = \text{Total development area Park Zestienhoven phase 1 Laag-Zestienhoven Built-on Area communal facilities (m}^2\text{)}

A\_DA\_16H\_P1\_LZ\_BOA\_FAC\_RECR\_TOT = \text{Total development area Park Zestienhoven phase 1 Laag-Zestienhoven Built-on Area recreational facilities (m}^2\text{)}

A\_DA\_16H\_P1\_LZ\_BOA\_FAC\_CAT\_TOT = \text{Total development area Park Zestienhoven phase 1 Laag-Zestienhoven Built-on Area catering industry facilities (m}^2\text{)}

A\_DA\_16H\_P1\_LZ\_G\_W\_TOT = \text{Total development area Park Zestienhoven phase 1 Laag-Zestienhoven green \& water (m}^2\text{)}

A\_DA\_16H\_P1\_LZ\_PAV\_TOT = \text{Total development area Park Zestienhoven phase 1 Laag-Zestienhoven pavement (m}^2\text{)}

A\_GFA\_16H\_P1\_LZ\_TOT = \text{Total gross floor area Park Zestienhoven phase 1 Laag-Zestienhoven (m}^2\text{)}
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A_GFA_16H_P1_MZ_GD_RES</td>
<td>Total gross floor area Park Zestienhoven phase 1 Midden-Zestienhoven 'gemengde doeleinden' residential (m²)</td>
</tr>
<tr>
<td>A_GFA_16H_P1_MZ_GD_FAC</td>
<td>Total gross floor area Park Zestienhoven phase 1 Midden-Zestienhoven 'gemengde doeleinden' facilities (m²)</td>
</tr>
<tr>
<td>A_GFA_16H_P1_MZ_GD_FAC_COMM</td>
<td>Total gross floor area Park Zestienhoven phase 1 Midden-Zestienhoven 'gemengde doeleinden' communal facilities (m²)</td>
</tr>
<tr>
<td>A_GFA_16H_P1_MZ_GD_FAC_RET</td>
<td>Total gross floor area Park Zestienhoven phase 1 Midden-Zestienhoven 'gemengde doeleinden' retail facilities (m²)</td>
</tr>
<tr>
<td>A_GFA_16H_P1_MZ_IND</td>
<td>Total gross floor area Park Zestienhoven phase 1 Midden-Zestienhoven industrial (m²)</td>
</tr>
<tr>
<td>N_RES_16H_P1_MZ_W2</td>
<td>Total number of Woningen2 residences Park Zestienhoven phase 1 Midden-Zestienhoven (#)</td>
</tr>
<tr>
<td>N_RES_16H_P1_MZ_GD_RES</td>
<td>Total number of residences Park Zestienhoven phase 1 Midden-Zestienhoven 'gemengde doeleinden' (#)</td>
</tr>
</tbody>
</table>

D 1.2.2 Exogenous variables

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>a_da_16h</td>
<td>Total development area Park Zestienhoven (2,000,000m²)</td>
</tr>
<tr>
<td>a_da_16h_p1_lz</td>
<td>Total development area Park Zestienhoven phase 1 Laag-Zestienhoven (1,024,100m²)</td>
</tr>
<tr>
<td>a_gfa_16h_p1_lz_fac_comm</td>
<td>Total gross floor area Park Zestienhoven phase 1 Laag-Zestienhoven communal facilities (1,250m²)</td>
</tr>
<tr>
<td>a_gfa_16h_p1_lz_fac_recr_re</td>
<td>Total gross floor area Park Zestienhoven phase 1 Laag-Zestienhoven recreational facilities real estate (1,200m²)</td>
</tr>
<tr>
<td>a_gfa_16h_p1_lz_fac_recr_sf</td>
<td>Total gross floor area Park Zestienhoven phase 1 Laag-Zestienhoven recreational facilities sports field (5,000m²)</td>
</tr>
<tr>
<td>a_gfa_16h_p1_lz_fac_cat</td>
<td>Total gross floor area Park Zestienhoven phase 1 Laag-Zestienhoven catering industry facilities (750m²)</td>
</tr>
<tr>
<td>a_gfa_16h_p1_res_pw</td>
<td>Total gross floor area Park Zestienhoven phase 1 Laag-Zestienhoven Parkwoning residence (100m²)</td>
</tr>
<tr>
<td>a_gfa_16h_p1_res_w1</td>
<td>Total gross floor area Park Zestienhoven phase 1 Laag-Zestienhoven Woningen1 residence (150m²)</td>
</tr>
<tr>
<td>a_gfa_16h_p1_all</td>
<td>Total gross floor area Park Zestienhoven phase 1 Laag-Zestienhoven allotment (260m²)</td>
</tr>
<tr>
<td>p_pav_16h</td>
<td>Percentage pavement Park Zestienhoven phase 1 (20%)</td>
</tr>
<tr>
<td>n_floors_16h_p1_pw</td>
<td>Total number of floors Park Zestienhoven Parkwoningen residences (4)</td>
</tr>
<tr>
<td>n_floors_16h_p1_w1</td>
<td>Total number of floors Park Zestienhoven Woningen1 residences (2)</td>
</tr>
<tr>
<td>n_floors_16h_p1_lz_oth</td>
<td>Total number of floors Park Zestienhoven phase 1 Laag-Zestienhoven other functions (1)</td>
</tr>
<tr>
<td>n_res_16h_p1_lz_sw</td>
<td>Total number of Parkwoningen residences (540)</td>
</tr>
<tr>
<td>n_res_16h_p1_lz_w1</td>
<td>Total number of Woningen1 residences (597)</td>
</tr>
<tr>
<td>n_all_16h_p1_lz_max</td>
<td>Maximum number of allotments (330)</td>
</tr>
<tr>
<td>n_all_16h_p1_lz_min</td>
<td>Minimum number of allotments (300)</td>
</tr>
<tr>
<td>n_sf_16h_p1_lz</td>
<td>Total number of sports fields (6)</td>
</tr>
</tbody>
</table>

Page 23
D 1.2.3 Constraints

\[
A_{DA_{16H}} = a_{da_{16h}}
\]

\[
A_{DA_{16H\_P1\_LZ}} = a_{da_{16h\_p1\_lz}}
\]

\[
A_{DA_{16H\_P1\_LZ}} = A_{DA_{16H\_P1\_LZ\_BOA}} + A_{DA_{16H\_P1\_LZ\_G\_W}} + A_{DA_{16H\_P1\_LZ\_PAV}}
\]

\[
A_{DA_{16H\_P1\_LZ\_BOA}} = A_{DA_{16H\_P1\_LZ\_BOA\_PW}} + A_{DA_{16H\_P1\_LZ\_BOA\_W1}} + A_{DA_{16H\_P1\_LZ\_BOA\_ALL}} + A_{DA_{16H\_P1\_LZ\_BOA\_FAC}}
\]

\[
A_{DA_{16H\_P1\_LZ\_BOA\_PW}} = A_{GFA_{16H\_P1\_LZ\_PW}} \cdot \left( \frac{1}{n_{floors_{16h\_p1\_pw}}} \right)
\]

\[
A_{DA_{16H\_P1\_LZ\_BOA\_W1}} = A_{GFA_{16H\_P1\_LZ\_W1}} \cdot \left( \frac{1}{n_{floors_{16h\_p1\_w1}}} \right)
\]

\[
A_{DA_{16H\_P1\_LZ\_BOA\_ALL}} = A_{GFA_{16H\_P1\_LZ\_ALL}} \cdot \left( \frac{1}{n_{floors_{16h\_p1\_lz\_oth}}} \right)
\]

\[
A_{DA_{16H\_P1\_LZ\_BOA\_FAC}} = A_{GFA_{16H\_P1\_LZ\_FAC}} \cdot \left( \frac{1}{n_{floors_{16h\_p1\_lz\_oth}}} \right)
\]

\[
A_{DA_{16H\_P1\_LZ\_PAV}} = A_{DA_{16H\_P1\_LZ}} \cdot p_{pav_{16h}}
\]

\[
A_{GFA_{16H\_P1\_LZ\_TOT}} = A_{GFA_{16H\_P1\_LZ\_PW}} + A_{GFA_{16H\_P1\_LZ\_W1}} + A_{GFA_{16H\_P1\_LZ\_ALL}} + A_{GFA_{16H\_P1\_LZ\_FAC}}
\]

\[
A_{GFA_{16H\_P1\_LZ\_PW}} = N_{RES_{16H\_P1\_PW}} \cdot a_{gfa_{16h\_p1\_res\_pw}}
\]
A_{GFA\_16H\_P1\_LZ\_W1} = N_{RES\_16H\_P1\_W1} \cdot a_{gfa\_16h\_p1\_res\_w1}
A_{GFA\_16H\_P1\_LZ\_ALL} = N_{ALL\_16H\_P1} \cdot a_{gfa\_16h\_p1\_all}
A_{GFA\_16H\_P1\_LZ\_FAC} = A_{GFA\_16H\_P1\_LZ\_FAC\_COMM} + A_{GFA\_16H\_P1\_LZ\_FAC\_RECR\_TOT} + A_{GFA\_16H\_P1\_LZ\_FAC\_CAT}
A_{GFA\_16H\_P1\_LZ\_FAC\_COMM} \leq a_{gfa\_16h\_p1\_lz\_fac\_comm}
A_{GFA\_16H\_P1\_LZ\_FAC\_RECR\_TOT} = A_{GFA\_16H\_P1\_LZ\_FAC\_RECR\_RE} + A_{GFA\_16H\_P1\_LZ\_FAC\_RECR\_SF}
A_{GFA\_16H\_P1\_LZ\_FAC\_RECR\_RE} \leq a_{gfa\_16h\_p1\_lz\_fac\_recr\_re}
A_{GFA\_16H\_P1\_LZ\_FAC\_RECR\_SF} \leq N_{SF\_16H\_P1} \cdot a_{gfa\_16h\_p1\_lz\_fac\_recr\_sf}
A_{GFA\_16H\_P1\_LZ\_FAC\_CAT} \leq a_{gfa\_16h\_p1\_lz\_fac\_cat}

N_{RES\_16H\_P1\_PW} \leq n_{res\_16h\_p1\_lz\_pw}
N_{RES\_16H\_P1\_W1} \leq n_{res\_16h\_p1\_lz\_w1}
n_{all\_16h\_p1\_lz\_min} \leq N_{ALL\_16H\_P1} \leq n_{all\_16h\_p1\_lz\_max}
N_{SF\_16H\_P1} \leq n_{sf\_16h\_p1\_lz}

A_{GFA\_16H\_P1\_MZ\_TOT} = A_{GFA\_16H\_P1\_MZ\_W2} + A_{GFA\_16H\_P1\_MZ\_GD} + A_{GFA\_16H\_P1\_MZ\_IND}
A_{GFA\_16H\_P1\_MZ\_W2} = N_{RES\_16H\_P1\_MZ\_W2} \cdot a_{gfa\_16h\_p1\_mz\_res\_w2}
A_{GFA\_16H\_P1\_MZ\_GD} = A_{GFA\_16H\_P1\_MZ\_GD\_RES} + A_{GFA\_16H\_P1\_MZ\_GD\_FAC}
A_{GFA\_16H\_P1\_MZ\_GD\_RES} = N_{RES\_16H\_P1\_MZ\_GD\_RES} \cdot a_{gfa\_16h\_p1\_mz\_res\_gd}
A_{GFA\_16H\_P1\_MZ\_GD\_FAC} \leq a_{gfa\_16h\_p1\_mz\_fac}
A_{GFA\_16H\_P1\_MZ\_GD\_FAC\_COMM} = A_{GFA\_16H\_P1\_MZ\_GD\_FAC\_COMM\_MIN} + A_{GFA\_16H\_P1\_MZ\_GD\_FAC\_COMM\_MAX}
a_{gfa\_16h\_p1\_mz\_fac\_comm\_min} \leq A_{GFA\_16H\_P1\_MZ\_GD\_FAC\_COMM} \leq a_{gfa\_16h\_p1\_mz\_fac\_comm\_max}
a_{gfa\_16h\_p1\_mz\_fac\_ret\_min} \leq A_{GFA\_16H\_P1\_MZ\_GD\_FAC\_RET} \leq a_{gfa\_16h\_p1\_mz\_fac\_ret\_max}
A_{GFA\_16H\_P1\_MZ\_IND} \leq a_{gfa\_16h\_p1\_mz\_ind}

N_{RES\_16H\_P1\_MZ\_W2} \leq n_{res\_16h\_p1\_mz\_w2}
N_{RES\_16H\_P1\_MZ\_GD\_RES} \leq n_{res\_16h\_p1\_mz\_gd}
D 2 Rotterdam Noordrand phase 2

D 2.1 Nature- and business spark Schieveen phase 2

D 2.1.1 Endogenous variables

A_DA_SCH_P2 Total development area Nature- and Business park Schieveen phase 2 (m²)
A_DA_SCH_P2_NAT Total development area Nature- and Business park Schieveen phase 2 nature area (m²)
A_DA_SCH_P2_BUS Total development area Nature- and Business park Schieveen phase 2 science & business park (m²)
A_DA_SCH_P2_BUS_BOA Total development area Nature- and Business park Schieveen phase 2 science & business park Built-on Area (m²)
A_DA_SCH_P2_BUS_BOA_IND Total development area Nature- and Business park Schieveen phase 2 science & business park Built-on Area industrial (m²)
A_DA_SCH_P2_BUS_BOA_OFF Total development area Nature- and Business park Schieveen phase 2 science & business park Built-on Area offices (m²)
A_DA_SCH_P2_BUS_BOA_FAC_COMM Total development area Nature- and Business park Schieveen phase 2 science & business park Built-on Area communal facilities (m²)
A_DA_SCH_P2_BUS_BOA_FAC_RECR Total development area Nature- and Business park Schieveen phase 2 science & business park Built-on Area recreational facilities (m²)
A_DA_SCH_P2_BUS_BOA_FAC_CAT Total development area Nature- and Business park Schieveen phase 2 science & business park Built-on Area catering industry facilities (m²)
A_DA_SCH_P2_BUS_BOA_FAC_HOT Total development area Nature- and Business park Schieveen phase 2 science & business park Built-on Area hotel facilities (m²)
A_DA_SCH_P2_BUS_BOA_FAC_RET Total development area Nature- and Business park Schieveen phase 2 science & business park Built-on Area retail facilities (m²)
A_DA_SCH_P2_BUS_G_W Total development area Nature- and Business park Schieveen phase 2 science & business park green & water (m²)
A_DA_SCH_P2_BUS_PAV Total development area Nature- and Business park Schieveen phase 2 science & business park pavement (m²)
A_DA_SCH_P2_A13_A16 Total development area Nature- and Business park Schieveen phase 2 reservation A13/A16 highway connection (m²)
A_GFA_SCH_P2_BUS Total gross floor area Nature- and Business park Schieveen phase 2 science & business park (m²)
A_GFA_SCH_P2_BUS_IND Total gross floor area Nature- and Business park Schieveen phase 2 science & business park industrial (m²)
A_GFA_SCH_P2_BUS_N_IND Total gross floor area Nature- and Business park Schieveen phase 2 science & business park non-industrial (m²)
A_GFA_SCH_P2_BUS_N_IND_OFF Total gross floor area Nature- and Business park Schieveen phase 2 science & business park non-industrial offices (m²)
A_GFA_SCH_P2_BUS_N_IND_FAC Total gross floor area Nature- and Business park Schieveen phase 2 science & business park non-industrial facilities (m²)
A_GFA_SCH_P2_BUS_N_IND_FAC_COMM
Total gross floor area Nature- and Business park Schieveen phase 2 science & business park non-industrial communal facilities (m²)

A_GFA_SCH_P2_BUS_N_IND_FAC_RECR
Total gross floor area Nature- and Business park Schieveen phase 2 science & business park non-industrial recreational facilities (m²)

A_GFA_SCH_P2_BUS_N_IND_FAC_CAT
Total gross floor area Nature- and Business park Schieveen phase 2 science & business park non-industrial catering industry facilities (m²)

A_GFA_SCH_P2_BUS_N_IND_FAC_HOT
Total gross floor area Nature- and Business park Schieveen phase 2 science & business park non-industrial hotel facilities (m²)

A_GFA_SCH_P2_BUS_N_IND_FAC_RET
Total gross floor area Nature- and Business park Schieveen phase 2 science & business park non-industrial retail facilities (m²)

N_RES_SCH_P2
Total number of residences Nature- and Business park Schieveen phase 2 (#)

D 2.1.2 Exogenous variables

a_da_sch_nat_tot
Total development area Nature- and Businesspark Schieveen nature reserves (2,000,000m²)

a_da_sch_p2_nat
Total development area Nature- and Businesspark Schieveen phase 2 nature reserves (730,000m²)

a_da_sch_p2_a13_a16
Total development area Nature- and Businesspark Schieveen phase 2 A13/A16 connection (120,000m²)

a_da_sch_bus
Total development area Nature- and Businesspark Schieveen businesspark (600,000m²)

a_da_sch_p2_bus
Total development area Nature- and Businesspark Schieveen phase 2 businesspark (256,000m²)

a_gfa_sch_bus
Total gross floor area science & businesspark Schieveen (900,000m²)

a_gfa_sch_p2_bus
Total gross floor area science & businesspark Schieveen phase 2 (100,000m²)

a_gfa_sch_p2_bus_ind
Total gross floor area science & businesspark Schieveen phase 2 industrial (50,000m²)

a_gfa_sch_p2_bus_off
Total gross floor area science & businesspark Schieveen phase 2 offices (50,000m²)

a_gfa_sch_p2_bus_fac_comm
Total gross floor area science & businesspark Schieveen phase 2 communal facilities (15,000m²)

a_gfa_sch_p2_bus_fac_recr
Total gross floor area science & businesspark Schieveen phase 2 recreational facilities (5,000m²)

a_gfa_sch_p2_bus_fac_cat
Total gross floor area science & businesspark Schieveen phase 2 catering industry facilities (2,500m²)

a_gfa_sch_p2_bus_fac_hot
Total gross floor area science & businesspark Schieveen phase 2 hotel facilities (35,000m²)

a_gfa_sch_p2_bus_fac_ret
Total gross floor area science & businesspark Schieveen phase 2 retail facilities (1,000m²)
p_g_w_sch_bus  Percentage green & water science & businesspark Schieveen (35%)

p_pav_sch_bus  Percentage pavement science & businesspark Schieveen (20%)

p_n_ind_sch_bus Percentage non-industrial functions science & businesspark Schieveen (50%)

n_floors_sch_ind  Total numbers of floors science & businesspark Schieveen industrial (1)

n_floors_sch_n_ind  Total numbers of floors science & businesspark Schieveen non-industrial (3)

n_res_sch_p2  Total number of residences Nature- and businesspark Schieveen phase 2 (28)

D 2.1.3 Constraints

A_DA_SCH_P2 = A_DA_SCH_P2_NAT + A_DA_SCH_P2_BUS + A_DA_SCH_P2_A13_A16

A_DA_SCH_P2_NAT ≤ a_da_sch_p2_nat


A_DA_SCH_P2_BUS_BOA_IND = A_GFA_SCH_P2_BUS_IND * (1/ n_floors_sch_ind)

A_DA_SCH_P2_BUS_BOA_OFF = A_GFA_SCH_P2_BUS_N_IND_OFF * (1/ n_floors_sch_n_ind)

A_DA_SCH_P2_BUS_BOA_FAC_COMM = A_GFA_SCH_P2_BUS_N_IND_FAC_COMM * (1/ n_floors_sch_n_ind)

A_DA_SCH_P2_BUS_BOA_FAC_RECR = A_GFA_SCH_P2_BUS_N_IND_FAC_RECR * (1/ n_floors_sch_n_ind)

A_DA_SCH_P2_BUS_BOA_FAC_CAT = A_GFA_SCH_P2_BUS_N_IND_FAC_CAT * (1/ n_floors_sch_n_ind)

A_DA_SCH_P2_BUS_BOA_FAC_HOT = A_GFA_SCH_P2_BUS_N_IND_FAC_HOT * (1/ n_floors_sch_n_ind)

A_DA_SCH_P2_BUS_BOA_FAC_RET = A_GFA_SCH_P2_BUS_N_IND_FAC_RET * (1/ n_floors_sch_n_ind)

A_DA_SCH_P2_BUS_G_W = A_DA_SCH_P2_BUS * p_g_w_sch_bus

A_DA_SCH_P2_BUS_PAV = A_DA_SCH_P2_BUS * p_g_w_sch_pav

A_GFA_SCH_P2_BUS ≤ a_gfa_sch_p2_bus

A_GFA_SCH_P2_BUS_IND ≤ a_gfa_sch_p2_bus_ind

A_GFA_SCH_P2_BUS_N_IND ≤ A_GFA_SCH_P2_BUS_BUS * p_n_ind_sch_bus

A_GFA_SCH_P2_BUS_N_IND = A_GFA_SCH_P2_BUS_N_IND_OFF + A_GFA_SCH_P2_BUS_N_IND_FAC

A_GFA_SCH_P2_BUS_N_IND_OFF ≤ a_gfa_sch_p2_bus_off


N_RES_SCH_P2 = n_res_sch_p2
D.2.2 Rotterdam Airport Business Park phase 2

D 2.2.1 Endogenous variables

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A_DA_RTM_P2_LUCHT</td>
<td>Total development area Rotterdam The Hague Airport phase 2 lucht zijde (m²)</td>
</tr>
<tr>
<td>A_DA_RTM_P2_LUCHT_BOA</td>
<td>Total development area Rotterdam The Hague Airport phase 2 lucht zijde Built-on Area (m²)</td>
</tr>
<tr>
<td>A_DA_RTM_P2_LUCHT_BOA_IND</td>
<td>Total development area Rotterdam The Hague Airport phase 2 lucht zijde Built-on Area industrial (m²)</td>
</tr>
<tr>
<td>A_DA_RTM_P2_LAND</td>
<td>Total development area Rotterdam The Hague Airport phase 2 land zijde (m²)</td>
</tr>
<tr>
<td>A_DA_RTM_P2_LAND_BOA</td>
<td>Total development area Rotterdam The Hague Airport phase 2 land zijde Built-on Area (m²)</td>
</tr>
<tr>
<td>A_DA_RTM_P2_LAND_BOA_IND</td>
<td>Total development area Rotterdam The Hague Airport phase 2 land zijde Built-on Area industrial (m²)</td>
</tr>
<tr>
<td>A_DA_RTM_P2_LAND_BOA_OFF</td>
<td>Total development area Rotterdam The Hague Airport phase 2 land zijde Built-on Area offices (m²)</td>
</tr>
<tr>
<td>A_DA_RTM_P2_LAND_BOA_FAC</td>
<td>Total development area Rotterdam The Hague Airport phase 2 land zijde Built-on Area facilities (m²)</td>
</tr>
<tr>
<td>A_DA_RTM_P2_LAND_BOA_FAC_COMM</td>
<td>Total development area Rotterdam The Hague Airport phase 2 land zijde Built-on Area communal facilities (m²)</td>
</tr>
<tr>
<td>A_DA_RTM_P2_LAND_BOA_FAC_RECR</td>
<td>Total development area Rotterdam The Hague Airport phase 2 land zijde Built-on Area recreational facilities (m²)</td>
</tr>
<tr>
<td>A_DA_RTM_P2_LAND_BOA_FAC_CAT</td>
<td>Total development area Rotterdam The Hague Airport phase 2 land zijde Built-on Area catering industry facilities (m²)</td>
</tr>
<tr>
<td>A_DA_RTM_P2_LAND_BOA_FAC_HOT</td>
<td>Total development area Rotterdam The Hague Airport phase 2 land zijde Built-on Area hotel facilities (m²)</td>
</tr>
<tr>
<td>A_DA_RTM_P2_LAND_BOA_FAC_RET</td>
<td>Total development area Rotterdam The Hague Airport phase 2 land zijde Built-on Area retail facilities (m²)</td>
</tr>
<tr>
<td>A_DA_RTM_P2_LAND_BOA_FAC_AIR</td>
<td>Total development area Rotterdam The Hague Airport phase 2 land zijde Built-on Area airport supporting facilities (m²)</td>
</tr>
<tr>
<td>A_DA_RTM_P2_LAND_G_W</td>
<td>Total development area Rotterdam The Hague Airport phase 2 land zijde green &amp; water (m²)</td>
</tr>
<tr>
<td>A_DA_RTM_P2_LAND_PAV</td>
<td>Total development area Rotterdam The Hague Airport phase 2 land zijde pavement (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P2_TOT</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2 (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P2_LUCHT</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2 Lucht zijde (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P2_LUCHT_IND</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2 Lucht zijde industrial (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P2_LAND</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2 Land zijde (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P2_LAND_BELLAIR</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2 Land zijde existing Bellair-building (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P2_LAND_NEW</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2 Land zijde new-to-build (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P2_LAND_NEW_OFF</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2 Land zijde new-to-build offices (m²)</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>A_GFA_RTM_P2_LAND_NEW_HOT</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2</td>
</tr>
<tr>
<td></td>
<td>Landzijde new-to-build hotel (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P2_LAND_NEW_OTH</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2</td>
</tr>
<tr>
<td></td>
<td>Landzijde new-to-build other functions (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P2_LAND_NEW_OTH_IND</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2</td>
</tr>
<tr>
<td></td>
<td>Landzijde new-to-built industrial (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P2_LAND_NEW_OTH_FAC</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2</td>
</tr>
<tr>
<td></td>
<td>Landzijde new-to-built facilities (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P2_LAND_NEW_OTH_FAC_COMM</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2</td>
</tr>
<tr>
<td></td>
<td>Landzijde new-to-built communal facilities (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P2_LAND_NEW_OTH_FAC_RECR</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2</td>
</tr>
<tr>
<td></td>
<td>Landzijde new-to-built recreational facilities (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P2_LAND_NEW_OTH_FAC_CAT</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2</td>
</tr>
<tr>
<td></td>
<td>Landzijde new-to-built catering industry facilities (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P2_LAND_NEW_OTH_FAC_RET</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2</td>
</tr>
<tr>
<td></td>
<td>Landzijde new-to-built retail facilities (m²)</td>
</tr>
<tr>
<td>A_GFA_RTM_P2_LAND_NEW_OTH_FAC_AIR</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2</td>
</tr>
<tr>
<td></td>
<td>Landzijde new-to-built airport supporting facilities (m²)</td>
</tr>
</tbody>
</table>

### Exogenous variables

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>a_da_rtm_p2_lucht</td>
<td>Total development area Rotterdam The Hague Airport phase 2</td>
</tr>
<tr>
<td></td>
<td>Luchtzijde (2,720,000m²)</td>
</tr>
<tr>
<td>a_da_rtm_p2_land</td>
<td>Total development area Rotterdam The Hague Airport phase 2</td>
</tr>
<tr>
<td></td>
<td>Landzijde (520,000m²)</td>
</tr>
<tr>
<td>a_gfa_rtm_p2_lucht_ind</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2</td>
</tr>
<tr>
<td></td>
<td>Luchtzijde industrial (0m²)</td>
</tr>
<tr>
<td>a_gfa_rtm_p2_land</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2</td>
</tr>
<tr>
<td></td>
<td>Landzijde (206,500m²)</td>
</tr>
<tr>
<td>a_gfa_rtm_p2_land_bellair</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2</td>
</tr>
<tr>
<td></td>
<td>Landzijde existing Bellair-building (6,500m²)</td>
</tr>
<tr>
<td>a_gfa_rtm_p2_land_new_off</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2</td>
</tr>
<tr>
<td></td>
<td>Landzijde new-to-build offices (73,000m²)</td>
</tr>
<tr>
<td>a_gfa_rtm_p2_land_new_hot</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2</td>
</tr>
<tr>
<td></td>
<td>Landzijde new-to-build hotel facilities (35,000m²)</td>
</tr>
<tr>
<td>a_gfa_rtm_p2_land_new_oth_ind</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2</td>
</tr>
<tr>
<td></td>
<td>Landzijde new-to-build industrial (200,000m²)</td>
</tr>
<tr>
<td>a_gfa_rtm_p2_land_new_oth_comm</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2</td>
</tr>
<tr>
<td></td>
<td>Landzijde new-to-build communal facilities (5,000m²)</td>
</tr>
<tr>
<td>a_gfa_rtm_p2_land_new_oth_recr</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2</td>
</tr>
<tr>
<td></td>
<td>Landzijde new-to-build recreational facilities (0m²)</td>
</tr>
<tr>
<td>a_gfa_rtm_p2_land_new_oth_cat</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2</td>
</tr>
<tr>
<td></td>
<td>Landzijde new-to-build catering industry facilities (0m²)</td>
</tr>
<tr>
<td>a_gfa_rtm_p2_land_new_oth_ret</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2</td>
</tr>
<tr>
<td></td>
<td>Landzijde new-to-build retail facilities (2,000m²)</td>
</tr>
<tr>
<td>a_gfa_rtm_p2_land_new_oth_air</td>
<td>Total gross floor area Rotterdam The Hague Airport phase 2</td>
</tr>
<tr>
<td></td>
<td>Landzijde new-to-build airport supporting facilities (2,000m²)</td>
</tr>
</tbody>
</table>
D 2.2.3 Constraints

\[ A_{DA \_RTM \_P2} = A_{DA \_RTM \_P2 \_LUCHT} + A_{DA \_RTM \_P2 \_LAND} \]
\[ A_{DA \_RTM \_P2 \_LUCHT} = a_{da \_rtm \_p2 \_lucht} \]
\[ A_{DA \_RTM \_P2 \_LAND} = a_{da \_rtm \_p2 \_land} \]
\[ A_{DA \_RTM \_P2 \_LUCHT \_BOA} = A_{DA \_RTM \_P2 \_LUCHT \_BOA \_IND} \]
\[ A_{DA \_RTM \_P2 \_LUCHT \_BOA \_IND} = A_{GFA \_RTM \_P2 \_LUCHT} \times (1/n_{floors \_rtm \_p2 \_ind}) \]
\[ A_{DA \_RTM \_P2 \_LAND} = A_{DA \_RTM \_P2 \_LAND \_BOA} + A_{DA \_RTM \_P2 \_LAND \_G \_W} + A_{DA \_RTM \_P2 \_LAND \_PAV} \]
\[ A_{DA \_RTM \_P2 \_LAND \_BOA} = A_{DA \_RTM \_P2 \_LAND \_BOA \_IND} + A_{DA \_RTM \_P2 \_LAND \_BOA \_OFF} + A_{DA \_RTM \_P2 \_LAND \_BOA \_FAC} \]
\[ A_{DA \_RTM \_P2 \_LAND \_BOA \_IND} = A_{GFA \_RTM \_P2 \_LAND \_NEW \_OTH \_IND} \times (1/n_{floors \_rtm \_p2 \_ind}) \]
\[ A_{DA \_RTM \_P2 \_LAND \_BOA \_OFF} = A_{GFA \_RTM \_P2 \_LAND \_NEW \_OFF} \times (1/n_{floors \_rtm \_p2 \_oth}) \]
\[ A_{DA \_RTM \_P2 \_LAND \_BOA \_FAC} = A_{GFA \_RTM \_P2 \_LAND \_NEW \_OTH \_FAC \_COMM} + A_{GFA \_RTM \_P2 \_LAND \_NEW \_OTH \_FAC \_RECR} + A_{GFA \_RTM \_P2 \_LAND \_NEW \_OTH \_FAC \_CAT} + A_{GFA \_RTM \_P2 \_LAND \_NEW \_OTH \_FAC \_RET} + A_{GFA \_RTM \_P2 \_LAND \_NEW \_OTH \_FAC \_AIR} \]
\[ A_{DA \_RTM \_P2 \_LAND \_BOA \_FAC \_COMM} = A_{GFA \_RTM \_P2 \_LAND \_NEW \_OTH \_FAC \_COMM} \times (1/n_{floors \_rtm \_p2 \_oth}) \]
\[ A_{DA \_RTM \_P2 \_LAND \_BOA \_FAC \_RECR} = A_{GFA \_RTM \_P2 \_LAND \_NEW \_OTH \_FAC \_RECR} \times (1/n_{floors \_rtm \_p2 \_oth}) \]
\[ A_{DA \_RTM \_P2 \_LAND \_BOA \_FAC \_CAT} = A_{GFA \_RTM \_P2 \_LAND \_NEW \_OTH \_FAC \_CAT} \times (1/n_{floors \_rtm \_p2 \_oth}) \]
\[ A_{DA \_RTM \_P2 \_LAND \_BOA \_FAC \_RET} = A_{GFA \_RTM \_P2 \_LAND \_NEW \_OTH \_FAC \_RET} \times (1/n_{floors \_rtm \_p2 \_oth}) \]
\[ A_{DA \_RTM \_P2 \_LAND \_BOA \_FAC \_AIR} = A_{GFA \_RTM \_P2 \_LAND \_NEW \_OTH \_FAC \_AIR} \times (1/n_{floors \_rtm \_p2 \_oth}) \]
\[ A_{DA \_RTM \_P2 \_LAND \_PAV} = A_{DA \_RTM \_P2 \_LAND} \times p_{pav \_rtm \_p2} \]

\[ A_{GFA \_RTM \_P2 \_LAND} = A_{GFA \_RTM \_P2 \_LAND \_BELLAIR} + A_{GFA \_RTM \_P2 \_LAND \_NEW} \]
\[ A_{GFA \_RTM \_P2 \_LAND} \leq a_{gfa \_rtm \_p2 \_land} \]
\[ A_{GFA \_RTM \_P2 \_LAND \_BELLAIR} = a_{gfa \_rtm \_p2 \_land \_bellair} \]

\[ A_{GFA \_RTM \_P2 \_LAND \_NEW} = A_{GFA \_RTM \_P2 \_LAND \_NEW \_OFF} + A_{GFA \_RTM \_P2 \_LAND \_NEW \_HOT} + A_{GFA \_RTM \_P2 \_LAND \_NEW \_OTH} \]
\[ A_{GFA \_RTM \_P2 \_LAND \_NEW \_OFF} \leq a_{gfa \_rtm \_p2 \_land \_new \_off} \]
\[ A_{GFA \_RTM \_P2 \_LAND \_NEW \_HOT} \leq a_{gfa \_rtm \_p2 \_land \_new \_hot} \]
\[ A_{GFA \_RTM \_P2 \_LAND \_NEW \_OTH} = A_{GFA \_RTM \_P2 \_LAND \_NEW \_OTH \_IND} + A_{GFA \_RTM \_P2 \_LAND \_NEW \_OTH \_FAC} \]
D 2.3 Park Zestienhoven phase 2

D 2.3.1 Endogenous variables

A_GFA_RTM_P2_LAND_NEW_OTH_IND \leq a_{gfa\_rtm\_p2\_land\_new\_oth\_ind}
A_GFA_RTM_P2_LAND_NEW_OTH_FAC = A_GFA_RTM_P2_LAND_NEW_OTH_FAC_COMM + A_GFA_RTM_P2_LAND_NEW_OTH_FAC_RECR + A_GFA_RTM_P2_LAND_NEW_OTH_FAC_CAT + A_GFA_RTM_P2_LAND_NEW_OTH_FAC_RET + A_GFA_RTM_P2_LAND_NEW_OTH_FAC_AIR

A_GFA_RTM_P2_LAND_NEW_OTH_FAC_COMM \leq a_{gfa\_rtm\_p2\_land\_new\_oth\_comm}
A_GFA_RTM_P2_LAND_NEW_OTH_FAC_RECR \leq a_{gfa\_rtm\_p2\_land\_new\_oth\_recr}
A_GFA_RTM_P2_LAND_NEW_OTH_FAC_CAT \leq a_{gfa\_rtm\_p2\_land\_new\_oth\_cat}
A_GFA_RTM_P2_LAND_NEW_OTH_FAC_RET \leq a_{gfa\_rtm\_p2\_land\_new\_oth\_ret}
A_GFA_RTM_P2_LAND_NEW_OTH_FAC_AIR \leq a_{gfa\_rtm\_p2\_land\_new\_oth\_air}

A_DA_16H_P2_HZ Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven (m²)
A_DA_16H_P2_HZ_S Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven South (m²)
A_DA_16H_P2_HZ_S_BOA Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven South Built-on Area (m²)
A_DA_16H_P2_HZ_S_BOA_HYB Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven South Built-on Area hybrid function (m²)
A_DA_16H_P2_HZ_S_BOA_IND Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven South Built-on Area industrial (m²)
A_DA_16H_P2_HZ_S_BOA_OFF Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven South Built-on Area offices (m²)
A_DA_16H_P2_HZ_S_BOA_FAC_TOT Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven South Built-on Area facilities (m²)
A_DA_16H_P2_HZ_S_BOA_FAC_RECR Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven South Built-on Area recreational facilities (m²)
A_DA_16H_P2_HZ_S_BOA_FAC_HOT Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven South Built-on Area hotel facilities (m²)
A_DA_16H_P2_HZ_S_BOA_FAC_TRANS Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven South Built-on Area transferee facilities (m²)
A_DA_16H_P2_HZ_S_G_W Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven South green & water (m²)
A_DA_16H_P2_HZ_S_PAV Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven South pavement (m²)
A_GFA_16H_P2_HZ_S_TOT Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven South (m²)
A_GFA_16H_P2_HZ_S_IND Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven South industrial (m²)
A_GFA_16H_P2_HZ_S_OFF Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven South offices (m²)
A_GFA_16H_P2_HZ_S_HYB Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven South hybrid function (m²)
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A_GFA_16H_P2_HZ_S_HYB_RES</td>
<td>Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven South hybrid function – residences (m²)</td>
</tr>
<tr>
<td>A_GFA_16H_P2_HZ_S_HYB_FAC_TOT</td>
<td>Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven South hybrid function – facilities (m²)</td>
</tr>
<tr>
<td>A_GFA_16H_P2_HZ_S_HYB_FAC_COMM</td>
<td>Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven South hybrid function – communal facilities (m²)</td>
</tr>
<tr>
<td>A_GFA_16H_P2_HZ_S_HYB_FAC_CAT</td>
<td>Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven South hybrid function – catering industry facilities (m²)</td>
</tr>
<tr>
<td>A_GFA_16H_P2_HZ_S_HYB_FAC_RET</td>
<td>Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven South hybrid function – retail facilities (m²)</td>
</tr>
<tr>
<td>A_GFA_16H_P2_HZ_S_FAC_RECR</td>
<td>Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven South recreational facilities (m²)</td>
</tr>
<tr>
<td>A_GFA_16H_P2_HZ_S_FAC_HOT</td>
<td>Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven South hotel facilities (m²)</td>
</tr>
<tr>
<td>A_GFA_16H_P2_HZ_S_FAC_TRANS</td>
<td>Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven South transferee facilities (m²)</td>
</tr>
<tr>
<td>N_RES_16H_P2_HZ_S</td>
<td>Total number of residences Park Zestienhoven phase 2 Hoog-Zestienhoven South (#)</td>
</tr>
<tr>
<td>A_DA_16H_P2_HZ_N</td>
<td>Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven North (m²)</td>
</tr>
<tr>
<td>A_DA_16H_P2_HZ_N_BOA</td>
<td>Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven North Built-on Area (m²)</td>
</tr>
<tr>
<td>A_DA_16H_P2_HZ_N_BOA_IND</td>
<td>Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven North Built-on Area industrial (m²)</td>
</tr>
<tr>
<td>A_DA_16H_P2_HZ_N_BOA_OFF</td>
<td>Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven North Built-on Area offices (m²)</td>
</tr>
<tr>
<td>A_DA_16H_P2_HZ_N_BOA_FAC_TOT</td>
<td>Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven North Built-on Area facilities (m²)</td>
</tr>
<tr>
<td>A_DA_16H_P2_HZ_N_BOA_FAC_COMM</td>
<td>Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven North Built-on Area communal facilities (m²)</td>
</tr>
<tr>
<td>A_DA_16H_P2_HZ_N_BOA_FAC_RECR</td>
<td>Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven North Built-on Area recreational facilities (m²)</td>
</tr>
<tr>
<td>A_DA_16H_P2_HZ_N_BOA_FAC_CAT</td>
<td>Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven North Built-on Area catering industry facilities (m²)</td>
</tr>
<tr>
<td>A_DA_16H_P2_HZ_N_BOA_FAC_HOT</td>
<td>Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven North Built-on Area hotel facilities (m²)</td>
</tr>
<tr>
<td>A_DA_16H_P2_HZ_N_BOA_FAC_RET</td>
<td>Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven North Built-on Area retail facilities (m²)</td>
</tr>
<tr>
<td>A_DA_16H_P2_HZ_N_BOA_FAC_TRANS</td>
<td>Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven North Built-on Area transferee facilities (m²)</td>
</tr>
<tr>
<td>A_DA_16H_P2_HZ_N_G_W</td>
<td>Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven North green &amp; water (m²)</td>
</tr>
<tr>
<td>A_DA_16H_P2_HZ_N_PAV</td>
<td>Total development area Park Zestienhoven phase 2 Hoog-Zestienhoven North pavement (m²)</td>
</tr>
<tr>
<td>A_GFA_16H_P2_HZ_N_TOT</td>
<td>Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven North (m²)</td>
</tr>
</tbody>
</table>
D 2.3.2 Exogenous variables

A_GFA_16H_P2_HZ_N_IND Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven North industrial (m²)
A_GFA_16H_P2_HZ_N_OFF Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven North offices (m²)
A_GFA_16H_P2_HZ_N_FAC_TOT Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven North facilities (m²)
A_GFA_16H_P2_HZ_N_FAC_COMM Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven North communal facilities (m²)
A_GFA_16H_P2_HZ_N_FAC_RECR Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven North recreational facilities (m²)
A_GFA_16H_P2_HZ_N_FAC_CAT Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven North catering industry facilities (m²)
A_GFA_16H_P2_HZ_N_FAC_HOT Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven North hotel facilities (m²)
A_GFA_16H_P2_HZ_N_FAC_RET Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven North retail facilities (m²)
A_GFA_16H_P2_HZ_N_FAC_TRANS Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven North transferee facilities (m²)

D 2.3.2 Exogenous variables

a_da_16h_hz Total development area Park Zestienhoven Hoog-Zestienhoven (612,900m²)
a_gfa_16h_p2_hz_s_ind Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven South industrial (0m²)
a_gfa_16h_p2_hz_s_off Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven South offices (50,000m²)
a_gfa_16h_p2_hz_s_fac_comm Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven South communal facilities (0m²)
a_gfa_16h_p2_hz_s_fac_recr Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven South recreational facilities (40,000m²)
a_gfa_16h_p2_hz_s_fac_cat Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven South catering industry facilities (0m²)
a_gfa_16h_p2_hz_s_fac_hot Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven South hotel facilities (0m²)
a_gfa_16h_p2_hz_s_fac_ret Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven South retail facilities (0m²)
a_gfa_16h_p2_hz_s_fac_trans Total gross floor area Park Zestienhoven phase 2 Hoog-Zestienhoven South transferee facilities (30,000m²)
a_res_16h_hz Total floor area Park Zestienhoven Hoog-Zestienhoven residence (80m²)
p_a_16h_hz_s Percentage area Park Zestienhoven Hoog-Zestienhoven South (40%)
n_res_16h_p2_hz_s Total number of residences Park Zestienhoven phase 2 Hoog-Zestienhoven South (200)
D 2.3.3 Constraints

\[
A_{DA_{16H_P2_HZ}} = a_{da_{16h_hz}}
\]

\[
A_{DA_{16H_P2_HZ_S}} = A_{DA_{16H_P2_HZ}} * p_{a_{16h_hz_s}}
\]

\[
A_{DA_{16H_P2_HZ_S_BOA}} = A_{DA_{16H_P2_HZ_S_BOA_HYB}} + A_{DA_{16H_P2_HZ_S_BOA_IND}} + A_{DA_{16H_P2_HZ_S_BOA_OFF}} + A_{DA_{16H_P2_HZ_S_BOA_FAC_TOT}}
\]

\[
A_{DA_{16H_P2_HZ_S_BOA_HYB}} = A_{GFA_{16H_P2_HZ_S_HYB}} * \left( \frac{1}{n_{floors_{16h_hz_n_ind}}} \right)
\]

\[
A_{DA_{16H_P2_HZ_S_BOA_IND}} = A_{GFA_{16H_P2_HZ_S_IND}} * \left( \frac{1}{n_{floors_{16h_hz_ind}}} \right)
\]

\[
A_{DA_{16H_P2_HZ_S_BOA_OFF}} = A_{GFA_{16H_P2_HZ_S_OFF}} * \left( \frac{1}{n_{floors_{16h_hz_n_ind}}} \right)
\]

\[
A_{DA_{16H_P2_HZ_S_BOA_FAC_TOT}} = A_{DA_{16H_P2_HZ_S_BOA_FAC_RECR}} + A_{DA_{16H_P2_HZ_S_BOA_FAC_HOT}} + A_{DA_{16H_P2_HZ_S_BOA_FAC_TRANS}}
\]

\[
A_{DA_{16H_P2_HZ_S_BOA_FAC_RECR}} = A_{GFA_{16H_P2_HZ_S_FAC_RECR}} * \left( \frac{1}{n_{floors_{16h_hz_n_ind}}} \right)
\]

\[
A_{DA_{16H_P2_HZ_S_BOA_FAC_HOT}} = A_{GFA_{16H_P2_HZ_S_FAC_HOT}} * \left( \frac{1}{n_{floors_{16h_hz_n_ind}}} \right)
\]

\[
A_{DA_{16H_P2_HZ_S_BOA_FAC_TRANS}} = A_{GFA_{16H_P2_HZ_S_FAC_TRANS}} * \left( \frac{1}{n_{floors_{16h_hz_n_ind}}} \right)
\]

\[
A_{DA_{16H_P2_HZ_S_PAV}} = A_{DA_{16H_P2_HZ_S_PAV}} * p_{pav_{16h}}
\]

\[
A_{GFA_{16H_P2_HZ_S_TOT}} = A_{GFA_{16H_P2_HZ_S_IND}} + A_{GFA_{16H_P2_HZ_S_OFF}} + A_{GFA_{16H_P2_HZ_S_HYB}} + A_{GFA_{16H_P2_HZ_S_FAC_RECR}} + A_{GFA_{16H_P2_HZ_S_FAC_HOT}} + A_{GFA_{16H_P2_HZ_S_FAC_TRANS}}
\]
\[ A_{GFA\_16H\_P2\_HZ\_S\_IND} \leq a_{gfa\_16h\_p2\_hz\_s\_ind} \]
\[ A_{GFA\_16H\_P2\_HZ\_S\_OFF} \leq a_{gfa\_16h\_p2\_hz\_s\_off} \]
\[ A_{GFA\_16H\_P2\_HZ\_S\_HYB} = A_{GFA\_16H\_P2\_HZ\_S\_HYB\_RES} + A_{GFA\_16H\_P2\_HZ\_S\_HYB\_FAC\_TOT} \]
\[ A_{GFA\_16H\_P2\_HZ\_S\_HYB\_RES} = N_{RES\_16H\_P2\_HZ\_S} \times a_{res\_16h\_hz} \]
\[ A_{GFA\_16H\_P2\_HZ\_S\_HYB\_FAC\_TOT} = A_{GFA\_16H\_P2\_HZ\_S\_HYB\_FAC\_COMM} + A_{GFA\_16H\_P2\_HZ\_S\_HYB\_FAC\_CAT} + A_{GFA\_16H\_P2\_HZ\_S\_HYB\_FAC\_RET} \]
\[ A_{GFA\_16H\_P2\_HZ\_S\_HYB\_FAC\_COMM} \leq a_{gfa\_16h\_p2\_hz\_s\_fac\_comm} \]
\[ A_{GFA\_16H\_P2\_HZ\_S\_HYB\_FAC\_CAT} \leq a_{gfa\_16h\_p2\_hz\_s\_fac\_cat} \]
\[ A_{GFA\_16H\_P2\_HZ\_S\_HYB\_FAC\_RET} \leq a_{gfa\_16h\_p2\_hz\_s\_fac\_ret} \]
\[ A_{GFA\_16H\_P2\_HZ\_S\_FAC\_RECR} \leq a_{gfa\_16h\_p2\_hz\_s\_fac\_recr} \]
\[ A_{GFA\_16H\_P2\_HZ\_S\_FAC\_HOT} \leq a_{gfa\_16h\_p2\_hz\_s\_fac\_hot} \]
\[ A_{GFA\_16H\_P2\_HZ\_S\_FAC\_TRANS} \leq a_{gfa\_16h\_p2\_hz\_s\_fac\_trans} \]

\[ N_{RES\_16H\_P2\_HZ\_S} \leq n_{res\_16h\_p2\_hz\_s} \]

\[ A_{DA\_16H\_P2\_HZ\_N} = A_{DA\_16H\_P2\_HZ\_N} \times p_{a\_16h\_hz\_n} \]
\[ A_{DA\_16H\_P2\_HZ\_N} = A_{DA\_16H\_P2\_HZ\_N\_BOA} + A_{DA\_16H\_P2\_HZ\_N\_G\_W} + A_{DA\_16H\_P2\_HZ\_N\_PAV} \]
\[ A_{DA\_16H\_P2\_HZ\_N\_BOA} = A_{DA\_16H\_P2\_HZ\_N\_BOA\_IND} + A_{DA\_16H\_P2\_HZ\_N\_BOA\_OFF} + A_{DA\_16H\_P2\_HZ\_N\_BOA\_FAC\_TOT} \]
\[ A_{DA\_16H\_P2\_HZ\_N\_BOA\_IND} = A_{GFA\_16H\_P2\_HZ\_N\_IND} \times \left( \frac{1}{n_{floors\_16h\_hz\_ind}} \right) \]
\[ A_{DA\_16H\_P2\_HZ\_N\_BOA\_OFF} = A_{GFA\_16H\_P2\_HZ\_N\_OFF} \times \left( \frac{1}{n_{floors\_16h\_hz\_n\_ind}} \right) \]
\[ A_{DA\_16H\_P2\_HZ\_N\_BOA\_FAC\_TOT} = A_{DA\_16H\_P2\_HZ\_N\_BOA\_FAC\_COMM} + A_{DA\_16H\_P2\_HZ\_N\_BOA\_FAC\_CAT} + A_{DA\_16H\_P2\_HZ\_N\_BOA\_FAC\_HOT} + A_{DA\_16H\_P2\_HZ\_N\_BOA\_FAC\_RET} + A_{DA\_16H\_P2\_HZ\_N\_BOA\_FAC\_TRANS} \]
\[ A_{DA\_16H\_P2\_HZ\_N\_BOA\_FAC\_COMM} = A_{GFA\_16H\_P2\_HZ\_N\_FAC\_COMM} \times \left( \frac{1}{n_{floors\_16h\_hz\_n\_ind}} \right) \]
\[ A_{DA\_16H\_P2\_HZ\_N\_BOA\_FAC\_RECR} = A_{GFA\_16H\_P2\_HZ\_N\_FAC\_RECR} \times \left( \frac{1}{n_{floors\_16h\_hz\_n\_ind}} \right) \]
\[ A_{DA\_16H\_P2\_HZ\_N\_BOA\_FAC\_CAT} = A_{GFA\_16H\_P2\_HZ\_N\_FAC\_CAT} \times \left( \frac{1}{n_{floors\_16h\_hz\_n\_ind}} \right) \]
\[ A_{DA\_16H\_P2\_HZ\_N\_BOA\_FAC\_HOT} = A_{GFA\_16H\_P2\_HZ\_N\_FAC\_HOT} \times \left( \frac{1}{n_{floors\_16h\_hz\_n\_ind}} \right) \]
\[ A_{DA\_16H\_P2\_HZ\_N\_BOA\_FAC\_RET} = A_{GFA\_16H\_P2\_HZ\_N\_FAC\_RET} \times \left( \frac{1}{n_{floors\_16h\_hz\_n\_ind}} \right) \]
\[ A_{DA\_16H\_P2\_HZ\_N\_BOA\_FAC\_TRANS} = A_{GFA\_16H\_P2\_HZ\_N\_FAC\_TRANS} \times \left( \frac{1}{n_{floors\_16h\_hz\_n\_ind}} \right) \]
\[ A_{DA\_16H\_P2\_HZ\_N\_PAV} = A_{DA\_16H\_P2\_HZ\_N} \times p_{pav\_16h} \]

\[ A_{GFA\_16H\_P2\_HZ\_N\_TOT} = A_{GFA\_16H\_P2\_HZ\_N\_IND} + A_{GFA\_16H\_P2\_HZ\_N\_OFF} + A_{GFA\_16H\_P2\_HZ\_N\_FAC\_TOT} \]
\[ A_{GFA\_16H\_P2\_HZ\_N\_IND} \leq a_{gfa\_16h\_p2\_hz\_n\_ind} \]
\[ A_{GFA\_16H\_P2\_HZ\_N\_OFF} \leq a_{gfa\_16h\_p2\_hz\_n\_off} \]
\[ A_{GFA\_16H\_P2\_HZ\_N\_FAC\_TOT} = A_{GFA\_16H\_P2\_HZ\_N\_FAC\_COMM} + A_{GFA\_16H\_P2\_HZ\_N\_FAC\_RECR} + A_{GFA\_16H\_P2\_HZ\_N\_FAC\_CAT} + A_{GFA\_16H\_P2\_HZ\_N\_FAC\_HOT} + A_{GFA\_16H\_P2\_HZ\_N\_FAC\_RET} + A_{GFA\_16H\_P2\_HZ\_N\_FAC\_TRANS} \]

\[ A_{GFA\_16H\_P2\_HZ\_N\_FAC\_COMM} \leq a_{gfa\_16h\_p2\_hz\_n\_fac\_comm} \]
\[ A_{GFA\_16H\_P2\_HZ\_N\_FAC\_RECR} \leq a_{gfa\_16h\_p2\_hz\_n\_fac\_recr} \]
\[ A_{GFA\_16H\_P2\_HZ\_N\_FAC\_CAT} \leq a_{gfa\_16h\_p2\_hz\_n\_fac\_cat} \]
\[ A_{GFA\_16H\_P2\_HZ\_N\_FAC\_HOT} \leq a_{gfa\_16h\_p2\_hz\_n\_fac\_hot} \]
\[ A_{GFA\_16H\_P2\_HZ\_N\_FAC\_RET} \leq a_{gfa\_16h\_p2\_hz\_n\_fac\_ret} \]
\[ A_{GFA\_16H\_P2\_HZ\_N\_FAC\_TRANS} \leq a_{gfa\_16h\_p2\_hz\_n\_fac\_trans} \]
# D 3 Rotterdam Noordrand phase 3

## D 3.1 Nature- and businesspark Schieveen phase 3

### D 3.1.1 Endogenous variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A_DA_SCH_P3</td>
<td>Total development area Nature- and Business park Schieveen phase 3 (m$^2$)</td>
</tr>
<tr>
<td>A_DA_SCH_P3_NAT</td>
<td>Total development area Nature- and Business park Schieveen phase 3 nature area (m$^2$)</td>
</tr>
<tr>
<td>A_DA_SCH_P3_BUS</td>
<td>Total development area Nature- and Business park Schieveen phase 3 science &amp; business park (m$^2$)</td>
</tr>
<tr>
<td>A_DA_SCH_P3_BUS_BOA</td>
<td>Total development area Nature- and Business park Schieveen phase 3 science &amp; business park Built-on Area (m$^2$)</td>
</tr>
<tr>
<td>A_DA_SCH_P3_BUS_BOA_IND</td>
<td>Total development area Nature- and Business park Schieveen phase 3 science &amp; business park Built-on Area industrial (m$^2$)</td>
</tr>
<tr>
<td>A_DA_SCH_P3_BUS_BOA_OFF</td>
<td>Total development area Nature- and Business park Schieveen phase 3 science &amp; business park Built-on Area offices (m$^2$)</td>
</tr>
<tr>
<td>A_DA_SCH_P3_BUS_BOA_FAC_COMM</td>
<td>Total development area Nature- and Business park Schieveen phase 3 science &amp; business park Built-on Area communal facilities (m$^2$)</td>
</tr>
<tr>
<td>A_DA_SCH_P3_BUS_BOA_FAC_RECR</td>
<td>Total development area Nature- and Business park Schieveen phase 3 science &amp; business park Built-on Area recreational facilities (m$^2$)</td>
</tr>
<tr>
<td>A_DA_SCH_P3_BUS_BOA_FAC_CAT</td>
<td>Total development area Nature- and Business park Schieveen phase 3 science &amp; business park Built-on Area catering industry facilities (m$^2$)</td>
</tr>
<tr>
<td>A_DA_SCH_P3_BUS_BOA_FAC_HOT</td>
<td>Total development area Nature- and Business park Schieveen phase 3 science &amp; business park Built-on Area hotel facilities (m$^2$)</td>
</tr>
<tr>
<td>A_DA_SCH_P3_BUS_BOA_FAC_RET</td>
<td>Total development area Nature- and Business park Schieveen phase 3 science &amp; business park Built-on Area retail facilities (m$^2$)</td>
</tr>
<tr>
<td>A_DA_SCH_P3_BUS_G_W</td>
<td>Total development area Nature- and Business park Schieveen phase 3 science &amp; business park green &amp; water (m$^2$)</td>
</tr>
<tr>
<td>A_DA_SCH_P3_BUS_PAV</td>
<td>Total development area Nature- and Business park Schieveen phase 3 science &amp; business park pavement (m$^2$)</td>
</tr>
<tr>
<td>A_DA_SCH_P3_A13_A16</td>
<td>Total development area Nature- and Business park Schieveen phase 3 reservation A13/A16 highway connection (m$^2$)</td>
</tr>
<tr>
<td>A_GFA_SCH_P3_BUS</td>
<td>Total gross floor area Nature- and Business park Schieveen phase 3 science &amp; business park (m$^2$)</td>
</tr>
<tr>
<td>A_GFA_SCH_P3_BUS_IND</td>
<td>Total gross floor area Nature- and Business park Schieveen phase 3 science &amp; business park industrial (m$^2$)</td>
</tr>
<tr>
<td>A_GFA_SCH_P3_BUS_N_IND</td>
<td>Total gross floor area Nature- and Business park Schieveen phase 3 science &amp; business park non-industrial (m$^2$)</td>
</tr>
<tr>
<td>A_GFA_SCH_P3_BUS_N_IND_OFF</td>
<td>Total gross floor area Nature- and Business park Schieveen phase 3 science &amp; business park non-industrial offices (m$^2$)</td>
</tr>
<tr>
<td>A_GFA_SCH_P3_BUS_N_IND_FAC</td>
<td>Total gross floor area Nature- and Business park Schieveen phase 3 science &amp; business park non-industrial facilities (m$^2$)</td>
</tr>
</tbody>
</table>
A_GFA_SCH_P3_BUS_N_IND_FAC_COMM  Total gross floor area Nature- and Business park Schieveen phase 3 science & business park non-industrial communal facilities (m$^2$)

A_GFA_SCH_P3_BUS_N_IND_FAC_RECR  Total gross floor area Nature- and Business park Schieveen phase 3 science & business park non-industrial recreational facilities (m$^2$)

A_GFA_SCH_P3_BUS_N_IND_FAC_CAT  Total gross floor area Nature- and Business park Schieveen phase 3 science & business park non-industrial catering industry facilities (m$^2$)

A_GFA_SCH_P3_BUS_N_IND_FAC_HOT  Total gross floor area Nature- and Business park Schieveen phase 3 science & business park non-industrial hotel facilities (m$^2$)

A_GFA_SCH_P3_BUS_N_IND_FAC_RET  Total gross floor area Nature- and Business park Schieveen phase 3 science & business park non-industrial retail facilities (m$^2$)

N_RES_SCH_P3  Total number of residences Nature- and Business park Schieveen phase 3 (#)

D 3.1.2 Exogenous variables

a_da_sch_nat_tot  Total development area Nature- and Businesspark Schieveen nature reserves (2,000,000m$^2$)

a_da_sch_p3_nat  Total development area Nature- and Businesspark Schieveen phase 3 nature reserves (700,000m$^2$)

a_da_sch_p3_a13_a16  Total development area Nature- and Businesspark Schieveen phase 3 A13/A16 connection (0m$^3$)

a_da_sch_bus  Total development area Nature- and Businesspark Schieveen businesspark (600,000m$^3$)

a_da_sch_p3_bus  Total development area Nature- and Businesspark Schieveen phase 3 businesspark (300,000m$^3$)

a_gfa_sch_bus  Total gross floor area science & businesspark Schieveen (900,000m$^2$)

a_gfa_sch_p3_bus  Total gross floor area science & businesspark Schieveen phase 3 (250,000m$^3$)

a_gfa_sch_p3_bus_ind  Total gross floor area science & businesspark Schieveen phase 3 industrial (125,000m$^3$)

a_gfa_sch_p3_bus_off  Total gross floor area science & businesspark Schieveen phase 3 offices (125,000m$^3$)

a_gfa_sch_p3_bus_fac_comm  Total gross floor area science & businesspark Schieveen phase 3 communal facilities (0m$^3$)

a_gfa_sch_p3_bus_fac_recr  Total gross floor area science & businesspark Schieveen phase 3 recreational facilities (0m$^3$)

a_gfa_sch_p3_bus_fac_cat  Total gross floor area science & businesspark Schieveen phase 3 catering industry facilities (0m$^3$)

a_gfa_sch_p3_bus_fac_hot  Total gross floor area science & businesspark Schieveen phase 3 hotel facilities (0m$^3$)

a_gfa_sch_p3_bus_fac_ret  Total gross floor area science & businesspark Schieveen phase 3 retail facilities (0m$^3$)
\[ \begin{align*}
\text{p\_g\_w\_sch\_bus} & \quad \text{Percentage green & water science & businesspark Schieveen (35\%)} \\
\text{p\_pav\_sch\_bus} & \quad \text{Percentage pavement science & businesspark Schieveen (30\%)} \\
\text{p\_n\_ind\_sch\_bus} & \quad \text{Percentage non-industrial functions science & businesspark Schieveen (50\%)} \\
\text{n\_floors\_sch\_ind} & \quad \text{Total numbers of floors science & businesspark Schieveen industrial (1)} \\
\text{n\_floors\_sch\_n\_ind} & \quad \text{Total numbers of floors science & businesspark Schieveen non-industrial (3)} \\
\text{n\_res\_sch\_p3} & \quad \text{Total number of residences Nature- and businesspark Schieveen phase 3 (0)}
\end{align*} \]

**D 3.1.3 Constraints**

\[\begin{align*}
\text{A\_DA\_SCH\_P3} & = \text{A\_DA\_SCH\_P3\_NAT} + \text{A\_DA\_SCH\_P3\_BUS} + \text{A\_DA\_SCH\_P3\_A13\_A16} \\
\text{A\_DA\_SCH\_P3\_NAT} & \leq \text{a\_da\_sch\_p3\_nat} \\
\text{A\_DA\_SCH\_P3\_BUS} & = \text{A\_DA\_SCH\_P3\_BUS\_BOA} + \text{A\_DA\_SCH\_P3\_BUS\_G\_W} + \text{A\_DA\_SCH\_P3\_BUS\_PAV} \\
\text{A\_DA\_SCH\_P3\_BUS\_BOA} & = \text{A\_DA\_SCH\_P3\_BUS\_BOA\_IND} + \text{A\_DA\_SCH\_P3\_BUS\_BOA\_OFF} + \text{A\_DA\_SCH\_P3\_BUS\_BOA\_FAC\_COMM} + \text{A\_DA\_SCH\_P3\_BUS\_BOA\_FAC\_RECR} + \text{A\_DA\_SCH\_P3\_BUS\_BOA\_FAC\_CAT} + \text{A\_DA\_SCH\_P3\_BUS\_BOA\_FAC\_HOT} + \text{A\_DA\_SCH\_P3\_BUS\_BOA\_FAC\_RET} \\
\text{A\_DA\_SCH\_P3\_BUS\_G\_W} & = \text{A\_DA\_SCH\_P3\_BUS\_G\_W} \cdot \text{p\_g\_w\_sch\_bus} \\
\text{A\_DA\_SCH\_P3\_BUS\_PAV} & = \text{A\_DA\_SCH\_P3\_BUS\_PAV} \cdot \text{p\_pav\_sch\_bus} \\
\text{A\_GFA\_SCH\_P3\_BUS} & \leq \text{a\_gfa\_sch\_p3\_bus} \\
\text{A\_GFA\_SCH\_P3\_BUS\_IND} & \leq \text{a\_gfa\_sch\_p3\_bus\_ind} \\
\text{A\_GFA\_SCH\_P3\_BUS\_N\_IND} & \leq \text{a\_gfa\_sch\_p3\_bus\_n\_ind} \\
\text{A\_GFA\_SCH\_P3\_BUS\_N\_IND\_OFF} & \leq \text{a\_gfa\_sch\_p3\_bus\_n\_ind\_off} \\
\text{A\_GFA\_SCH\_P3\_BUS\_N\_IND\_FAC\_COMM} & \leq \text{a\_gfa\_sch\_p3\_bus\_n\_ind\_facs\_comm} \\
\text{A\_GFA\_SCH\_P3\_BUS\_N\_IND\_FAC\_RECR} & \leq \text{a\_gfa\_sch\_p3\_bus\_n\_ind\_facs\_recr} \\
\text{A\_GFA\_SCH\_P3\_BUS\_N\_IND\_FAC\_CAT} & \leq \text{a\_gfa\_sch\_p3\_bus\_n\_ind\_facs\_cat} \\
\text{A\_GFA\_SCH\_P3\_BUS\_N\_IND\_FAC\_HOT} & \leq \text{a\_gfa\_sch\_p3\_bus\_n\_ind\_facs\_hot} \\
\text{A\_GFA\_SCH\_P3\_BUS\_N\_IND\_FAC\_RET} & \leq \text{a\_gfa\_sch\_p3\_bus\_n\_ind\_facs\_ret} \\
\text{A\_GFA\_SCH\_P3\_BUS\_N\_IND\_FAC\_COMM} & \leq \text{a\_gfa\_sch\_p3\_bus\_n\_ind\_fac\_comm} \\
\text{A\_GFA\_SCH\_P3\_BUS\_N\_IND\_FAC\_RECR} & \leq \text{a\_gfa\_sch\_p3\_bus\_n\_ind\_fac\_recr} \\
\text{A\_GFA\_SCH\_P3\_BUS\_N\_IND\_FAC\_CAT} & \leq \text{a\_gfa\_sch\_p3\_bus\_n\_ind\_fac\_cat} \\
\text{A\_GFA\_SCH\_P3\_BUS\_N\_IND\_FAC\_HOT} & \leq \text{a\_gfa\_sch\_p3\_bus\_n\_ind\_fac\_hot} \\
\text{A\_GFA\_SCH\_P3\_BUS\_N\_IND\_FAC\_RET} & \leq \text{a\_gfa\_sch\_p3\_bus\_n\_ind\_fac\_ret}
\end{align*} \]
### D 3.2 Park Zestienhoven phase 3

#### D 3.2.1 Endogenous variables

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A_DA_16H_P3_HZ</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven (m²)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_S</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven South (m²)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_S_BOA</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven South Built-on Area (m²)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_S_BOA_HYB</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven South Built-on Area hybrid function (m²)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_S_BOA_IND</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven South Built-on Area industrial (m²)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_S_BOA_OFF</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven South Built-on Area offices (m²)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_S_BOA_FAC_TOT</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven South Built-on Area facilities (m²)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_S_BOA_FAC_RECR</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven South Built-on Area recreational facilities (m²)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_S_BOA_FAC_HOT</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven South Built-on Area hotel facilities (m²)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_S_BOA_FAC_TRANS</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven South Built-on Area transferee facilities (m²)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_S_G_W</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven South green &amp; water (m²)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_S_PAV</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven South pavement (m²)</td>
</tr>
<tr>
<td>A_GFA_16H_P3_HZ_S_TOT</td>
<td>Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven South (m³)</td>
</tr>
<tr>
<td>A_GFA_16H_P3_HZ_S_IND</td>
<td>Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven South industrial (m³)</td>
</tr>
<tr>
<td>A_GFA_16H_P3_HZ_S_OFF</td>
<td>Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven South offices (m³)</td>
</tr>
<tr>
<td>A_GFA_16H_P3_HZ_S_HYB</td>
<td>Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven South hybrid function (m³)</td>
</tr>
<tr>
<td>A_GFA_16H_P3_HZ_S_HYB_RES</td>
<td>Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven South hybrid function – residences (m³)</td>
</tr>
<tr>
<td>A_GFA_16H_P3_HZ_S_HYB_FAC_TOT</td>
<td>Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven South hybrid function – facilities (m³)</td>
</tr>
<tr>
<td>A_GFA_16H_P3_HZ_S_HYB_FAC_COMM</td>
<td>Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven South hybrid function – communal facilities (m³)</td>
</tr>
<tr>
<td>A_GFA_16H_P3_HZ_S_HYB_FAC_CAT</td>
<td>Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven South hybrid function – catering industry facilities (m³)</td>
</tr>
<tr>
<td>A_GFA_16H_P3_HZ_S_HYB_FAC_RET</td>
<td>Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven South hybrid function – retail facilities (m³)</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>A_GFA_16H_P3_HZ_S_FAC_RECR</td>
<td>Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven South recreational facilities (m$^3$)</td>
</tr>
<tr>
<td>A_GFA_16H_P3_HZ_S_FAC_HOT</td>
<td>Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven South hotel facilities (m$^3$)</td>
</tr>
<tr>
<td>A_GFA_16H_P3_HZ_S_FAC_TRANS</td>
<td>Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven South transferee facilities (m$^3$)</td>
</tr>
<tr>
<td>N_RES_16H_P3_HZ_S</td>
<td>Total number of residences Park Zestienhoven phase 3 Hoog-Zestienhoven South (#)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_N</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven North (m$^3$)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_N_BOA</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven North Built-on Area (m$^3$)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_N_BOA_IND</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven North Built-on Area industrial (m$^3$)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_N_BOA_OFF</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven North Built-on Area offices (m$^3$)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_N_BOA_FAC_TOT</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven North Built-on Area facilities (m$^3$)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_N_BOA_FAC_COMM</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven North Built-on Area communal facilities (m$^3$)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_N_BOA_FAC_RECR</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven North Built-on Area recreational facilities (m$^3$)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_N_BOA_FAC_CAT</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven North Built-on Area catering industry facilities (m$^3$)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_N_BOA_FAC_HOT</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven North Built-on Area hotel facilities (m$^3$)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_N_BOA_FAC_RET</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven North Built-on Area retail facilities (m$^3$)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_N_BOA_FAC_TRANS</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven North Built-on Area transferee facilities (m$^3$)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_N_G_W</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven North green &amp; water (m$^3$)</td>
</tr>
<tr>
<td>A_DA_16H_P3_HZ_N_PAV</td>
<td>Total development area Park Zestienhoven phase 3 Hoog-Zestienhoven North pavement (m$^3$)</td>
</tr>
<tr>
<td>A_GFA_16H_P3_HZ_N_TOT</td>
<td>Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven North (m$^3$)</td>
</tr>
<tr>
<td>A_GFA_16H_P3_HZ_N_IND</td>
<td>Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven North industrial (m$^3$)</td>
</tr>
<tr>
<td>A_GFA_16H_P3_HZ_N_OFF</td>
<td>Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven North offices (m$^3$)</td>
</tr>
<tr>
<td>A_GFA_16H_P3_HZ_N_FAC_TOT</td>
<td>Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven North facilities (m$^3$)</td>
</tr>
<tr>
<td>A_GFA_16H_P3_HZ_N_FAC_COMM</td>
<td>Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven North communal facilities (m$^3$)</td>
</tr>
<tr>
<td>A_GFA_16H_P3_HZ_N_FAC_RECR</td>
<td>Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven North recreational facilities (m$^3$)</td>
</tr>
<tr>
<td>A_GFA_16H_P3_HZ_N_FAC_CAT</td>
<td>Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven North catering industry facilities (m$^3$)</td>
</tr>
</tbody>
</table>
A_GFA_16H_P3_HZ_N_FAC_HOT  Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven North hotel facilities (m$^3$)

A_GFA_16H_P3_HZ_N_FAC_RET  Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven North retail facilities (m$^3$)

A_GFA_16H_P3_HZ_N_FAC_TRANS  Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven North transferee facilities (m$^3$)

D 3.2.2 Exogenous variables

a_da_16h_hz  Total development area Park Zestienhoven Hoog-Zestienhoven (613,900m$^3$)

a_gfa_16h_p3_hz_s_ind  Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven South industrial (0m$^3$)

a_gfa_16h_p3_hz_s_off  Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven South offices (50,000m$^3$)

a_gfa_16h_p3_hz_s_fac_comm  Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven South communal facilities (0m$^3$)

a_gfa_16h_p3_hz_s_fac_recr  Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven South recreational facilities (35,000m$^3$)

a_gfa_16h_p3_hz_s_fac_cat  Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven South catering industry facilities (0m$^3$)

a_gfa_16h_p3_hz_s_fac_hot  Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven South hotel facilities (0m$^3$)

a_gfa_16h_p3_hz_s_fac_ret  Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven South retail facilities (0m$^3$)

a_gfa_16h_p3_hz_s_fac_trans  Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven South transferee facilities (60,000m$^3$)

a_res_16h_hz  Total floor area Park Zestienhoven Hoog-Zestienhoven residence (80m$^3$)

p_a_16h_hz_s  Percentage area Park Zestienhoven Hoog-Zestienhoven South (40%)

n_res_16h_p3_hz_s  Total number of residences Park Zestienhoven phase 3 Hoog-Zestienhoven South (250)

a_gfa_16h_p3_hz_n_ind  Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven North industrial (0m$^3$)

a_gfa_16h_p3_hz_n_off  Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven North offices (150,000m$^3$)

a_gfa_16h_p3_hz_n_fac_comm  Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven North communal facilities (0m$^3$)

a_gfa_16h_p3_hz_n_fac_recr  Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven North recreational facilities (0m$^3$)

a_gfa_16h_p3_hz_n_fac_cat  Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven North catering industry facilities (0m$^3$)

a_gfa_16h_p3_hz_n_fac_hot  Total gross floor area Park Zestienhoven phase 3 Hoog-Zestienhoven North hotel facilities (0m$^3$)
D 3.2.3 Constraints

A_DA_16H_P3_HZ = a_da_16h_hz

A_DA_16H_P3_HZ_S = A_DA_16H_P3_HZ * p_a_16h_hz_s
A_DA_16H_P3_HZ_S = A_DA_16H_P3_HZ_S_BOA + A_DA_16H_P3_HZ_S_G_W + A_DA_16H_P3_HZ_S_PAV

A_DA_16H_P3_HZ_S_BOA = A_DA_16H_P3_HZ_S_BOA_HYB + A_DA_16H_P3_HZ_S_BOA_IND + A_DA_16H_P3_HZ_S_BOA_OFF + A_DA_16H_P3_HZ_S_BOA_FAC_TOT

A_DA_16H_P3_HZ_S_BOA_HYB = A_GFA_16H_P3_HZ_S_HYB * (1/ n_floors_16h_hz_n_ind)
A_DA_16H_P3_HZ_S_BOA_IND = A_GFA_16H_P3_HZ_S_IND * (1/ n_floors_16h_hz_ind)
A_DA_16H_P3_HZ_S_BOA_OFF = A_GFA_16H_P3_HZ_S_OFF * (1/ n_floors_16h_hz_n_ind)

A_DA_16H_P3_HZ_S_BOA_FAC_TOT = A_DA_16H_P3_HZ_S_BOA_FAC_RECR + A_DA_16H_P3_HZ_S_BOA_FAC_HOT + A_DA_16H_P3_HZ_S_BOA_FAC_TRANS

A_DA_16H_P3_HZ_S_BOA_FAC_RECR = A_GFA_16H_P3_HZ_S_FAC_RECR * (1/ n_floors_16h_hz_n_ind)
A_DA_16H_P3_HZ_S_BOA_FAC_HOT = A_GFA_16H_P3_HZ_S_FAC_HOT * (1/ n_floors_16h_hz_n_ind)
A_DA_16H_P3_HZ_S_BOA_FAC_TRANS = A_GFA_16H_P3_HZ_S_FAC_TRANS * (1/ n_floors_16h_hz_n_ind)

A_DA_16H_P3_HZ_S_PAV = A_DA_16H_P3_HZ_S * p_pav_16h

A_GFA_16H_P3_HZ_S_TOT = A_GFA_16H_P3_HZ_S_IND + A_GFA_16H_P3_HZ_S_OFF + A_GFA_16H_P3_HZ_S_HYB + A_GFA_16H_P3_HZ_S_FAC_RECR + A_GFA_16H_P3_HZ_S_FAC_HOT + A_GFA_16H_P3_HZ_S_FAC_TRANS

A_GFA_16H_P3_HZ_S_IND ≤ a_gfa_16h_p3_hz_s_ind
A_GFA_16H_P3_HZ_S_OFF ≤ a_gfa_16h_p3_hz_s_off
A_GFA_16H_P3_HZ_S_HYB = A_GFA_16H_P3_HZ_S_HYB_RES + A_GFA_16H_P3_HZ_S_HYB_FAC_TOT

A_GFA_16H_P3_HZ_S_HYB_RES = N_RES_16H_P3_HZ_S * a_res_16h_hz
A_GFA_16H_P3_HZ_S_HYB_FAC_TOT = A_GFA_16H_P3_HZ_S_HYB_FAC_COMM + A_GFA_16H_P3_HZ_S_HYB_FAC_CAT + A_GFA_16H_P3_HZ_S_HYB_FAC_RET
A_GFA_16H_P3_HZ_S_HYB_FAC_COMM ≤ a_gfa_16h_p3_hz_s_fac_comm
A_GFA_16H_P3_HZ_S_HYB_FAC_CAT ≤ a_gfa_16h_p3_hz_s_fac_cat
A_GFA_16H_P3_HZ_S_HYB_FAC_RET ≤ a_gfa_16h_p3_hz_s_fac_ret
A_GFA_16H_P3_HZ_S_FAC_RECR ≤ a_gfa_16h_p3_hz_s_fac_recr
A_GFA_16H_P3_HZ_S_FAC_HOT ≤ a_gfa_16h_p3_hz_s_fac_hot
A_GFA_16H_P3_HZ_S_FAC_TRANS ≤ a_gfa_16h_p3_hz_s_fac_trans

N_RES_16H_P3_HZ_S ≤ n_res_16h_p3_hz_s

A_DA_16H_P3_HZ_N = A_DA_16H_P3_HZ * p_a_16h_hz_n
A_DA_16H_P3_HZ_N = A_DA_16H_P3_HZ_N_BOA + A_DA_16H_P3_HZ_N_G_W + A_DA_16H_P3_HZ_N_PAV
A_DA_16H_P3_HZ_N_BOA = A_DA_16H_P3_HZ_N_BOA_IND + A_DA_16H_P3_HZ_N_BOA_OFF + A_DA_16H_P3_HZ_N_BOA_FAC_TRANS

A_DA_16H_P3_HZ_N_BOA_IND = A_GFA_16H_P3_HZ_N_IND * (1/ n_floors_16h_hz_ind)
A_DA_16H_P3_HZ_N_BOA_OFF = A_GFA_16H_P3_HZ_N_OFF * (1/ n_floors_16h_hz_n_ind)

A_DA_16H_P3_HZ_N_BOA_FAC_COMM = A_GFA_16H_P3_HZ_N_FAC_COMM * (1/ n_floors_16h_hz_n_ind)
A_DA_16H_P3_HZ_N_BOA_FAC_RECR = A_GFA_16H_P3_HZ_N_FAC_RECR * (1/ n_floors_16h_hz_n_ind)
A_DA_16H_P3_HZ_N_BOA_FAC_CAT = A_GFA_16H_P3_HZ_N_FAC_CAT * (1/ n_floors_16h_hz_n_ind)
A_DA_16H_P3_HZ_N_BOA_FAC_HOT = A_GFA_16H_P3_HZ_N_FAC_HOT * (1/ n_floors_16h_hz_n_ind)
A_DA_16H_P3_HZ_N_BOA_FAC_RET = A_GFA_16H_P3_HZ_N_FAC_RET * (1/ n_floors_16h_hz_n_ind)
A_DA_16H_P3_HZ_N_BOA_FAC_TRANS = A_GFA_16H_P3_HZ_N_FAC_TRANS * (1/ n_floors_16h_hz_n_ind)

A_DA_16H_P3_HZ_N_PAV = A_DA_16H_P3_HZ_N * p_pav_16h

A_GFA_16H_P3_HZ_N_TOT = A_GFA_16H_P3_HZ_N_IND + A_GFA_16H_P3_HZ_N_OFF + A_GFA_16H_P3_HZ_N_FAC_TOT

A_GFA_16H_P3_HZ_N_IND ≤ a_gfa_16h_p3_hz_n_ind
A_GFA_16H_P3_HZ_N_OFF ≤ a_gfa_16h_p3_hz_n_off

A_GFA_16H_P3_HZ_N_FAC_TOT = A_GFA_16H_P3_HZ_N_FAC_COMM + A_GFA_16H_P3_HZ_N_FAC_RECR + A_GFA_16H_P3_HZ_N_FAC_CAT + A_GFA_16H_P3_HZ_N_FAC_HOT + A_GFA_16H_P3_HZ_N_FAC_RET + A_GFA_16H_P3_HZ_N_FAC_TRANS

A_GFA_16H_P3_HZ_N_FAC_COMM ≤ a_gfa_16h_p3_hz_n_fac_comm
A_GFA_16H_P3_HZ_N_FAC_RECR ≤ a_gfa_16h_p3_hz_n_fac_recr
A_GFA_16H_P3_HZ_N_FAC_CAT ≤ a_gfa_16h_p3_hz_n_fac_cat
A_GFA_16H_P3_HZ_N_FAC_HOT ≤ a_gfa_16h_p3_hz_n_fac_hot
A_GFA_16H_P3_HZ_N_FAC_RET ≤ a_gfa_16h_p3_hz_n_fac_ret
A_GFA_16H_P3_HZ_N_FAC_TRANS ≤ a_gfa_16h_p3_hz_n_fac_trans
### D 4 Rotterdam Noordrand phase 4

#### D 4.1 Nature- and Business park Schieveen phase 4

#### D 4.1.1 Endogenous variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A_DA_SCH_P4</td>
<td>Total development area Nature- and Business park Schieveen phase 4 (m²)</td>
</tr>
<tr>
<td>A_DA_SCH_P4_NAT</td>
<td>Total development area Nature- and Business park Schieveen phase 4 nature area (m²)</td>
</tr>
<tr>
<td>A_DA_SCH_P4_BUS</td>
<td>Total development area Nature- and Business park Schieveen phase 4 science &amp; business park (m²)</td>
</tr>
<tr>
<td>A_DA_SCH_P4_BUS_BOA</td>
<td>Total development area Nature- and Business park Schieveen phase 4 science &amp; business park Built-on Area (m²)</td>
</tr>
<tr>
<td>A_DA_SCH_P4_BUS_BOA_IND</td>
<td>Total development area Nature- and Business park Schieveen phase 4 science &amp; business park Built-on Area industrial (m²)</td>
</tr>
<tr>
<td>A_DA_SCH_P4_BUS_BOA_OFF</td>
<td>Total development area Nature- and Business park Schieveen phase 4 science &amp; business park Built-on Area offices (m²)</td>
</tr>
<tr>
<td>A_DA_SCH_P4_BUS_BOA_FAC_COMM</td>
<td>Total development area Nature- and Business park Schieveen phase 4 science &amp; business park Built-on Area communal facilities (m²)</td>
</tr>
<tr>
<td>A_DA_SCH_P4_BUS_BOA_FAC_RECR</td>
<td>Total development area Nature- and Business park Schieveen phase 4 science &amp; business park Built-on Area recreational facilities (m²)</td>
</tr>
<tr>
<td>A_DA_SCH_P4_BUS_BOA_FAC_CAT</td>
<td>Total development area Nature- and Business park Schieveen phase 4 science &amp; business park Built-on Area catering industry facilities (m²)</td>
</tr>
<tr>
<td>A_DA_SCH_P4_BUS_BOA_FAC_HOT</td>
<td>Total development area Nature- and Business park Schieveen phase 4 science &amp; business park Built-on Area hotel facilities (m²)</td>
</tr>
<tr>
<td>A_DA_SCH_P4_BUS_BOA_FAC_RET</td>
<td>Total development area Nature- and Business park Schieveen phase 4 science &amp; business park Built-on Area retail facilities (m²)</td>
</tr>
<tr>
<td>A_DA_SCH_P4_BUS_G_W</td>
<td>Total development area Nature- and Business park Schieveen phase 4 science &amp; business park green &amp; water (m²)</td>
</tr>
<tr>
<td>A_DA_SCH_P4_BUS_PAV</td>
<td>Total development area Nature- and Business park Schieveen phase 4 science &amp; business park pavement (m²)</td>
</tr>
<tr>
<td>A_DA_SCH_P4_A14_A16</td>
<td>Total development area Nature- and Business park Schieveen phase 4 reservation A14/A16 highway connection (m²)</td>
</tr>
<tr>
<td>A_GFA_SCH_P4_BUS</td>
<td>Total gross floor area Nature- and Business park Schieveen phase 4 science &amp; business park (m²)</td>
</tr>
<tr>
<td>A_GFA_SCH_P4_BUS_IND</td>
<td>Total gross floor area Nature- and Business park Schieveen phase 4 science &amp; business park industrial (m²)</td>
</tr>
<tr>
<td>A_GFA_SCH_P4_BUS_N_IND</td>
<td>Total gross floor area Nature- and Business park Schieveen phase 4 science &amp; business park non-industrial (m²)</td>
</tr>
<tr>
<td>A_GFA_SCH_P4_BUS_N_IND_OFF</td>
<td>Total gross floor area Nature- and Business park Schieveen phase 4 science &amp; business park non-industrial offices (m²)</td>
</tr>
<tr>
<td>A_GFA_SCH_P4_BUS_N_IND_FAC</td>
<td>Total gross floor area Nature- and Business park Schieveen phase 4 science &amp; business park non-industrial facilities (m²)</td>
</tr>
</tbody>
</table>
D 4.1.2 Exogenous variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>a_da_sch_nat_tot</td>
<td>Total development area Nature- and Businesspark Schieveen nature reserves (2,000,000m²)</td>
</tr>
<tr>
<td>a_da_sch_nat</td>
<td>Total development area Nature- and Businesspark Schieveen phase 4 nature reserves (700,000m²)</td>
</tr>
<tr>
<td>a_da_sch_p4_a14_a16</td>
<td>Total development area Nature- and Businesspark Schieveen phase 4 A14/A16 connection (0m²)</td>
</tr>
<tr>
<td>a_da_sch_bus</td>
<td>Total development area Nature- and Businesspark Schieveen businesspark (600,000m²)</td>
</tr>
<tr>
<td>a_gfa_sch_bus</td>
<td>Total gross floor area science &amp; businesspark Schieveen (900,000m²)</td>
</tr>
<tr>
<td>a_gfa_sch_bus_ind</td>
<td>Total gross floor area science &amp; businesspark Schieveen phase 4 industrial (125,000m²)</td>
</tr>
<tr>
<td>a_gfa_sch_bus_off</td>
<td>Total gross floor area science &amp; businesspark Schieveen phase 4 offices (125,000m²)</td>
</tr>
<tr>
<td>a_gfa_sch_bus_fac_comm</td>
<td>Total gross floor area science &amp; businesspark Schieveen phase 4 communal facilities (0m²)</td>
</tr>
<tr>
<td>a_gfa_sch_bus_fac_recr</td>
<td>Total gross floor area science &amp; businesspark Schieveen phase 4 recreational facilities (0m²)</td>
</tr>
<tr>
<td>a_gfa_sch_bus_fac_cat</td>
<td>Total gross floor area science &amp; businesspark Schieveen phase 4 catering industry facilities (0m²)</td>
</tr>
<tr>
<td>a_gfa_sch_bus_fac_hot</td>
<td>Total gross floor area science &amp; businesspark Schieveen phase 4 hotel facilities (0m²)</td>
</tr>
<tr>
<td>a_gfa_sch_bus_fac_ret</td>
<td>Total gross floor area science &amp; businesspark Schieveen phase 4 retail facilities (0m²)</td>
</tr>
</tbody>
</table>
p_g_w_sch_bus  Percentage green & water science & businesspark Schieveen (45%)
p_pav_sch_bus  Percentage pavement science & businesspark Schieveen (40%)
p_n_ind_sch_bus Percentage non-industrial functions science & businesspark Schieveen (50%)

n_floors_sch_ind  Total numbers of floors science & businesspark Schieveen industrial (1)
n_floors_sch_n_ind  Total numbers of floors science & businesspark Schieveen non-industrial (3)
n_res_sch_p4  Total number of residences Nature- and businesspark Schieveen phase 4 (0)

D 4.1.3 Constraints

\( A_{DA \_SCH \_P4} = A_{DA \_SCH \_P4 \_NAT} + A_{DA \_SCH \_P4 \_BUS} + A_{DA \_SCH \_P4 \_A14 \_A16} \)

\( A_{DA \_SCH \_P4 \_NAT} \leq a_{da \_sch \_p4 \_nat} \)

\( A_{DA \_SCH \_P4 \_BUS} = A_{DA \_SCH \_P4 \_BUS \_BOA} + A_{DA \_SCH \_P4 \_BUS \_G \_W} + A_{DA \_SCH \_P4 \_BUS \_PAV} \)

\( A_{DA \_SCH \_P4 \_BUS \_BOA} = A_{DA \_SCH \_P4 \_BUS \_BOA \_IND} + A_{DA \_SCH \_P4 \_BUS \_BOA \_OFF} + A_{DA \_SCH \_P4 \_BUS \_BOA \_FAC \_COMM} + A_{DA \_SCH \_P4 \_BUS \_BOA \_FAC \_RECR} + A_{DA \_SCH \_P4 \_BUS \_BOA \_FAC \_CAT} + A_{DA \_SCH \_P4 \_BUS \_BOA \_FAC \_RET} \)

\( A_{DA \_SCH \_P4 \_BUS \_G \_W} = A_{DA \_SCH \_P4 \_BUS \_BUS \_G \_W} \times p_{g \_w \_sch \_bus} \)

\( A_{DA \_SCH \_P4 \_BUS \_PAV} = A_{DA \_SCH \_P4 \_BUS \_PAV} \times p_{pav \_sch \_bus} \)

\( A_{GFA \_SCH \_P4 \_BUS} \leq a_{gfa \_sch \_p4 \_bus} \)

\( A_{GFA \_SCH \_P4 \_BUS \_IND} \leq a_{gfa \_sch \_p4 \_bus \_ind} \)

\( A_{GFA \_SCH \_P4 \_BUS \_N \_IND} \leq a_{gfa \_sch \_p4 \_bus \_n \_ind} \)

\( A_{GFA \_SCH \_P4 \_BUS \_N \_IND} = A_{GFA \_SCH \_P4 \_BUS \_N \_IND \_OFF} + A_{GFA \_SCH \_P4 \_BUS \_N \_IND \_FAC} \)

\( A_{GFA \_SCH \_P4 \_BUS \_N \_IND \_OFF} \leq a_{gfa \_sch \_p4 \_bus \_off} \)

\( A_{GFA \_SCH \_P4 \_BUS \_N \_IND \_FAC} = A_{GFA \_SCH \_P4 \_BUS \_N \_IND \_FAC \_COMM} + A_{GFA \_SCH \_P4 \_BUS \_N \_IND \_FAC \_RECR} + A_{GFA \_SCH \_P4 \_BUS \_N \_IND \_FAC \_CAT} + A_{GFA \_SCH \_P4 \_BUS \_N \_IND \_FAC \_RET} \)

\( A_{GFA \_SCH \_P4 \_BUS \_N \_IND \_FAC \_COMM} \leq a_{gfa \_sch \_p4 \_bus \_fac \_comm} \)

\( A_{GFA \_SCH \_P4 \_BUS \_N \_IND \_FAC \_RECR} \leq a_{gfa \_sch \_p4 \_bus \_fac \_recr} \)

\( A_{GFA \_SCH \_P4 \_BUS \_N \_IND \_FAC \_CAT} \leq a_{gfa \_sch \_p4 \_bus \_fac \_cat} \)

\( A_{GFA \_SCH \_P4 \_BUS \_N \_IND \_FAC \_RET} \leq a_{gfa \_sch \_p4 \_bus \_fac \_ret} \)
N_RES_SCH_P4 = n_res_sch_p4

**D 4.2 Park Zestienhoven phase 4**

**D 4.2.1 Endogenous variables**

- **A_DA_16H_P4_HZ**
  Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven (m$^4$)

- **A_DA_16H_P4_HZ_S**
  Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven South (m$^4$)

- **A_DA_16H_P4_HZ_S_BOA**
  Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven South Built-on Area (m$^4$)

- **A_DA_16H_P4_HZ_S_BOA_HYB**
  Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven South Built-on Area hybrid function (m$^4$)

- **A_DA_16H_P4_HZ_S_BOA_IND**
  Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven South Built-on Area industrial (m$^4$)

- **A_DA_16H_P4_HZ_S_BOA_OFF**
  Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven South Built-on Area offices (m$^4$)

- **A_DA_16H_P4_HZ_S_BOA_FAC_TOT**
  Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven South Built-on Area facilities (m$^4$)

- **A_DA_16H_P4_HZ_S_BOA_FAC_RECR**
  Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven South Built-on Area recreational facilities (m$^4$)

- **A_DA_16H_P4_HZ_S_BOA_FAC_HOT**
  Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven South Built-on Area hotel facilities (m$^4$)

- **A_DA_16H_P4_HZ_S_BOA_FAC_TRANS**
  Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven South Built-on Area transferee facilities (m$^4$)

- **A_DA_16H_P4_HZ_S_G_W**
  Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven South green & water (m$^4$)

- **A_DA_16H_P4_HZ_S_PAV**
  Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven South pavement (m$^4$)

- **A_GFA_16H_P4_HZ_S_TOT**
  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven South (m$^4$)

- **A_GFA_16H_P4_HZ_S_IND**
  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven South industrial (m$^4$)

- **A_GFA_16H_P4_HZ_S_OFF**
  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven South offices (m$^4$)

- **A_GFA_16H_P4_HZ_S_HYB**
  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven South hybrid function (m$^4$)

- **A_GFA_16H_P4_HZ_S_HYB_RES**
  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven South hybrid function – residences (m$^4$)

- **A_GFA_16H_P4_HZ_S_HYB_FAC_TOT**
  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven South hybrid function – facilities (m$^4$)

- **A_GFA_16H_P4_HZ_S_HYB_FAC_COMM**
  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven South hybrid function – communal facilities (m$^4$)

- **A_GFA_16H_P4_HZ_S_HYB_FAC_CAT**
  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven South hybrid function – catering industry facilities (m$^4$)

- **A_GFA_16H_P4_HZ_S_HYB_FAC_RET**
  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven South hybrid function – retail facilities (m$^4$)
A_GFA_16H_P4_HZ_S_FAC_RECR  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven South recreational facilities (m$^4$)
A_GFA_16H_P4_HZ_S_FAC_HOT  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven South hotel facilities (m$^4$)
A_GFA_16H_P4_HZ_S_FAC_TRANS  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven South transferee facilities (m$^4$)
N_RES_16H_P4_HZ_S    Total number of residences Park Zestienhoven phase 4 Hoog-Zestienhoven South (#)
A_DA_16H_P4_HZ_N   Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven North (m$^4$)
A_DA_16H_P4_HZ_N_BOA   Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven North Built-on Area (m$^4$)
A_DA_16H_P4_HZ_N_BOA_IND  Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven North Built-on Area industrial (m$^4$)
A_DA_16H_P4_HZ_N_BOA_OFF   Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven North Built-on Area offices (m$^4$)
A_DA_16H_P4_HZ_N_BOA_FAC_TOT  Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven North Built-on Area facilities (m$^4$)
A_DA_16H_P4_HZ_N_BOA_FAC_COMM  Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven North Built-on Area communal facilities (m$^4$)
A_DA_16H_P4_HZ_N_BOA_FAC_RECR  Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven North Built-on Area recreational facilities (m$^4$)
A_DA_16H_P4_HZ_N_BOA_FAC_CAT  Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven North Built-on Area catering industry facilities (m$^4$)
A_DA_16H_P4_HZ_N_BOA_FAC_HOT  Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven North Built-on Area hotel facilities (m$^4$)
A_DA_16H_P4_HZ_N_BOA_FAC_RET  Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven North Built-on Area retail facilities (m$^4$)
A_DA_16H_P4_HZ_N_BOA_FAC_TRANS  Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven North Built-on Area transferee facilities (m$^4$)
A_DA_16H_P4_HZ_N_G_W   Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven North green & water (m$^4$)
A_DA_16H_P4_HZ_N_PAV   Total development area Park Zestienhoven phase 4 Hoog-Zestienhoven North pavement (m$^4$)
A_GFA_16H_P4_HZ_N_TOT  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven North (m$^4$)
A_GFA_16H_P4_HZ_N_IND  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven North industrial (m$^4$)
A_GFA_16H_P4_HZ_N_OFF  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven North offices (m$^4$)
A_GFA_16H_P4_HZ_N_FAC_TOT  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven North facilities (m$^4$)
A_GFA_16H_P4_HZ_N_FAC_COMM  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven North communal facilities (m$^4$)
A_GFA_16H_P4_HZ_N_FAC_RECR  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven North recreational facilities (m$^4$)
A_GFA_16H_P4_HZ_N_FAC_CAT  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven North catering industry facilities (m$^4$)
A_GFA_16H_P4_HZ_N_FAC_HOT  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven North hotel facilities (m$^4$)
A_GFA_16H_P4_HZ_N_FAC_RET  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven North retail facilities (m$^4$)
A_GFA_16H_P4_HZ_N_FAC_TRANS  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven North transferee facilities (m$^4$)

D 4.2.2 Exogenous variables

a_da_16h_hz  Total development area Park Zestienhoven Hoog-Zestienhoven (612,900m$^4$)

a_gfa_16h_p4_hz_s_ind  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven South industrial (0m$^4$)

a_gfa_16h_p4_hz_s_off  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven South offices (50,000m$^4$)

a_gfa_16h_p4_hz_s_fac_comm  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven South communal facilities (0m$^4$)

a_gfa_16h_p4_hz_s_fac_recr  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven South recreational facilities (0m$^4$)

a_gfa_16h_p4_hz_s_fac_cat  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven South catering industry facilities (0m$^4$)

a_gfa_16h_p4_hz_s_fac_hot  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven South hotel facilities (0m$^4$)

a_gfa_16h_p4_hz_s_fac_ret  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven South retail facilities (0m$^4$)

a_gfa_16h_p4_hz_s_fac_trans  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven South transferee facilities (0m$^4$)

a_res_16h_hz  Total floor area Park Zestienhoven Hoog-Zestienhoven residence (80m$^4$)

p_a_16h_hz_s  Percentage area Park Zestienhoven Hoog-Zestienhoven South (40%)

n_res_16h_p4_hz_s  Total number of residences Park Zestienhoven phase 4 Hoog-Zestienhoven South (0)

a_gfa_16h_p4_hz_n_ind  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven North industrial (0m$^4$)

a_gfa_16h_p4_hz_n_off  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven North offices (150,000m$^4$)

a_gfa_16h_p4_hz_n_fac_comm  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven North communal facilities (0m$^4$)

a_gfa_16h_p4_hz_n_fac_recr  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven North recreational facilities (0m$^4$)

a_gfa_16h_p4_hz_n_fac_cat  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven North catering industry facilities (0m$^4$)

a_gfa_16h_p4_hz_n_fac_hot  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven North hotel facilities (0m$^4$)
a_gfa_16h_p4_hz_n_fac_ret  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven North retail facilities (0m²)
a_gfa_16h_p4_hz_n_fac_trans  Total gross floor area Park Zestienhoven phase 4 Hoog-Zestienhoven North transferee facilities (0m²)

p_a_16h_hz_n  Percentage area Park Zestienhoven Hoog-Zestiehoven North (60%)
n_floors_16h_hz_ind  Total number of floors Hoog-Zestienhoven industrial (1)
n_floors_16h_hz_n_ind  Total number of floors Hoog-Zestienhoven non-industrial (6)

D 4.2.3 Constraints

\[ A_{DA\_16H\_P4\_HZ} = a_{da\_16h\_hz} \]
\[ A_{DA\_16H\_P4\_HZ\_S} = A_{DA\_16H\_P4\_HZ} \cdot p_a_{16h\_hz\_s} \]
\[ A_{DA\_16H\_P4\_HZ\_S} = A_{DA\_16H\_P4\_HZ\_S\_BOA} + A_{DA\_16H\_P4\_HZ\_S\_G\_W} + A_{DA\_16H\_P4\_HZ\_S\_PAV} \]

\[ A_{DA\_16H\_P4\_HZ\_S\_BOA} = A_{DA\_16H\_P4\_HZ\_S\_BOA\_HYB} + A_{DA\_16H\_P4\_HZ\_S\_BOA\_IND} + A_{DA\_16H\_P4\_HZ\_S\_BOA\_OFF} + A_{DA\_16H\_P4\_HZ\_S\_BOA\_FAC\_TOT} \]
\[ A_{DA\_16H\_P4\_HZ\_S\_BOA\_HYB} = A_{GFA\_16H\_P4\_HZ\_S\_HYB} \cdot \left(\frac{1}{n_{floors\_16h\_hz\_n\_ind}}\right) \]
\[ A_{DA\_16H\_P4\_HZ\_S\_BOA\_IND} = A_{GFA\_16H\_P4\_HZ\_S\_IND} \cdot \left(\frac{1}{n_{floors\_16h\_hz\_ind}}\right) \]
\[ A_{DA\_16H\_P4\_HZ\_S\_BOA\_OFF} = A_{GFA\_16H\_P4\_HZ\_S\_OFF} \cdot \left(\frac{1}{n_{floors\_16h\_hz\_n\_ind}}\right) \]

\[ A_{DA\_16H\_P4\_HZ\_S\_BOA\_FAC\_TOT} = A_{DA\_16H\_P4\_HZ\_S\_BOA\_FAC\_RECR} + A_{DA\_16H\_P4\_HZ\_S\_BOA\_FAC\_TRANS} \]
\[ A_{DA\_16H\_P4\_HZ\_S\_BOA\_FAC\_RECR} = A_{GFA\_16H\_P4\_HZ\_S\_FAC\_RECR} \cdot \left(\frac{1}{n_{floors\_16h\_hz\_n\_ind}}\right) \]
\[ A_{DA\_16H\_P4\_HZ\_S\_BOA\_FAC\_TRANS} = A_{GFA\_16H\_P4\_HZ\_S\_FAC\_TRANS} \cdot \left(\frac{1}{n_{floors\_16h\_hz\_n\_ind}}\right) \]

\[ A_{DA\_16H\_P4\_HZ\_S\_PAV} = A_{DA\_16H\_P4\_HZ\_S} \cdot p_{pav\_16h} \]
\[ A_{GFA\_16H\_P4\_HZ\_S\_TOT} = A_{GFA\_16H\_P4\_HZ\_S\_IND} + A_{GFA\_16H\_P4\_HZ\_S\_OFF} + A_{GFA\_16H\_P4\_HZ\_S\_HYB} + A_{GFA\_16H\_P4\_HZ\_S\_FAC\_RECR} + A_{GFA\_16H\_P4\_HZ\_S\_FAC\_HOT} + A_{GFA\_16H\_P4\_HZ\_S\_FAC\_TRANS} \]
\[ A_{GFA\_16H\_P4\_HZ\_S\_IND} \leq a_{gfa\_16h\_p4\_hz\_s\_ind} \]
\[ A_{GFA\_16H\_P4\_HZ\_S\_OFF} \leq a_{gfa\_16h\_p4\_hz\_s\_off} \]
\[ A_{GFA\_16H\_P4\_HZ\_S\_HYB} = A_{GFA\_16H\_P4\_HZ\_S\_HYB\_RES} + A_{GFA\_16H\_P4\_HZ\_S\_HYB\_FAC\_TOT} \]
\[ A_{GFA\_16H\_P4\_HZ\_S\_HYB\_RES} = N_{RES\_16H\_P4\_HZ\_S} \cdot a_{res\_16h\_hz} \]
\[ A_{GFA\_16H\_P4\_HZ\_S\_HYB\_FAC\_TOT} = A_{GFA\_16H\_P4\_HZ\_S\_HYB\_FAC\_COMM} + A_{GFA\_16H\_P4\_HZ\_S\_HYB\_FAC\_CAT} + A_{GFA\_16H\_P4\_HZ\_S\_HYB\_FAC\_RET} \]
\[ A_{GFA\_16H\_P4\_HZ\_S\_HYB\_FAC\_COMM} \leq a_{gfa\_16h\_p4\_hz\_s\_fac\_comm} \]
\[ A_{GFA\_16H\_P4\_HZ\_S\_HYB\_FAC\_CAT} \leq a_{gfa\_16h\_p4\_hz\_s\_fac\_cat} \]
\[ A_{GFA\_16H\_P4\_HZ\_S\_HYB\_FAC\_RET} \leq a_{gfa\_16h\_p4\_hz\_s\_fac\_ret} \]

A_{GFA\_16H\_P4\_HZ\_S\_FAC\_RECR} \leq a_{gfa\_16h\_p4\_hz\_s\_fac\_recr}
\[ A_{GFA\_16H\_P4\_HZ\_S\_FAC\_HOT} \leq a_{gfa\_16h\_p4\_hz\_s\_fac\_hot} \]
\[ A_{GFA\_16H\_P4\_HZ\_S\_FAC\_TRANS} \leq a_{gfa\_16h\_p4\_hz\_s\_fac\_trans} \]

\[ N_{RES\_16H\_P4\_HZ\_S} \leq n_{res\_16h\_p4\_hz\_s} \]

\[ A_{DA\_16H\_P4\_HZ\_N} = A_{DA\_16H\_P4\_HZ} * p_{a\_16h\_hz\_n} \]
\[ A_{DA\_16H\_P4\_HZ\_N} = A_{DA\_16H\_P4\_HZ\_N\_BOA} + A_{DA\_16H\_P4\_HZ\_N\_G\_W} + A_{DA\_16H\_P4\_HZ\_N\_PAV} \]
\[ A_{DA\_16H\_P4\_HZ\_N\_BOA} = A_{DA\_16H\_P4\_HZ\_N\_BOA\_IND} + A_{DA\_16H\_P4\_HZ\_N\_BOA\_OFF} + A_{DA\_16H\_P4\_HZ\_N\_BOA\_FAC\_TOT} \]

\[ A_{DA\_16H\_P4\_HZ\_N\_BOA\_IND} = A_{GFA\_16H\_P4\_HZ\_N\_IND} * \left(\frac{1}{n_{floors\_16h\_hz\_ind}}\right) \]
\[ A_{DA\_16H\_P4\_HZ\_N\_BOA\_OFF} = A_{GFA\_16H\_P4\_HZ\_N\_OFF} * \left(\frac{1}{n_{floors\_16h\_hz\_n\_ind}}\right) \]

\[ A_{DA\_16H\_P4\_HZ\_N\_BOA\_FAC\_TOT} = A_{DA\_16H\_P4\_HZ\_N\_BOA\_FAC\_COMM} + A_{DA\_16H\_P4\_HZ\_N\_BOA\_FAC\_RECR} + A_{DA\_16H\_P4\_HZ\_N\_BOA\_FAC\_CAT} + A_{DA\_16H\_P4\_HZ\_N\_BOA\_FAC\_HOT} + A_{DA\_16H\_P4\_HZ\_N\_BOA\_FAC\_RET} + A_{DA\_16H\_P4\_HZ\_N\_BOA\_FAC\_TRANS} \]

\[ A_{DA\_16H\_P4\_HZ\_N\_BOA\_FAC\_COMM} = A_{GFA\_16H\_P4\_HZ\_N\_FAC\_COMM} * \left(\frac{1}{n_{floors\_16h\_hz\_n\_ind}}\right) \]
\[ A_{DA\_16H\_P4\_HZ\_N\_BOA\_FAC\_RECR} = A_{GFA\_16H\_P4\_HZ\_N\_FAC\_RECR} * \left(\frac{1}{n_{floors\_16h\_hz\_n\_ind}}\right) \]
\[ A_{DA\_16H\_P4\_HZ\_N\_BOA\_FAC\_CAT} = A_{GFA\_16H\_P4\_HZ\_N\_FAC\_CAT} * \left(\frac{1}{n_{floors\_16h\_hz\_n\_ind}}\right) \]
\[ A_{DA\_16H\_P4\_HZ\_N\_BOA\_FAC\_HOT} = A_{GFA\_16H\_P4\_HZ\_N\_FAC\_HOT} * \left(\frac{1}{n_{floors\_16h\_hz\_n\_ind}}\right) \]
\[ A_{DA\_16H\_P4\_HZ\_N\_BOA\_FAC\_RET} = A_{GFA\_16H\_P4\_HZ\_N\_FAC\_RET} * \left(\frac{1}{n_{floors\_16h\_hz\_n\_ind}}\right) \]
\[ A_{DA\_16H\_P4\_HZ\_N\_BOA\_FAC\_TRANS} = A_{GFA\_16H\_P4\_HZ\_N\_FAC\_TRANS} * \left(\frac{1}{n_{floors\_16h\_hz\_n\_ind}}\right) \]

\[ A_{DA\_16H\_P4\_HZ\_N\_PAV} = A_{DA\_16H\_P4\_HZ\_N} * p_{pav\_16h} \]

\[ A_{GFA\_16H\_P4\_HZ\_N\_TOT} = A_{GFA\_16H\_P4\_HZ\_N\_IND} + A_{GFA\_16H\_P4\_HZ\_N\_OFF} + A_{GFA\_16H\_P4\_HZ\_N\_FAC\_TOT} \]

\[ A_{GFA\_16H\_P4\_HZ\_N\_IND} \leq a_{gfa\_16h\_p4\_hz\_n\_ind} \]
\[ A_{GFA\_16H\_P4\_HZ\_N\_OFF} \leq a_{gfa\_16h\_p4\_hz\_n\_off} \]

\[ A_{GFA\_16H\_P4\_HZ\_N\_FAC\_TOT} = A_{GFA\_16H\_P4\_HZ\_N\_FAC\_COMM} + A_{GFA\_16H\_P4\_HZ\_N\_FAC\_RECR} + A_{GFA\_16H\_P4\_HZ\_N\_FAC\_CAT} + A_{GFA\_16H\_P4\_HZ\_N\_FAC\_HOT} + A_{GFA\_16H\_P4\_HZ\_N\_FAC\_RET} + A_{GFA\_16H\_P4\_HZ\_N\_FAC\_TRANS} \]

\[ A_{GFA\_16H\_P4\_HZ\_N\_FAC\_COMM} \leq a_{gfa\_16h\_p4\_hz\_n\_fac\_comm} \]
\[ A_{GFA\_16H\_P4\_HZ\_N\_FAC\_RECR} \leq a_{gfa\_16h\_p4\_hz\_n\_fac\_recr} \]
\[ A_{GFA\_16H\_P4\_HZ\_N\_FAC\_CAT} \leq a_{gfa\_16h\_p4\_hz\_n\_fac\_cat} \]
\[ A_{GFA\_16H\_P4\_HZ\_N\_FAC\_HOT} \leq a_{gfa\_16h\_p4\_hz\_n\_fac\_hot} \]
\[ A_{GFA\_16H\_P4\_HZ\_N\_FAC\_RET} \leq a_{gfa\_16h\_p4\_hz\_n\_fac\_ret} \]
\[ A_{GFA\_16H\_P4\_HZ\_N\_FAC\_TRANS} \leq a_{gfa\_16h\_p4\_hz\_n\_fac\_trans} \]
Appendix E Variables and constraints derived from optimisation focuses

This section describes how these constraints are derived and implemented in the Linear Programming model.

E 1 Market quality

E 1.1 Industrial space Rotterdam Noordrand

Table E.1 Assumed maximum of BOA industrial space in Rotterdam Noordrand, translated according to the phasing plan

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total of industrial</td>
<td>369,000</td>
<td>266,500</td>
<td>164,000</td>
<td>164,000</td>
</tr>
<tr>
<td>space Rotterdam</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noordrand</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum share of</td>
<td>184,500</td>
<td>133,300</td>
<td>82,000</td>
<td>82,000</td>
</tr>
<tr>
<td>built-on area</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The derived endogenous variables are:

A_BOA_TOT_P1_IND Total Built-on Area Rotterdam Noordrand phase 1 industrial functions realized (m²)
A_BOA_TOT_P2_IND Total Built-on Area Rotterdam Noordrand phase 2 industrial functions realized (m²)
A_BOA_TOT_P3_IND Total Built-on Area Rotterdam Noordrand phase 3 industrial functions realized (m²)
A_BOA_TOT_P4_IND Total Built-on Area Rotterdam Noordrand phase 4 industrial functions realized (m²)

The derived exogenous variables are:

a_boa_tot_p1_ind Total Built-on Area Rotterdam Noordrand phase 1 industrial functions (184,500m²)
a_boa_tot_p2_ind Total Built-on Area Rotterdam Noordrand phase 2 industrial functions (133,300m²)
a_boa_tot_p3_ind Total Built-on Area Rotterdam Noordrand phase 3 industrial functions (82,000m²)
a_boa_tot_p4_ind Total Built-on Area Rotterdam Noordrand phase 4 industrial functions (82,000m²)
The presence of the word ‘maximum’ identifies the relation between these variables as the endogenous variable being smaller than or equal to the exogenous variable:

\[ A_{BOA\_TOT\_P1\_IND} \leq a_{boa\_tot\_p1\_ind} \]
\[ A_{BOA\_TOT\_P2\_IND} \leq a_{boa\_tot\_p2\_ind} \]
\[ A_{BOA\_TOT\_P3\_IND} \leq a_{boa\_tot\_p3\_ind} \]
\[ A_{BOA\_TOT\_P4\_IND} \leq a_{boa\_tot\_p4\_ind} \]

E 1.2 Office space Rotterdam Noordrand

Table E.2 Assumption of the share of office space in Rotterdam Noordrand translated according to the phasing plan

<table>
<thead>
<tr>
<th>Demand phase</th>
<th>Demand phase</th>
<th>Demand phase</th>
<th>Demand phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total of office space Rotterdam</td>
<td>800,000</td>
<td>800,000</td>
<td>800,000</td>
</tr>
<tr>
<td>Minimum share of Rotterdam Noordrand (10%)</td>
<td>80,000</td>
<td>80,000</td>
<td>80,000</td>
</tr>
<tr>
<td>Maximum share of Rotterdam Noordrand (15%)</td>
<td>120,000</td>
<td>120,000</td>
<td>120,000</td>
</tr>
</tbody>
</table>

The derived endogenous variables are:

- **A_GFA_TOT_P1_OFF**: Total Gross Floor Area Rotterdam Noordrand phase 1 offices realized (m²)
- **A_GFA_TOT_P2_OFF**: Total Gross Floor Area Rotterdam Noordrand phase 2 offices realized (m²)
- **A_GFA_TOT_P3_OFF**: Total Gross Floor Area Rotterdam Noordrand phase 3 offices realized (m²)
- **A_GFA_TOT_P4_OFF**: Total Gross Floor Area Rotterdam Noordrand phase 4 offices realized (m²)

The derived exogenous variables are:

- **a_gfa_tot_p1_ind_min**: Total Gross Floor Area Rotterdam Noordrand phase 1 offices (80,000m²)
- **a_gfa_tot_p1_ind_max**: Total Gross Floor Area Rotterdam Noordrand phase 1 offices (120,000m²)
The presence of the words ‘minimum’ and ‘maximum’ identifies the relation between these variables as the endogenous variable being in some cases bigger or equal to, and in some cases smaller than or equal to the exogenous variable:

\[
\begin{align*}
\text{a}_g\text{fa}_\text{tot}_\text{p1}_\text{ind}_\text{min} & \leq \text{A}_\text{GFA}_\text{TOT}_\text{P1}_\text{OFF} \leq \text{a}_g\text{fa}_\text{tot}_\text{p1}_\text{ind}_\text{max} \\
\text{a}_g\text{fa}_\text{tot}_\text{p2}_\text{ind}_\text{min} & \leq \text{A}_\text{GFA}_\text{TOT}_\text{P2}_\text{OFF} \leq \text{a}_g\text{fa}_\text{tot}_\text{p2}_\text{ind}_\text{max} \\
\text{a}_g\text{fa}_\text{tot}_\text{p3}_\text{ind}_\text{min} & \leq \text{A}_\text{GFA}_\text{TOT}_\text{P3}_\text{OFF} \leq \text{a}_g\text{fa}_\text{tot}_\text{p3}_\text{ind}_\text{max} \\
\text{a}_g\text{fa}_\text{tot}_\text{p4}_\text{ind}_\text{min} & \leq \text{A}_\text{GFA}_\text{TOT}_\text{P4}_\text{OFF} \leq \text{a}_g\text{fa}_\text{tot}_\text{p4}_\text{ind}_\text{max}
\end{align*}
\]

E 1.3 Space for centre-like facilities Rotterdam Noordrand

Table E.3 Assumption of the share of facility-types per centre-like facility-cluster in Rotterdam Noordrand

This table corresponds with table 6.5 of the thesis

<table>
<thead>
<tr>
<th>Total facilities</th>
<th>23,500m² GFA</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communal facilities</td>
<td>15,000m² GFA</td>
<td>65%</td>
</tr>
<tr>
<td>Recreational facilities</td>
<td>5,000m² GFA</td>
<td>20%</td>
</tr>
<tr>
<td>Catering industry facilities</td>
<td>2,500m² GFA</td>
<td>10%</td>
</tr>
<tr>
<td>Retail facilities</td>
<td>1,000m² GFA</td>
<td>5%</td>
</tr>
</tbody>
</table>

The derived endogenous variables concerning the central place are:

\text{A}_\text{GFA}_\text{CENTRAL}_\text{EC}_\text{TOT} \quad \text{Total Gross Floor Area central place Rotterdam Noordrand economic functions realized (m²)}

\text{A}_\text{GFA}_\text{CENTRAL}_\text{FAC}_\text{TOT} \quad \text{Total Gross Floor Area central place Rotterdam Noordrand facilities realized (m²)}

\text{A}_\text{GFA}_\text{CENTRAL}_\text{FAC}_\text{COMM} \quad \text{Total Gross Floor Area central place Rotterdam Noordrand communal facilities realized (m²)}
The derived exogenous variables concerning the central place are:

- \( A_{GFA\_CENTRAL\_FAC\_RECR} \) Total Gross Floor Area central place Rotterdam Noordrand recreational facilities realized (m²)
- \( A_{GFA\_CENTRAL\_FAC\_CAT} \) Total Gross Floor Area central place Rotterdam Noordrand catering industry facilities realized (m²)
- \( A_{GFA\_CENTRAL\_FAC\_RET} \) Total Gross Floor Area central place Rotterdam Noordrand retail facilities realized (m²)
- \( A_{GFA\_CENTRAL\_FAC\_HOT} \) Total Gross Floor Area central place Rotterdam Noordrand hotel facilities realized (m²)

The following constraints concerning the central place determine the relation between the endogenous- and exogenous variables:

\[
A_{GFA\_CENTRAL\_EC\_TOT} = A_{GFA\_CENTRAL\_IND\_TOT} + A_{GFA\_CENTRAL\_OFF\_TOT}
\]

\[
A_{GFA\_CENTRAL\_FAC\_TOT} - (p_{gfa\_central\_fac\_tot} \times A_{GFA\_CENTRAL\_EC\_TOT}) = 0
\]

\[
A_{GFA\_CENTRAL\_FAC\_COMM} - (p_{gfa\_central\_fac\_comm} \times A_{GFA\_CENTRAL\_FAC\_TOT}) = 0
\]

\[
A_{GFA\_CENTRAL\_FAC\_RECR} - (p_{gfa\_central\_fac\_recr} \times A_{GFA\_CENTRAL\_FAC\_TOT}) = 0
\]

\[
A_{GFA\_CENTRAL\_FAC\_CAT} - (p_{gfa\_central\_fac\_cat} \times A_{GFA\_CENTRAL\_FAC\_TOT}) = 0
\]

\[
A_{GFA\_CENTRAL\_FAC\_RET} - (p_{gfa\_central\_fac\_ret} \times A_{GFA\_CENTRAL\_FAC\_TOT}) = 0
\]

\[
A_{GFA\_CENTRAL\_FAC\_HOT} = a_{gfa\_central\_fac\_hotel}
\]
E 2 Spatial quality

Table E.4 Assumed GSI and FSI for the sub-areas of Rotterdam Noordrand
This table corresponds with table 6.7 of the thesis

<table>
<thead>
<tr>
<th>Area</th>
<th>GSI</th>
<th>Maximum Floor Space Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science &amp; business park Schieveen phase 1</td>
<td>0.35</td>
<td>0.80</td>
</tr>
<tr>
<td>Science &amp; business park Schieveen phase 1</td>
<td>0.35</td>
<td>0.80</td>
</tr>
<tr>
<td>Science &amp; business park Schieveen phase 1</td>
<td>0.35</td>
<td>0.80</td>
</tr>
<tr>
<td>Science &amp; business park Schieveen phase 1</td>
<td>0.35</td>
<td>0.80</td>
</tr>
<tr>
<td>Rotterdam Airport Business Park Landzijde</td>
<td>0.35</td>
<td>0.80</td>
</tr>
<tr>
<td>Park Zestienhoven Hoog-Zestienhoven South</td>
<td>0.45</td>
<td>0.80</td>
</tr>
<tr>
<td>Park Zestienhoven Hoog-Zestienhoven North</td>
<td>0.45</td>
<td>0.80</td>
</tr>
</tbody>
</table>

The constraints are directly made with the use of the existing endogenous variables in the Linear Programming model. The GSI and FSI values can be denoted as exogenous variables (in percentages).

The derived exogenous variables are:

- \texttt{p gsi sch p1 max} Maximum percentage GSI Schieveen phase 1 realized (35%)
- \texttt{p gsi sch p2 max} Maximum percentage GSI Schieveen phase 2 realized (35%)
- \texttt{p gsi sch p3 max} Maximum percentage GSI Schieveen phase 3 realized (35%)
- \texttt{p gsi sch p4 max} Maximum percentage GSI Schieveen phase 4 realized (35%)
- \texttt{p gsi rtm land max} Maximum percentage GSI Rotterdam Airport Business Park phase 4 realized (35%)
- \texttt{p gsi 16h hz s max} Maximum percentage GSI Hoog-Zestienhoven South realized (45%)
- \texttt{p gsi 16h hz n max} Maximum percentage GSI Hoog-Zestienhoven North realized (45%)

- \texttt{p fsi sch p1 max} Maximum percentage FSI Schieveen phase 1 realized (80%)
- \texttt{p fsi sch p2 max} Maximum percentage FSI Schieveen phase 2 realized (80%)
- \texttt{p fsi sch p3 max} Maximum percentage FSI Schieveen phase 3 realized (80%)
\begin{align*}
  p_{\text{fsi}\_\text{sch}\_\text{p4}\_\text{max}} & \quad \text{Maximum percentage FSI Schieveen phase 4 realized (80\%)} \\
  p_{\text{fsi}\_\text{rtm}\_\text{land}\_\text{max}} & \quad \text{Maximum percentage FSI Rotterdam Airport Business Park phase 4 realized (80\%)} \\
  p_{\text{fsi}\_\text{16h}\_\text{hz}\_\text{s}\_\text{max}} & \quad \text{Maximum percentage FSI Hoog-Zestienhoven South realized (80\%)} \\
  p_{\text{fsi}\_\text{16h}\_\text{hz}\_\text{n}\_\text{max}} & \quad \text{Maximum percentage FSI Hoog-Zestienhoven North realized (80\%)} \\

  \text{The presence of the word 'maximum' identifies the relation between these variables:} \\
  A_{\text{BOA}\_\text{SCH}\_\text{P1}} - (p_{\text{gsi}\_\text{sch}\_\text{p1}\_\text{max}} \times A_{\text{DA}\_\text{SCH}\_\text{P1}}) \leq 0 \\
  A_{\text{BOA}\_\text{SCH}\_\text{P2}} - (p_{\text{gsi}\_\text{sch}\_\text{p2}\_\text{max}} \times A_{\text{DA}\_\text{SCH}\_\text{P2}}) \leq 0 \\
  A_{\text{BOA}\_\text{SCH}\_\text{P3}} - (p_{\text{gsi}\_\text{sch}\_\text{p3}\_\text{max}} \times A_{\text{DA}\_\text{SCH}\_\text{P3}}) \leq 0 \\
  A_{\text{BOA}\_\text{SCH}\_\text{P4}} - (p_{\text{gsi}\_\text{sch}\_\text{p4}\_\text{max}} \times A_{\text{DA}\_\text{SCH}\_\text{P4}}) \leq 0 \\
  A_{\text{BOA}\_\text{RTM}\_\text{LAND}} - (p_{\text{gsi}\_\text{rtm}\_\text{land}\_\text{max}} \times A_{\text{DA}\_\text{RTM}\_\text{LAND}}) \leq 0 \\
  A_{\text{BOA}\_\text{16H}\_\text{HZ}\_\text{S}} - (p_{\text{gsi}\_\text{16h}\_\text{hz}\_\text{s}\_\text{max}} \times A_{\text{DA}\_\text{16H}\_\text{HZ}\_\text{S}}) \leq 0 \\
  A_{\text{BOA}\_\text{16H}\_\text{HZ}\_\text{N}} - (p_{\text{gsi}\_\text{16h}\_\text{hz}\_\text{n}\_\text{max}} \times A_{\text{DA}\_\text{16H}\_\text{HZ}\_\text{N}}) \leq 0 \\

  A_{\text{GFA}\_\text{SCH}\_\text{P1}} - (p_{\text{fsi}\_\text{sch}\_\text{p1}\_\text{max}} \times A_{\text{DA}\_\text{SCH}\_\text{P1}}) \leq 0 \\
  A_{\text{GFA}\_\text{SCH}\_\text{P2}} - (p_{\text{fsi}\_\text{sch}\_\text{p2}\_\text{max}} \times A_{\text{DA}\_\text{SCH}\_\text{P2}}) \leq 0 \\
  A_{\text{GFA}\_\text{SCH}\_\text{P3}} - (p_{\text{fsi}\_\text{sch}\_\text{p3}\_\text{max}} \times A_{\text{DA}\_\text{SCH}\_\text{P3}}) \leq 0 \\
  A_{\text{GFA}\_\text{SCH}\_\text{P4}} - (p_{\text{fsi}\_\text{sch}\_\text{p4}\_\text{max}} \times A_{\text{DA}\_\text{SCH}\_\text{P4}}) \leq 0 \\
  A_{\text{GFA}\_\text{RTM}\_\text{LAND}} - (p_{\text{fsi}\_\text{rtm}\_\text{land}\_\text{max}} \times A_{\text{DA}\_\text{RTM}\_\text{LAND}}) \leq 0 \\
  A_{\text{GFA}\_\text{16H}\_\text{HZ}\_\text{S}} - (p_{\text{fsi}\_\text{16h}\_\text{hz}\_\text{s}\_\text{max}} \times A_{\text{DA}\_\text{16H}\_\text{HZ}\_\text{S}}) \leq 0 \\
  A_{\text{GFA}\_\text{16H}\_\text{HZ}\_\text{N}} - (p_{\text{fsi}\_\text{16h}\_\text{hz}\_\text{n}\_\text{max}} \times A_{\text{DA}\_\text{16H}\_\text{HZ}\_\text{N}}) \leq 0
\end{align*}
E 3 Means

Table E.5 Transaction-prices per function in the municipality of Rotterdam
This table corresponds with table 6.8 of the thesis

<table>
<thead>
<tr>
<th>Function</th>
<th>Land-price in € per m² GFA that will be realized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial function</td>
<td>190</td>
</tr>
<tr>
<td>Office function</td>
<td>600*</td>
</tr>
<tr>
<td>Communal facilities</td>
<td>195</td>
</tr>
<tr>
<td>Recreational facilities</td>
<td>300*</td>
</tr>
<tr>
<td>Catering industry facilities</td>
<td>450</td>
</tr>
<tr>
<td>Hotel facilities</td>
<td>290</td>
</tr>
<tr>
<td>Retail facilities</td>
<td>450</td>
</tr>
<tr>
<td>Airport-supporting facilities</td>
<td>195*</td>
</tr>
<tr>
<td>Residences</td>
<td>275</td>
</tr>
</tbody>
</table>

The derived endogenous variables are:

- **R_IND_TOT**: Total revenues industrial function realized (€)
- **R_OFF_TOT**: Total revenues offices realized (€)
- **R_FAC_COMM_TOT**: Total revenues communal facilities realized (€)
- **R_FAC_RECR_TOT**: Total revenues recreational facilities realized (€)
- **R_FAC_CAT_TOT**: Total revenues catering industry facilities realized (€)
- **R_FAC_HOT_TOT**: Total revenues hotel facilities realized (€)
- **R_FAC_RET_TOT**: Total revenues retail facilities realized (€)
- **R_FAC_AIR_TOT**: Total revenues airport supporting facilities realized (€)
- **R_TOT**: Total revenues Rotterdam Noordrand realized (€)

The derived exogenous variables are:

- **r_ind**: Revenues industrial function realized (€190/m² GFA)
- **r_off**: Revenues offices realized (€600/m² GFA)
- **r_fac_comm**: Revenues communal facilities realized (€195/m² GFA)
- **r_fac_recr**: Revenues recreational facilities realized (€300/m² GFA)

---

5 The office locations of Rotterdam Noordrand may be compared with the office location Brainpark which land-prices are valued between 590 and 605 €/m² GFA (Ontwikkelingsbedrijf Rotterdam 2008, p. 9).

6 The assumption for the transaction-price of recreational facilities is positioned between the transaction-prices of communal- and retail facilities.

7 These are assumed to be equal to the land-price of communal facilities.
r_fac_cat  Revenues catering industry facilities realized (€450/m² GFA)

r_fac_hot  Revenues hotel facilities realized (€290/m² GFA)

r_fac_ret  Revenues retail facilities realized (€450/m² GFA)

r_fac_air  Revenues airport supporting facilities realized (€195/m² GFA)

The following relations between these variables can be identified:

\[
\begin{align*}
R_{\text{IND}_\text{TOT}} &= r_{\text{ind}} \times A_{GFA_{\text{IND}_\text{TOT}}} \\
R_{\text{OFF}_\text{TOT}} &= r_{\text{off}} \times A_{GFA_{\text{OFF}_\text{TOT}}} \\
R_{\text{FAC}_\text{COMM}_\text{TOT}} &= r_{\text{fac}_\text{comm}} \times A_{GFA_{\text{FAC}_\text{COMM}_\text{TOT}}} \\
R_{\text{FAC}_\text{RECR}_\text{TOT}} &= r_{\text{fac}_\text{recr}} \times A_{GFA_{\text{FAC}_\text{RECR}_\text{TOT}}} \\
R_{\text{FAC}_\text{CAT}_\text{TOT}} &= r_{\text{fac}_\text{cat}} \times A_{GFA_{\text{FAC}_\text{CAT}_\text{TOT}}} \\
R_{\text{FAC}_\text{HOT}_\text{TOT}} &= r_{\text{fac}_\text{hot}} \times A_{GFA_{\text{FAC}_\text{HOT}_\text{TOT}}} \\
R_{\text{FAC}_\text{RET}_\text{TOT}} &= r_{\text{fac}_\text{ret}} \times A_{GFA_{\text{FAC}_\text{RET}_\text{TOT}}} \\
R_{\text{FAC}_\text{AIR}_\text{TOT}} &= r_{\text{fac}_\text{air}} \times A_{GFA_{\text{FAC}_\text{AIR}_\text{TOT}}} \\
R_{\text{TOT}} &= R_{\text{IND}_\text{TOT}} + R_{\text{OFF}_\text{TOT}} + R_{\text{FAC}_\text{COMM}_\text{TOT}} + R_{\text{FAC}_\text{RECR}_\text{TOT}} + R_{\text{FAC}_\text{CAT}_\text{TOT}} + R_{\text{FAC}_\text{HOT}_\text{TOT}} + R_{\text{FAC}_\text{RET}_\text{TOT}} + R_{\text{FAC}_\text{AIR}_\text{TOT}}
\end{align*}
\]
Appendix F Preference identification for stakeholders 1 & 2

### Preferences stakeholder 1

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>F1: industrial function</td>
<td>1.2 1.1 1.1</td>
<td>1.2 1.1 1.1</td>
<td>1.2 1.1 1.1</td>
<td>1.2 1.1 1.1</td>
</tr>
<tr>
<td>F2: offices</td>
<td>0.1 1.1 1.1</td>
<td>0.1 1.1 1.1</td>
<td>0.1 1.1 1.1</td>
<td>0.1 1.1 1.1</td>
</tr>
<tr>
<td>F3: communal facilities</td>
<td>0.0 2.1 1.1</td>
<td>0.2 2.1 1.1</td>
<td>1.1 1.1 1.1</td>
<td>1.1 1.1 1.1</td>
</tr>
<tr>
<td>F4: recreational facilities</td>
<td>0.0 1.1 1.1</td>
<td>0.0 1.1 1.1</td>
<td>1.1 1.1 1.1</td>
<td>1.1 1.1 1.1</td>
</tr>
<tr>
<td>F5: catering industry facilities</td>
<td>0.0 1.1 1.1</td>
<td>0.2 2.1 1.1</td>
<td>1.1 1.1 1.1</td>
<td>1.1 1.1 1.1</td>
</tr>
<tr>
<td>F6: hotel facilities</td>
<td>0.0 2.1 1.1</td>
<td>1.0 1.1 1.1</td>
<td>1.1 1.1 1.1</td>
<td>1.1 1.1 1.1</td>
</tr>
<tr>
<td>F7: retail facilities</td>
<td>0.0 1.1 1.1</td>
<td>0.0 1.1 1.1</td>
<td>1.1 1.1 1.1</td>
<td>1.1 1.1 1.1</td>
</tr>
<tr>
<td>F8: transport facilities</td>
<td>0.0 1.1 1.1</td>
<td>0.0 1.1 1.1</td>
<td>1.1 1.1 1.1</td>
<td>1.1 1.1 1.1</td>
</tr>
<tr>
<td>F9: airport supporting facilities</td>
<td>0.0 2.1 1.1</td>
<td>0.0 2.1 1.1</td>
<td>1.0 1.1 1.1</td>
<td>1.0 1.1 1.1</td>
</tr>
<tr>
<td>F10: residences</td>
<td>0.0 0.2 1.1</td>
<td>0.0 0.2 1.1</td>
<td>0.2 0.1 1.1</td>
<td>0.2 0.1 1.1</td>
</tr>
</tbody>
</table>

### Preferences stakeholder 2

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>F1: industrial function</td>
<td>1.1 2.1 1.1</td>
<td>1.1 2.1 1.1</td>
<td>1.1 2.1 1.1</td>
<td>1.1 2.1 1.1</td>
</tr>
<tr>
<td>F2: offices</td>
<td>1.1 2.1 1.1</td>
<td>1.1 2.1 1.1</td>
<td>1.1 2.1 1.1</td>
<td>1.1 2.1 1.1</td>
</tr>
<tr>
<td>F3: communal facilities</td>
<td>1.0 0.1 1.1</td>
<td>1.0 0.1 1.1</td>
<td>1.1 1.1 1.1</td>
<td>1.1 1.1 1.1</td>
</tr>
<tr>
<td>F4: recreational facilities</td>
<td>1.0 0.1 1.1</td>
<td>1.0 0.1 1.1</td>
<td>1.1 1.1 1.1</td>
<td>1.1 1.1 1.1</td>
</tr>
<tr>
<td>F5: catering industry facilities</td>
<td>1.0 0.1 1.1</td>
<td>1.0 0.1 1.1</td>
<td>1.1 1.1 1.1</td>
<td>1.1 1.1 1.1</td>
</tr>
<tr>
<td>F6: hotel facilities</td>
<td>1.0 2.1 1.1</td>
<td>1.0 2.1 1.1</td>
<td>1.1 1.1 1.1</td>
<td>1.1 1.1 1.1</td>
</tr>
<tr>
<td>F7: retail facilities</td>
<td>1.0 2.1 1.1</td>
<td>1.0 2.1 1.1</td>
<td>1.1 1.1 1.1</td>
<td>1.1 1.1 1.1</td>
</tr>
<tr>
<td>F8: transport facilities</td>
<td>1.0 0.1 1.1</td>
<td>1.0 0.1 1.1</td>
<td>1.1 1.1 1.1</td>
<td>1.1 1.1 1.1</td>
</tr>
<tr>
<td>F9: airport supporting facilities</td>
<td>1.0 0.1 1.1</td>
<td>1.0 0.1 1.1</td>
<td>1.1 1.1 1.1</td>
<td>1.1 1.1 1.1</td>
</tr>
<tr>
<td>F10: residences</td>
<td>1.0 0.1 1.1</td>
<td>1.0 0.1 1.1</td>
<td>1.1 1.1 1.1</td>
<td>1.1 1.1 1.1</td>
</tr>
</tbody>
</table>

### Cumulative preferences

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>F1: industrial function</td>
<td>0 1 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
</tr>
<tr>
<td>F2: offices</td>
<td>0 1 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
</tr>
<tr>
<td>F3: communal facilities</td>
<td>0 0 1 1</td>
<td>1 0 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
</tr>
<tr>
<td>F4: recreational facilities</td>
<td>0 0 1 1</td>
<td>1 0 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
</tr>
<tr>
<td>F5: catering industry facilities</td>
<td>0 0 1 1</td>
<td>1 0 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
</tr>
<tr>
<td>F6: hotel facilities</td>
<td>0 0 1 1</td>
<td>1 0 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
</tr>
<tr>
<td>F7: retail facilities</td>
<td>0 0 1 1</td>
<td>1 0 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
</tr>
<tr>
<td>F8: transport facilities</td>
<td>0 0 1 1</td>
<td>1 0 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
</tr>
<tr>
<td>F9: airport supporting facilities</td>
<td>0 0 1 1</td>
<td>0 0 1 0</td>
<td>1 0 1 0</td>
<td>0 0 1 0</td>
</tr>
<tr>
<td>F10: residences</td>
<td>0 0 1 1</td>
<td>0 0 1 0</td>
<td>0 1 0 1</td>
<td>1 0 1 0</td>
</tr>
</tbody>
</table>

Figure F.1 Visualization of the interface that allocates the stakeholders’ preferences

The Cumulative table applies the equation $S_1 \cdot S_2 \geq 1 + (S_1=2) \times (S_i=0)$
### Appendix G Interface for valuing hard exogenous variables

#### Figure G.1 User interface for valuing programmatic exogenous variables

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>maximum</td>
<td>Industrial function</td>
<td>104,000 sq GFA</td>
<td>104,000 sq GFA</td>
<td>104,000 sq GFA</td>
<td>104,000 sq GFA</td>
</tr>
<tr>
<td>minimum</td>
<td>Offices</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>maximum</td>
<td>Offices</td>
<td>120,000 sq GFA</td>
<td>120,000 sq GFA</td>
<td>120,000 sq GFA</td>
<td>120,000 sq GFA</td>
</tr>
</tbody>
</table>

#### Spatial quality

<table>
<thead>
<tr>
<th>gS1</th>
<th>gS2</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3</td>
<td>0.5</td>
</tr>
<tr>
<td>0.3</td>
<td>0.5</td>
</tr>
<tr>
<td>0.3</td>
<td>0.5</td>
</tr>
<tr>
<td>0.3</td>
<td>0.5</td>
</tr>
<tr>
<td>0.3</td>
<td>0.5</td>
</tr>
<tr>
<td>0.3</td>
<td>0.5</td>
</tr>
</tbody>
</table>

#### Nature and businesspark Schiereen

<table>
<thead>
<tr>
<th></th>
<th>gS1</th>
<th>gS2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total development area Schiereen</td>
<td>2,400,000 sq GFA</td>
<td>12 m</td>
</tr>
<tr>
<td>Maximum building height</td>
<td>12 m</td>
<td></td>
</tr>
<tr>
<td>Height ground floor</td>
<td>4 m</td>
<td></td>
</tr>
<tr>
<td>Height following floors</td>
<td>3 m</td>
<td></td>
</tr>
<tr>
<td>Maximum amount of floors industrial function</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

#### Rotterdam Airport Business Park

<table>
<thead>
<tr>
<th></th>
<th>gS1</th>
<th>gS2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total development area Rotterdam Airport</td>
<td>2,230,000 sq GFA</td>
<td>40 m</td>
</tr>
<tr>
<td>Maximum building height</td>
<td>40 m</td>
<td></td>
</tr>
<tr>
<td>Height ground floor</td>
<td>4 m</td>
<td></td>
</tr>
<tr>
<td>Height following floors</td>
<td>3 m</td>
<td></td>
</tr>
<tr>
<td>Maximum amount of floors industrial function</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>

#### Park Zevenhoven

<table>
<thead>
<tr>
<th></th>
<th>gS1</th>
<th>gS2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total development area Park Zevenhoven</td>
<td>2,800,000 sq GFA</td>
<td>26 m</td>
</tr>
<tr>
<td>Maximum building height</td>
<td>26 m</td>
<td></td>
</tr>
<tr>
<td>Height ground floor</td>
<td>4 m</td>
<td></td>
</tr>
<tr>
<td>Height following floors</td>
<td>3 m</td>
<td></td>
</tr>
<tr>
<td>Maximum amount of floors industrial function</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>

#### Residential characteristics

<table>
<thead>
<tr>
<th></th>
<th>gS1</th>
<th>gS2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum amount of dwellings L2</td>
<td>300</td>
<td>0.2</td>
</tr>
<tr>
<td>Maximum amount of dwellings L2</td>
<td>320</td>
<td>0.2</td>
</tr>
<tr>
<td>Maximum amount of dwellings L2</td>
<td>100</td>
<td>0.2</td>
</tr>
<tr>
<td>Minimum gross floor area facilities L2</td>
<td>1,600 sq GFA</td>
<td>0.2</td>
</tr>
<tr>
<td>Minimum gross floor area communal facilities L2</td>
<td>2,560 sq GFA</td>
<td>0.2</td>
</tr>
<tr>
<td>Average size dwellings Rotterdam</td>
<td>200 sq GFA</td>
<td>0.2</td>
</tr>
<tr>
<td>Average size sports field</td>
<td>5,500 sq GFA</td>
<td>0.2</td>
</tr>
</tbody>
</table>
Appendix H Validating the four-vertex research model

The following pages visualize the optimization process of the LP model and are form the input for table H.1 below. Optimizing without accounting the four focuses, results in an unbounded solution area. Consequently, figure H.1 translates the programmatic optimization when accounted for the spatial quality that is desired in the area. Figure H.2 translates the programmatic optimization when also the market call is accounted for. Figure H.3 translates the programmatic optimization when also the stakeholders’ preferences are accounted for and eventually figure H.4 translates the programmatic optimization when also the revenues are accounted for.8

Table H.1 Phased path towards the optimal strategy with science & business park Schieveen as central place
This table corresponds with table 6.9 of the thesis

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>m² BOA</td>
<td>m² GFA</td>
<td>m² BOA</td>
<td>m² GFA</td>
</tr>
<tr>
<td>Starting model</td>
<td>Unbounded</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+ Spatial quality</td>
<td>256,549</td>
<td>468,008</td>
<td>957,489</td>
<td>340,320</td>
</tr>
<tr>
<td></td>
<td>716,667</td>
<td>407,500</td>
<td>820,400</td>
<td>198,100</td>
</tr>
<tr>
<td>+ Market quality</td>
<td>279,850</td>
<td>491,310</td>
<td>943,907</td>
<td>258,825</td>
</tr>
<tr>
<td></td>
<td>701,042</td>
<td>313,750</td>
<td>826,808</td>
<td>236,550</td>
</tr>
<tr>
<td>+ Organization</td>
<td>279,850</td>
<td>491,310</td>
<td>943,907</td>
<td>258,825</td>
</tr>
<tr>
<td></td>
<td>701,042</td>
<td>313,750</td>
<td>826,808</td>
<td>236,550</td>
</tr>
<tr>
<td>+ Revenues</td>
<td>279,850</td>
<td>491,310</td>
<td>947,282</td>
<td>297,077</td>
</tr>
<tr>
<td></td>
<td>697,696</td>
<td>293,678</td>
<td>827,333</td>
<td>237,000</td>
</tr>
</tbody>
</table>

The outcomes of the optimization process are only given for science & business park Schieveen – as central place in Rotterdam Noordrand – as similar conclusions regarding the four-vertex research model were conducted regarding the other central places. Figures H.1 – H.4 are presented below:

---

8 Note that figure H.4 gives in fact also the optimal strategy, as all four focuses are accounted for.
Figure H.1 Optimal strategy, accounted for spatial quality
Figure H.2 Optimal strategy, accounted for spatial quality and market quality
Figure H.3: Optimal strategy, accounted for spatial quality, market quality and stakeholders’ preferences.
Figure H.4 Optimal strategy, accounted for spatial quality, market quality, stakeholders’ preferences and revenues