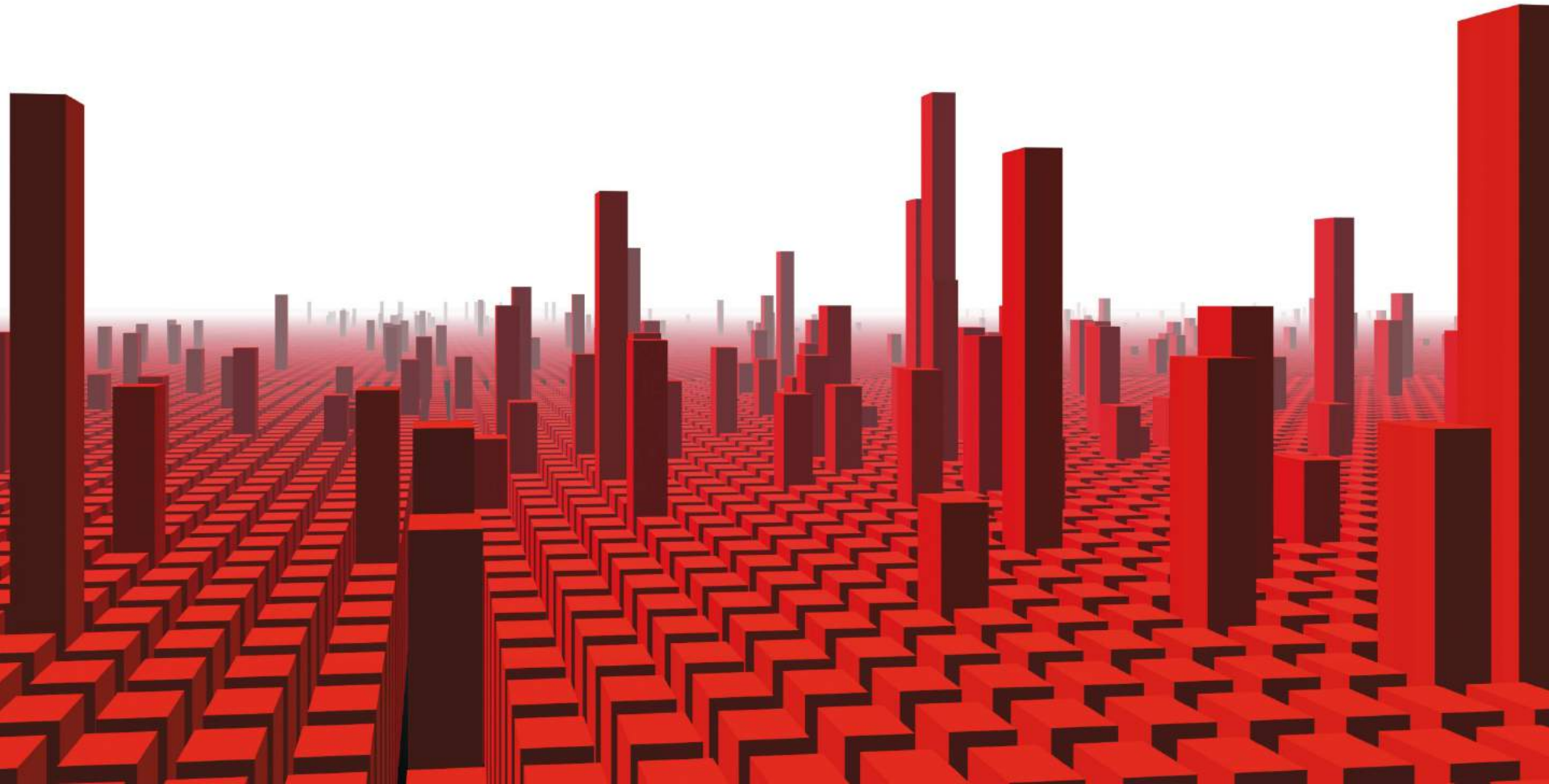
FROM DATASCAPE TO BIM

Emilie Koch

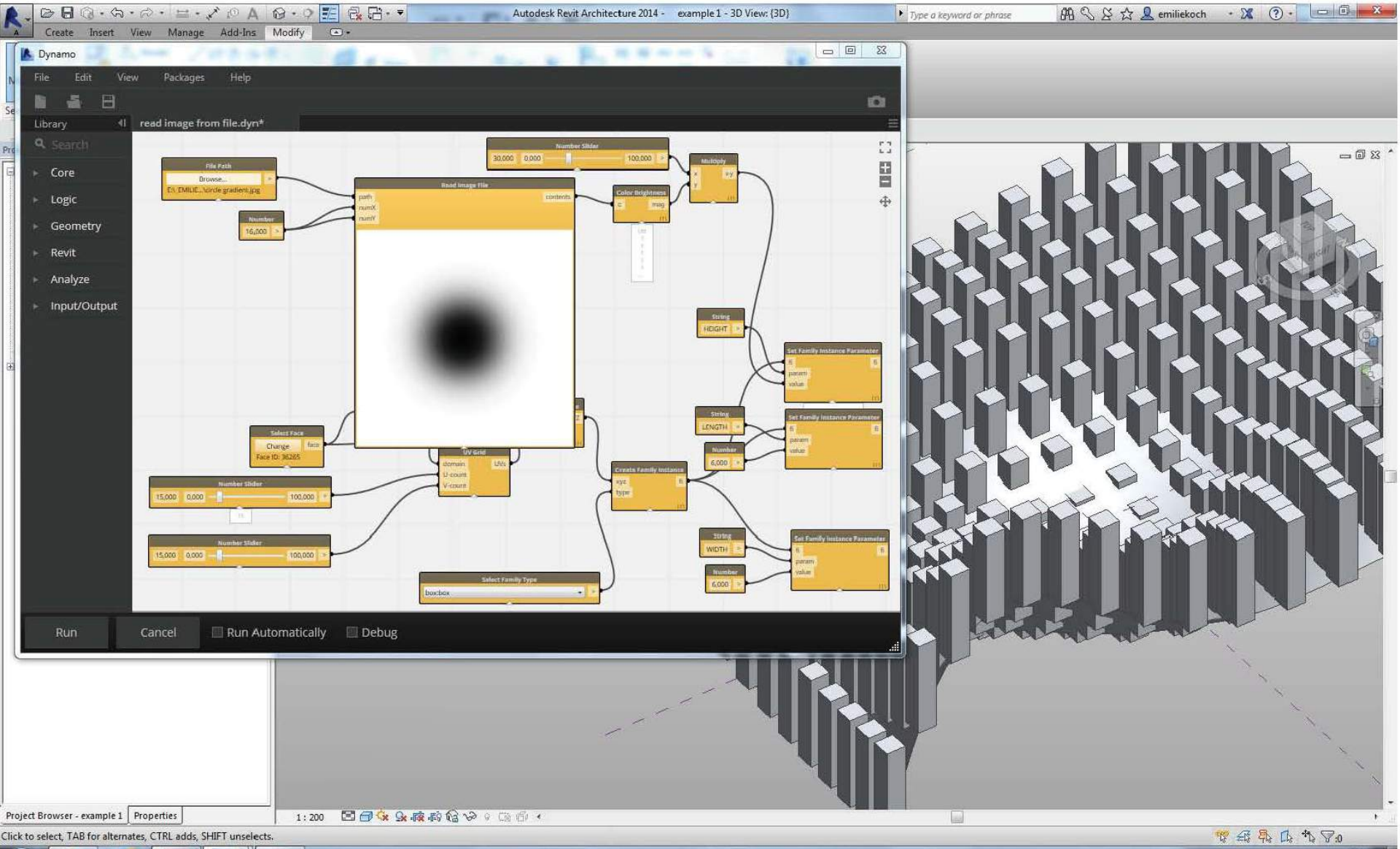
02.10.2014
MVRDV

Datascape

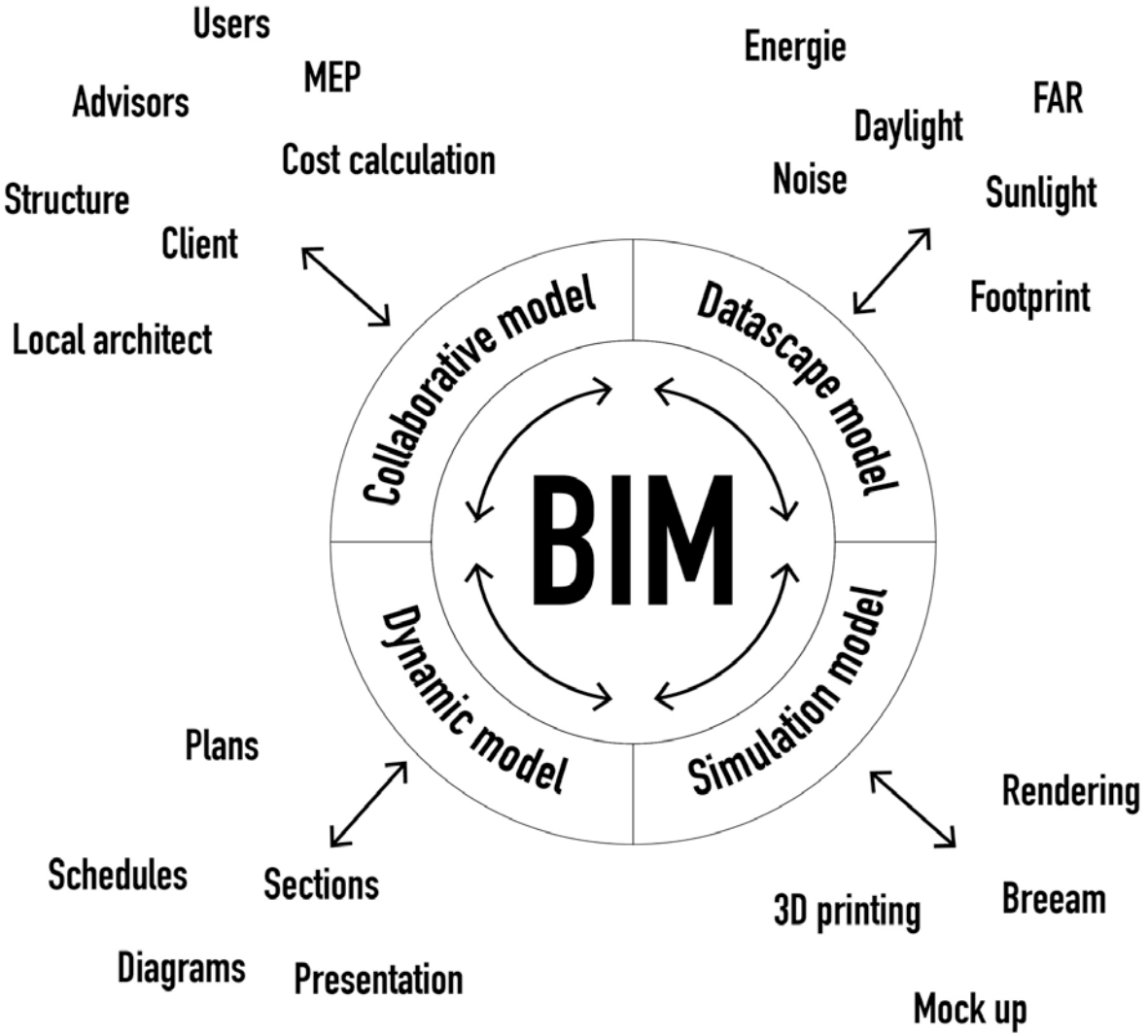
DATASCAPE



Building Information Model



BIM AT MVRDV:


Users
MEP
Advisors
Cost calculation
Structure
Client
Local architect
Energie
FAR
Daylight
Noise
Sunlight
Footprint
Collaborative model
Datascape model
BIM
Dynamic model
Simulation model
Plans
Schedules
Sections
Diagrams
Presentation
Rendering
Breeam
3D printing
Mock up

BIM as datascape model

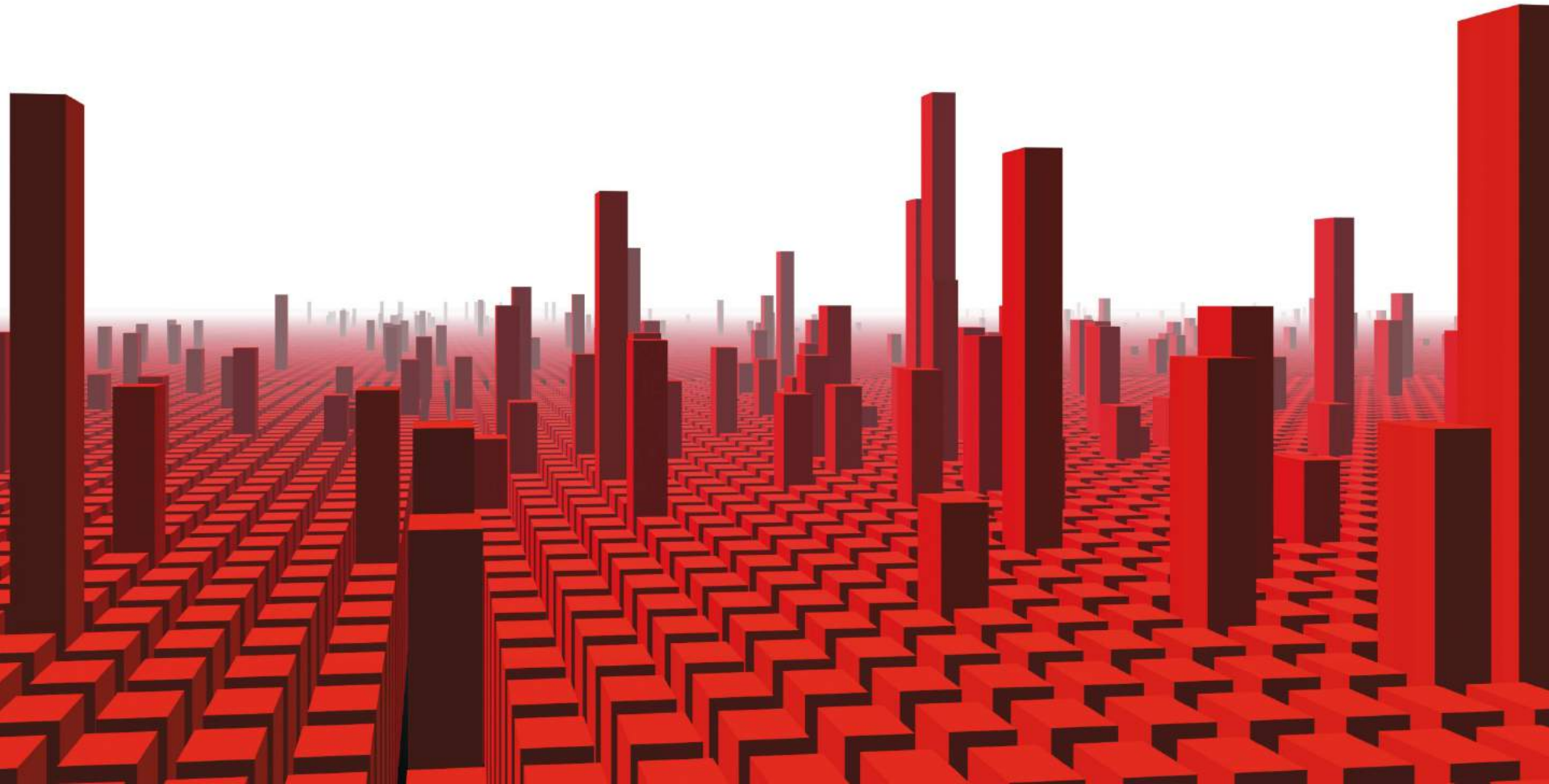
- design consists of quantifiable parameters
- data driven, parametric design
- landscape that consists of data

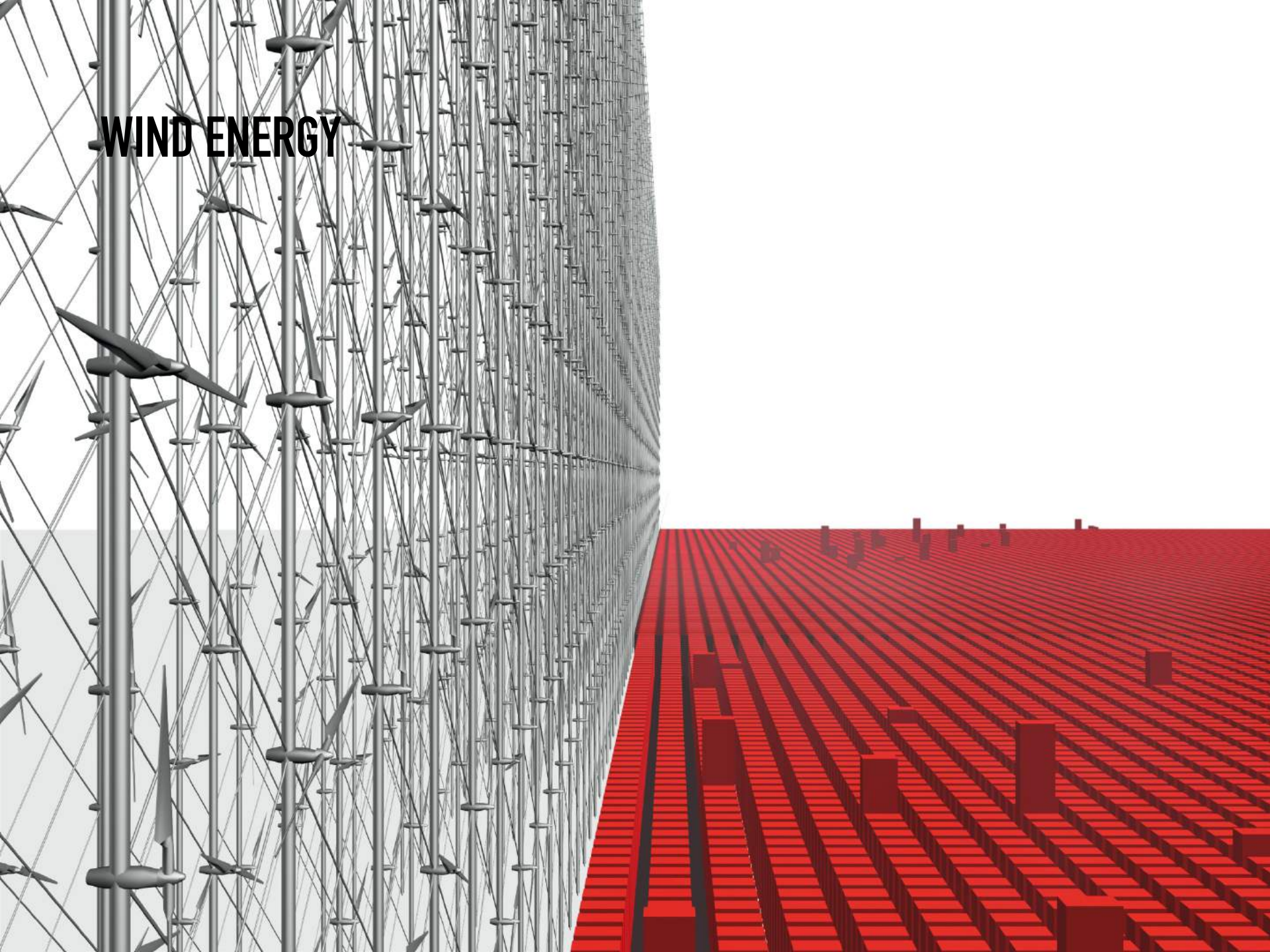
Metacity/Datatown 1998–1999

parameters:

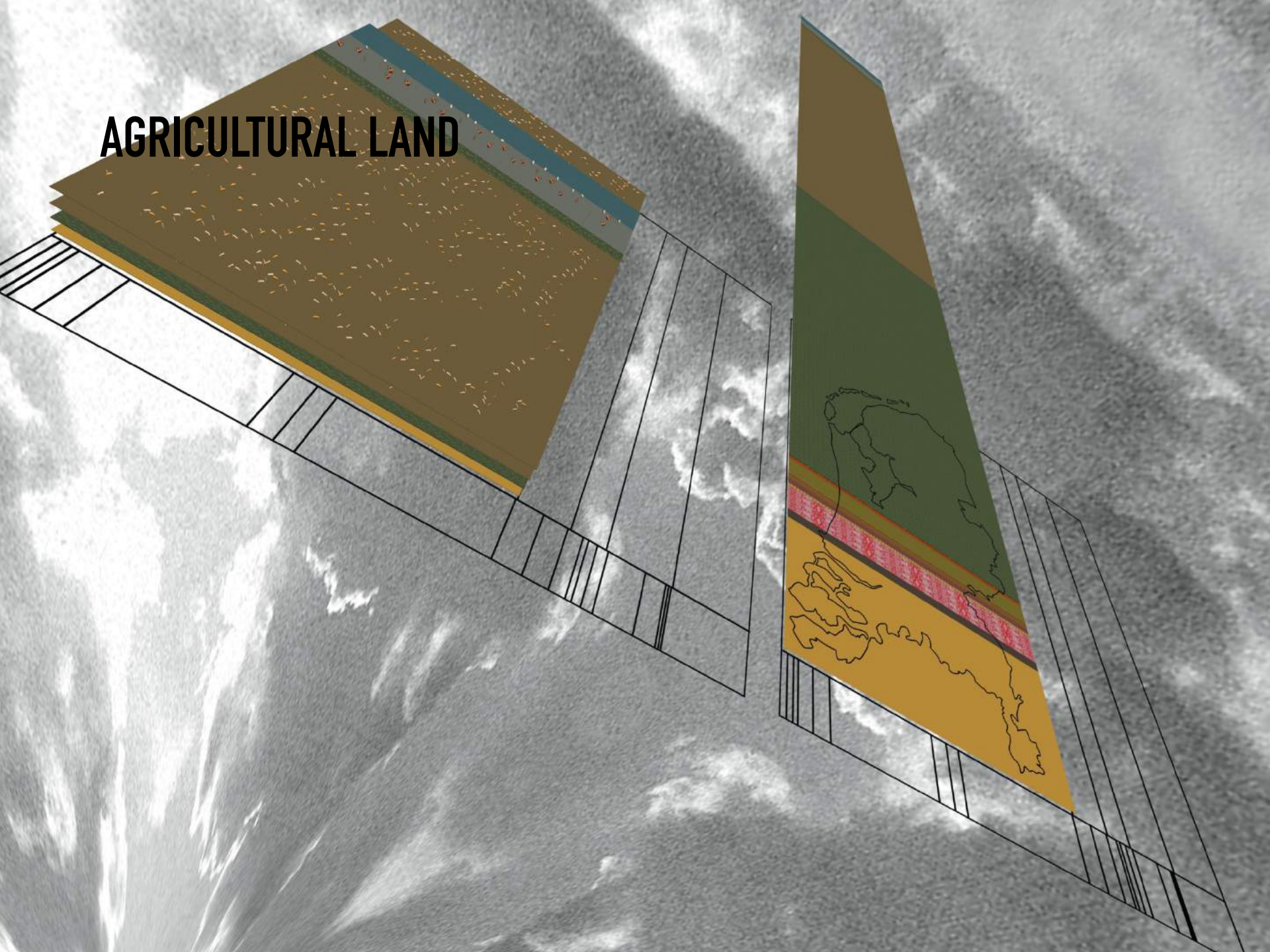
existing use living, energy, agriculture, CO2, water

LIVING QUARTERS

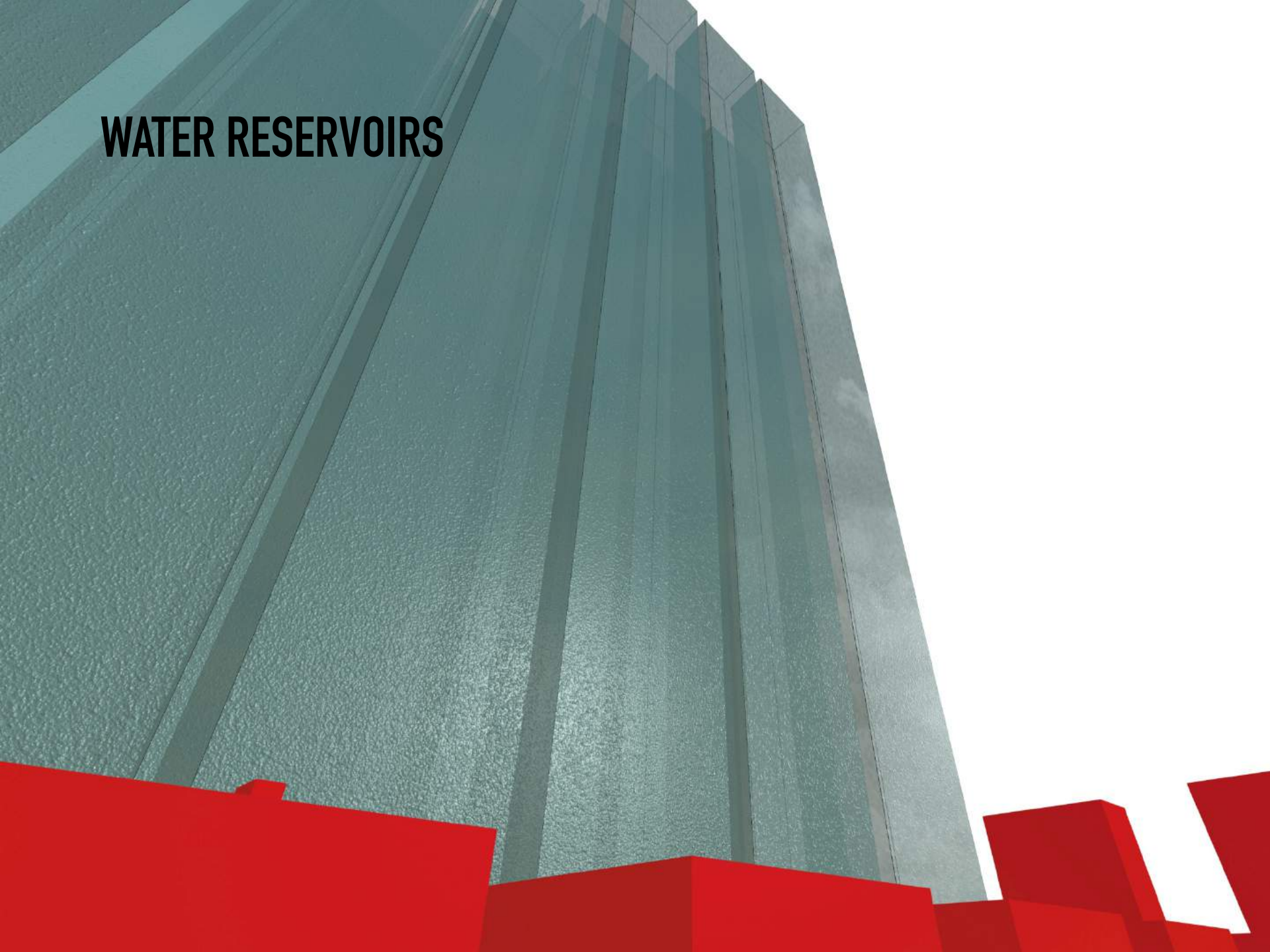



WIND ENERGY

STACKED FOREST FOR CO2 COMPENSATION


AGRICULTURAL LAND

WATER RESERVOIRS



WASTE MOUNTAINS

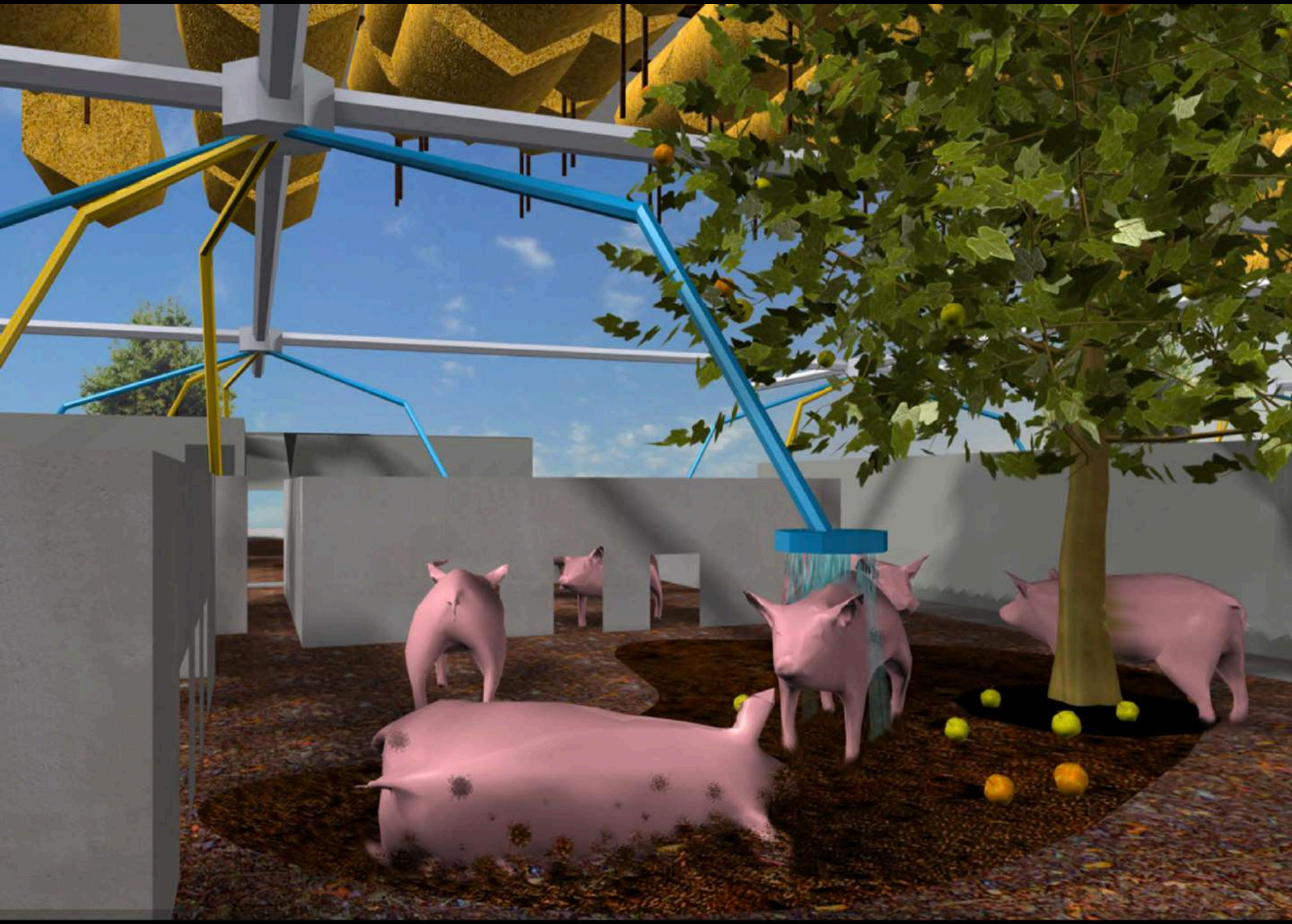
Pig city
2000-2001

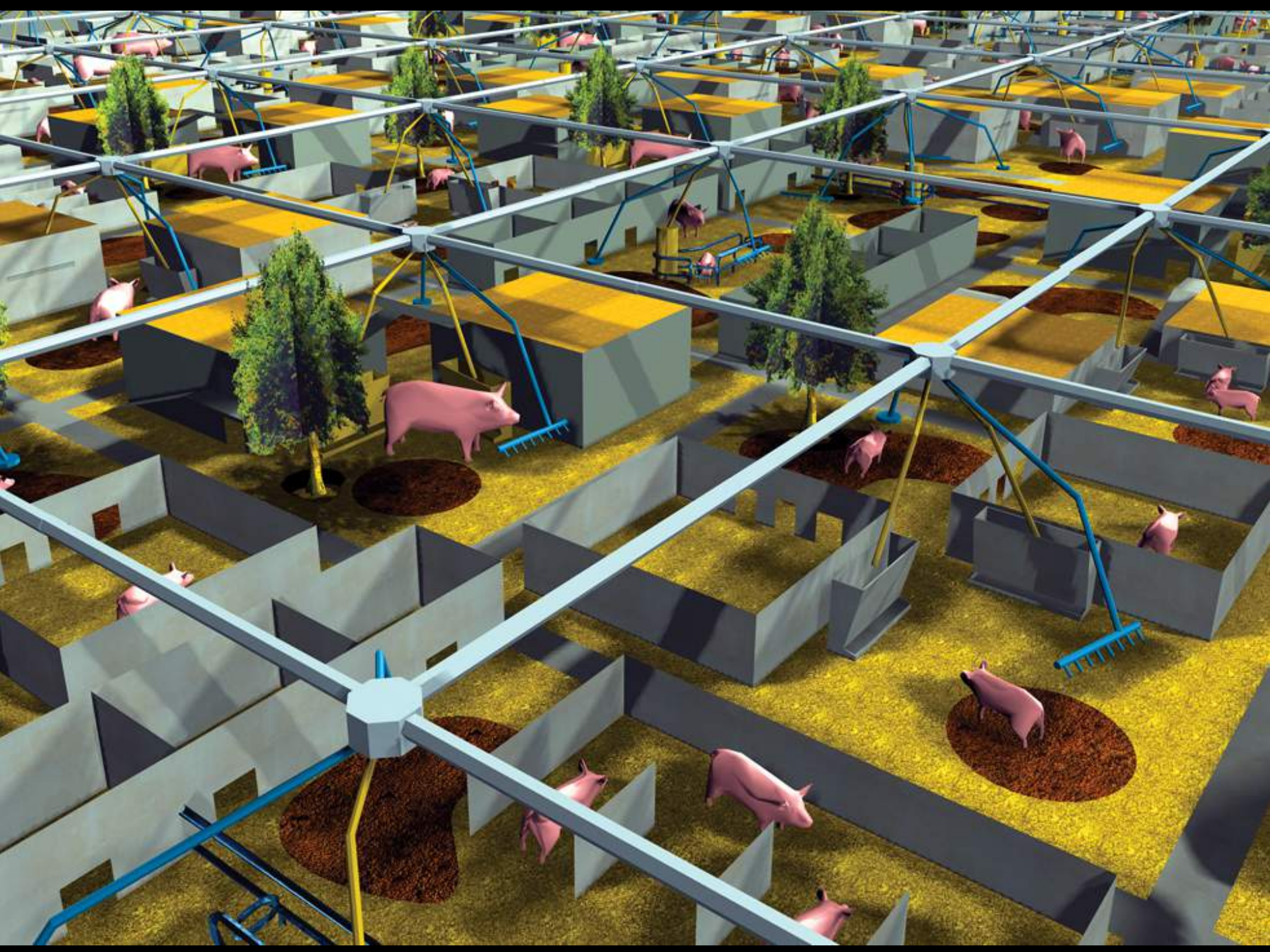
parameters:

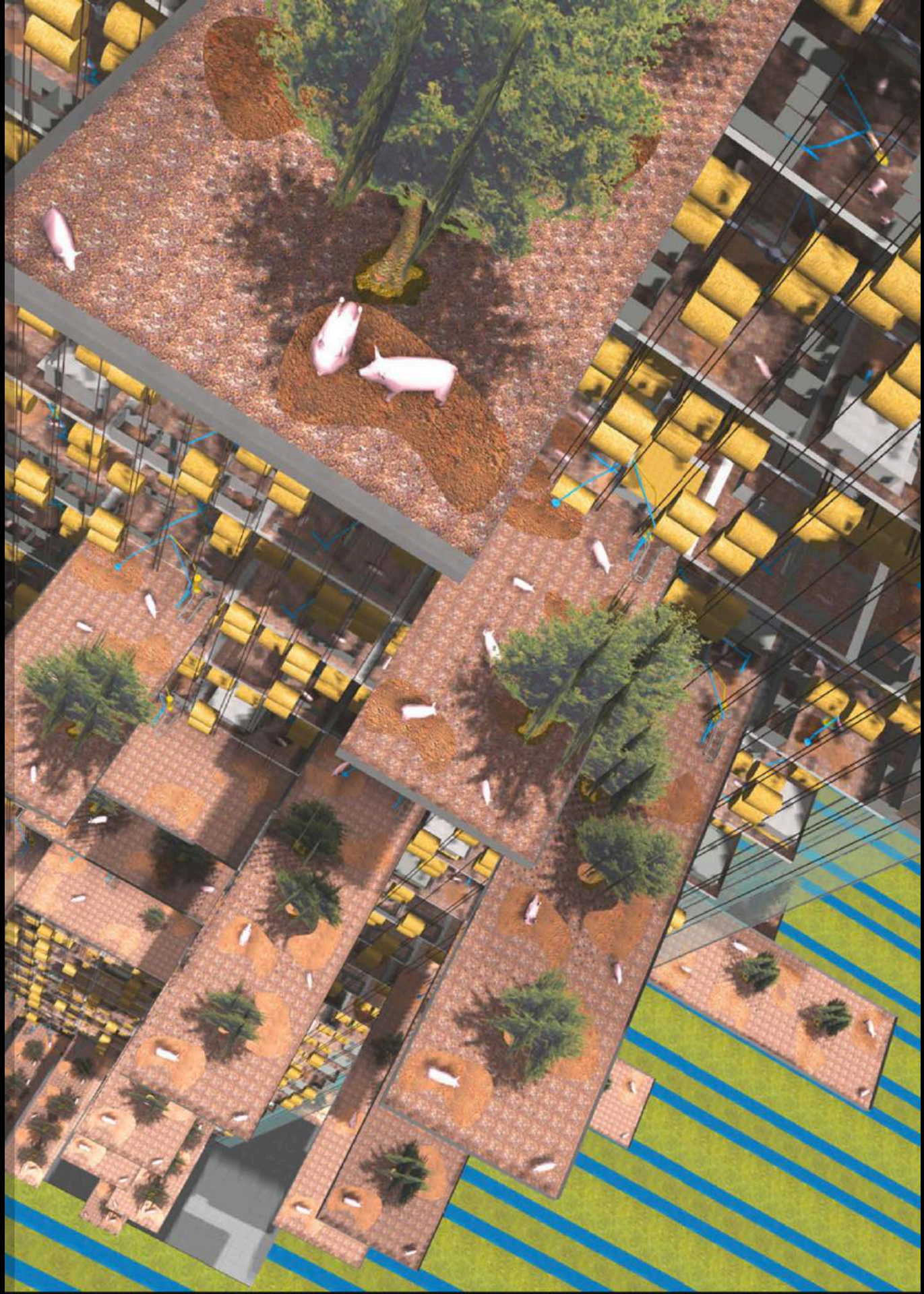
m2 floor area

TRADITIONAL PIG FARMING

ECOLOGICAL PIG FARMING







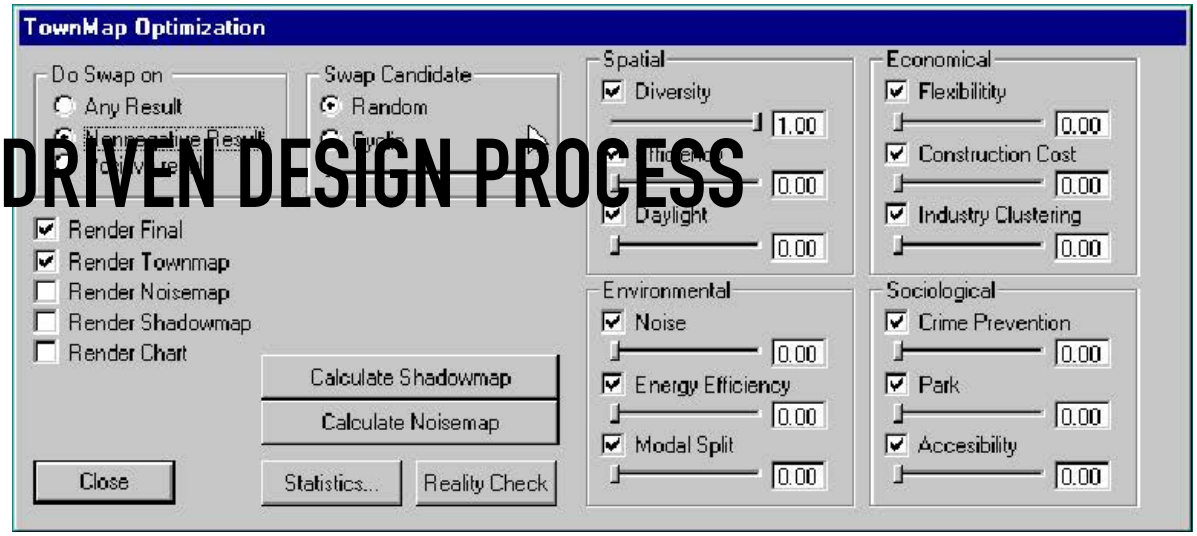
The Function mixer

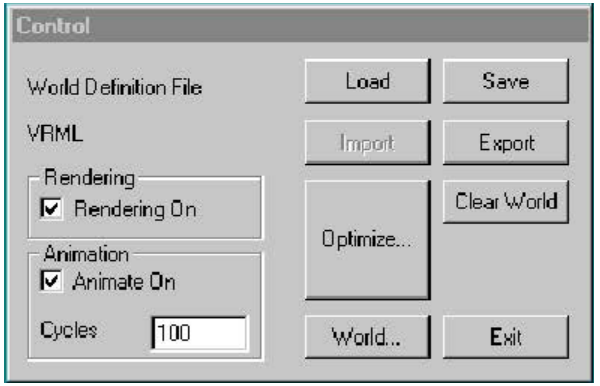
2001–2003

parameters:

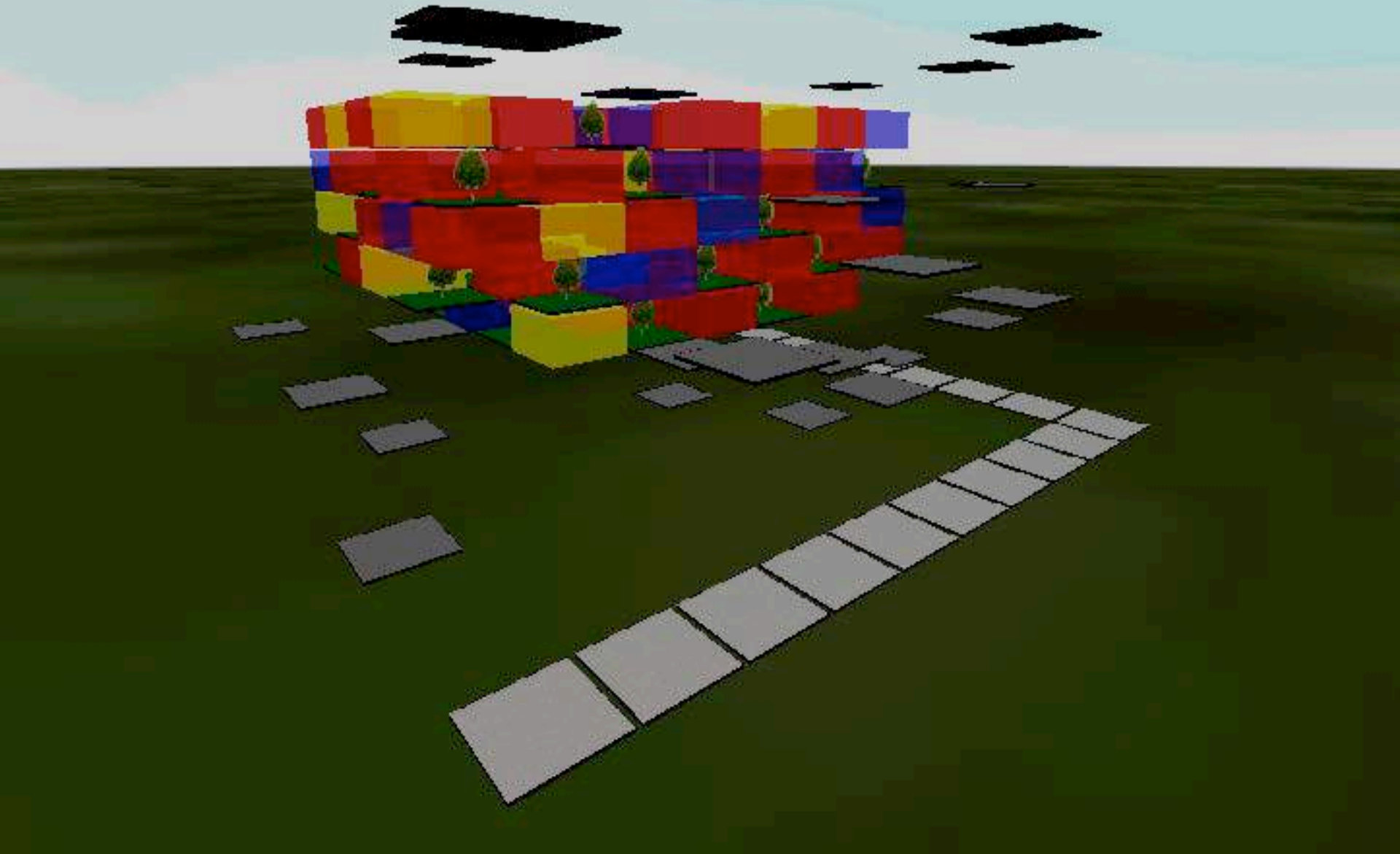
diversity, costs, light, noise

SOFTWARE DATA DRIVEN DESIGN PROCESS





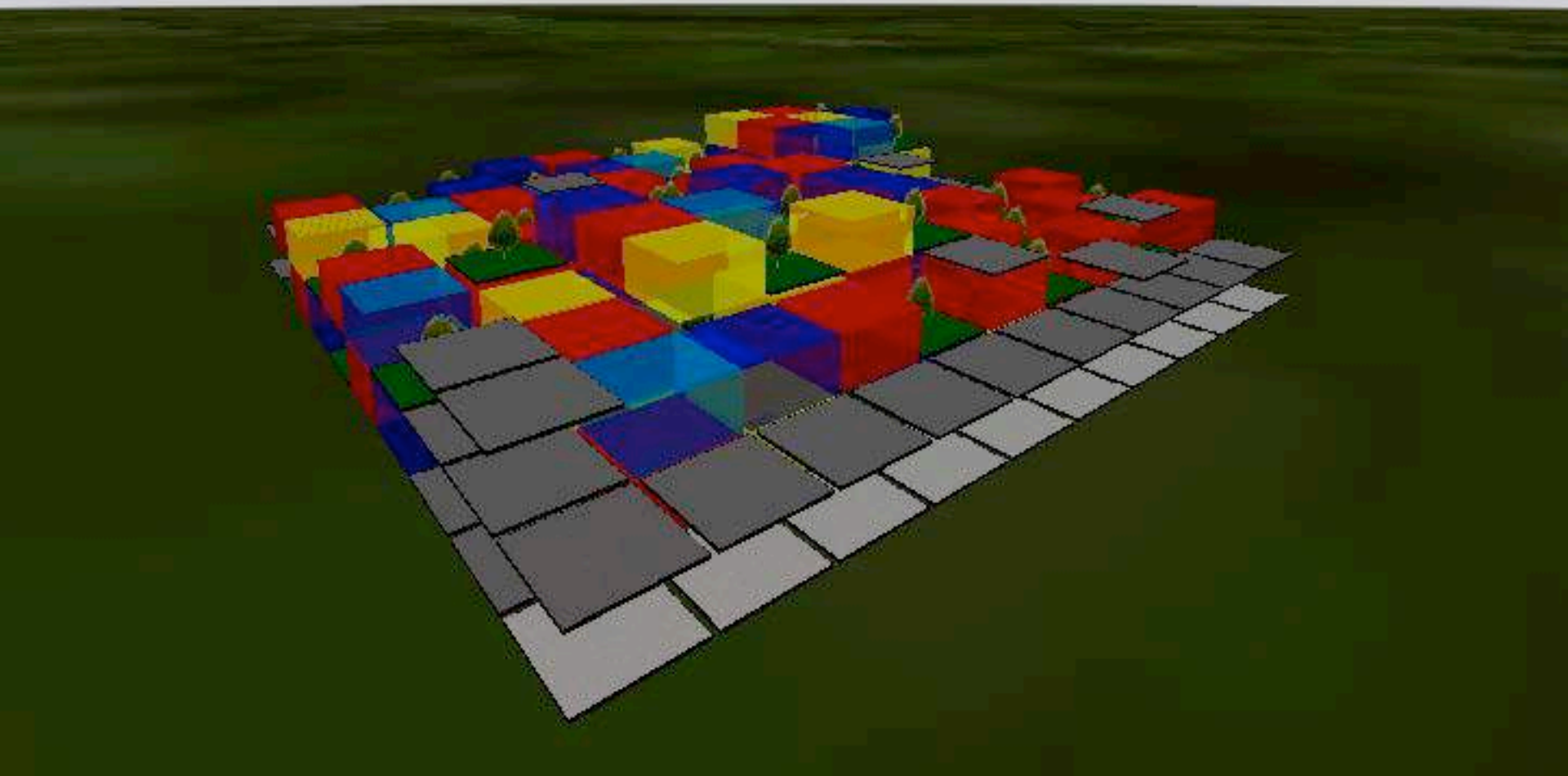
DIVERSITY



DIVERSITY

+

CONSTRUCTION COSTS



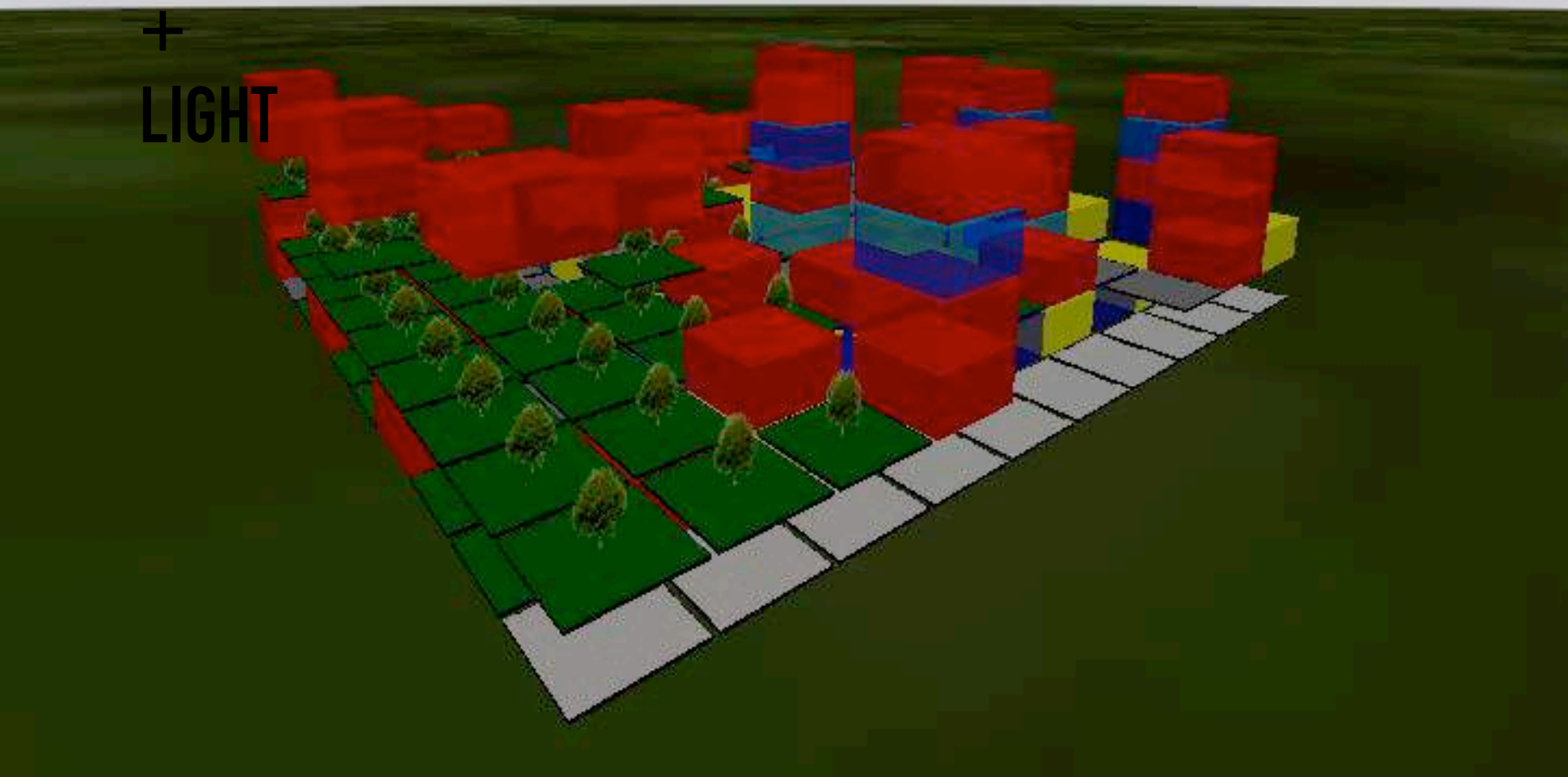
DIVERSITY

+

CONSTRUCTION COSTS

+

LIGHT



DIVERSITY

+

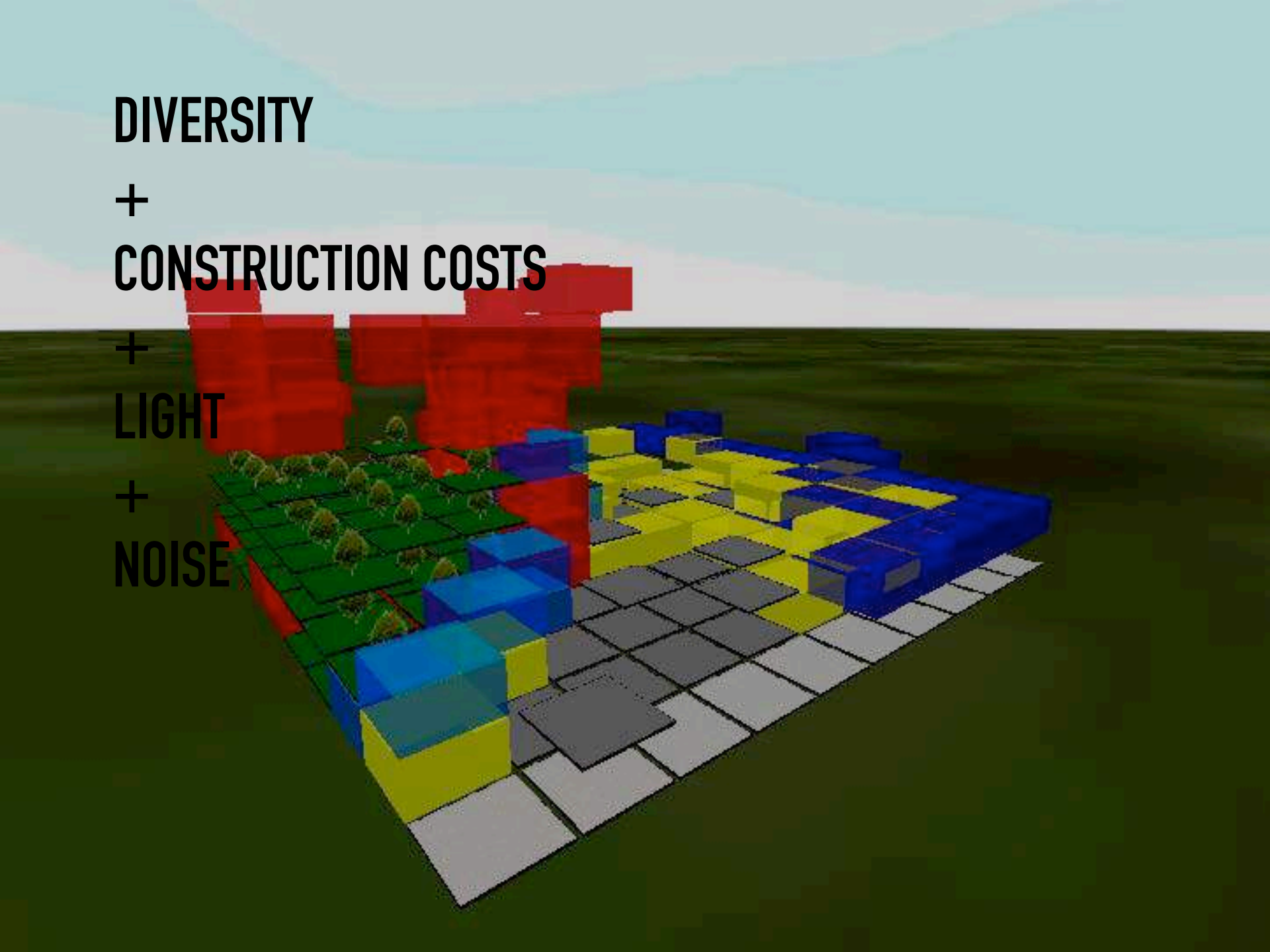
CONSTRUCTION COSTS

+

LIGHT

+

NOISE



Homerusquarter
Almere NL
2007

parameters:

architecture, parcel, communal courtyard, position parcel

VOTING FOR THE COMMUNAL COURTYARD

kavel

http://www.hierbouwik.nl - Hier bouw ik - Microsoft Internet Explorer

HIER BOUW IK

het oosten

WELKOM,

1. WONINGTYPE | 2. KAVELGROOTTE | 3. LANDSCHAP

TUSSENWONINGEN | HOEKWONINGEN | VRIJSTAAND

ANNULEER | SLA OP

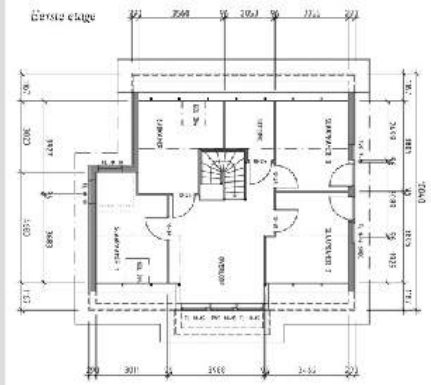


foto 1 | foto 2 | foto 3 | foto 4 | foto 5 | foto 6

SPECIFICATIES VAN DE WONING

- **Naam:** Hunneberg
- **Bouwstijl:** 1 laag met 45° kap
- **Bouwprijs:** € 250000,-
- **Inhoud:** 761 m3
- **Gebruiksoppervlakte:** 213 m2

BESCHRIJVING VAN DE WONING

omschrijving

JOUW STATUS

1. WONINGTYPE

Hunneberg
Vrijstaande woning

2. KAVELGROOTTE

LENGTE:	25 m
BREEDTE:	15.86 m
OPPERVLAKTE:	396.48 m2

3. TEGELINDELING

Bekijk in Google Earth

LIVE CALCULATOR

WONING	€ 250000,-
KAVEL	€ 208153,-
	---------- +
TOTAAL	€ 458153,-

Done
Internet
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Microsoft Power...
Internet Expl...
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Adobe Photoshop
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http://www.hierbouwik.nl - Hier bouw ik - Microsoft Internet Explorer

HIER BOUW IK

het oosten

WELKOM,

1. WONINGTYPE | 2. KAVELGROOTTE | 3. LANDSCHAP

ANNULEER | SLA OP

BEPAAL DE GROOTTE VAN UW KAVEL

Bij de door u gekozen woning hoort een standaard kavel.

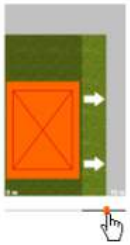
U kunt deze eventueel uitbreiden tot een maximum van 18 meter breed en 30 meter diep. In de rechterkolom berekent de live calculator wat het effect van deze keuzes op de totaalprijs is.

U kunt, afhankelijk van het woningtype, ook de woning binnen de kavel verplaatsen.

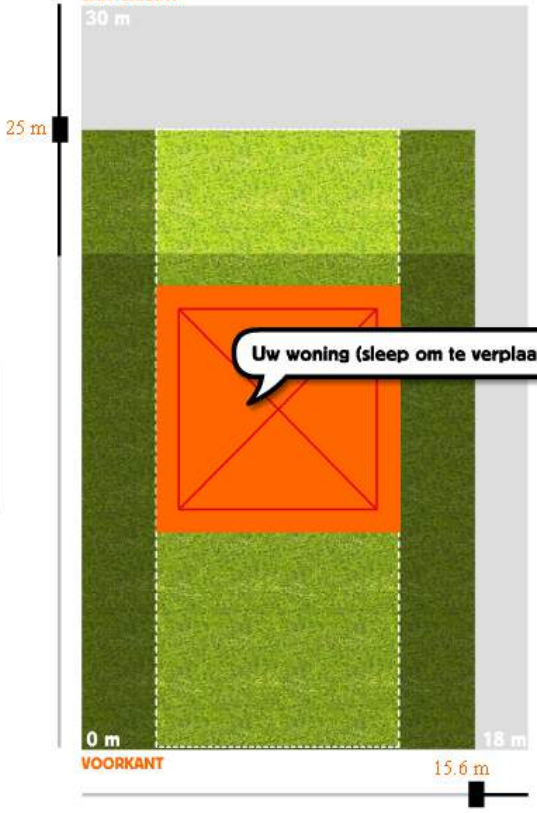
LEGENDA

- Gekozen woning
- De basiskavel behorend bij de woning
- Extra gekozen kavelruimte bij de woning

Verschuif de woning binnen de kavel naar de plek van uw keuze.



De kavel kan met de sliders groter en kleiner gemaakt worden



JOUW STATUS

1. WONINGTYPE

Hunneberg
Vrijstaande woning

2. KAVELGROOTTE

LENGTE:	0 m
BREEDTE:	0 m
OPPERVLAKTE:	0 m

3. TEGELINDELING

Bekijk in Google Earth

LIVE CALCULATOR

WONING	€ 250000,-
KAVEL	€ 208153,-
TOTAAL	€ 458153,-

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HIER BOUW IK

het oosten

WELKOM,

1. WONINGTYPE | 2. KAVELGROOTTE | 3. LANDSCHAP

LANDSCHAP KIEZEN

ANNULEER | SLA OP

De door u gekozen woning met kavel staat op de startplek. U kunt de kavel selecteren door erop te klikken. Sleep de kavel vervolgens naar het landschap.

Op het landschap staan al een aantal voorbeeldkavels. U kunt ervoor kiezen om uw kavel bovenop een bestaand kavel te plaatsen of een nieuwe locatie uit te zoeken.

Zodra u uw keuzes hebt opgeslagen, kunt u in de rechterkolom de knop naar Google Earth aanklikken. Wanneer u Google Earth nog niet op uw computer hebt geïnstalleerd, kunt u deze eerst **hier** downloaden.

Selecteer uw kavel in het oranje vierkant en plaats het in het landschap. U kunt uw kavel over bestaande kavels heen plaatsen.

JOUW STATUS

1. WONINGTYPE

Hunneberg
Vrijstaande woning

2. KAVELGROOTTE

LENGTE:	25 m
BREEDTE:	15.86 m
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3. TEGELINDELING

Bekijk in Google Earth

LIVE CALCULATOR

WONING	€ 250000,-
KAVEL	€ 208153,-
	+
TOTAAL	€ 458153,-

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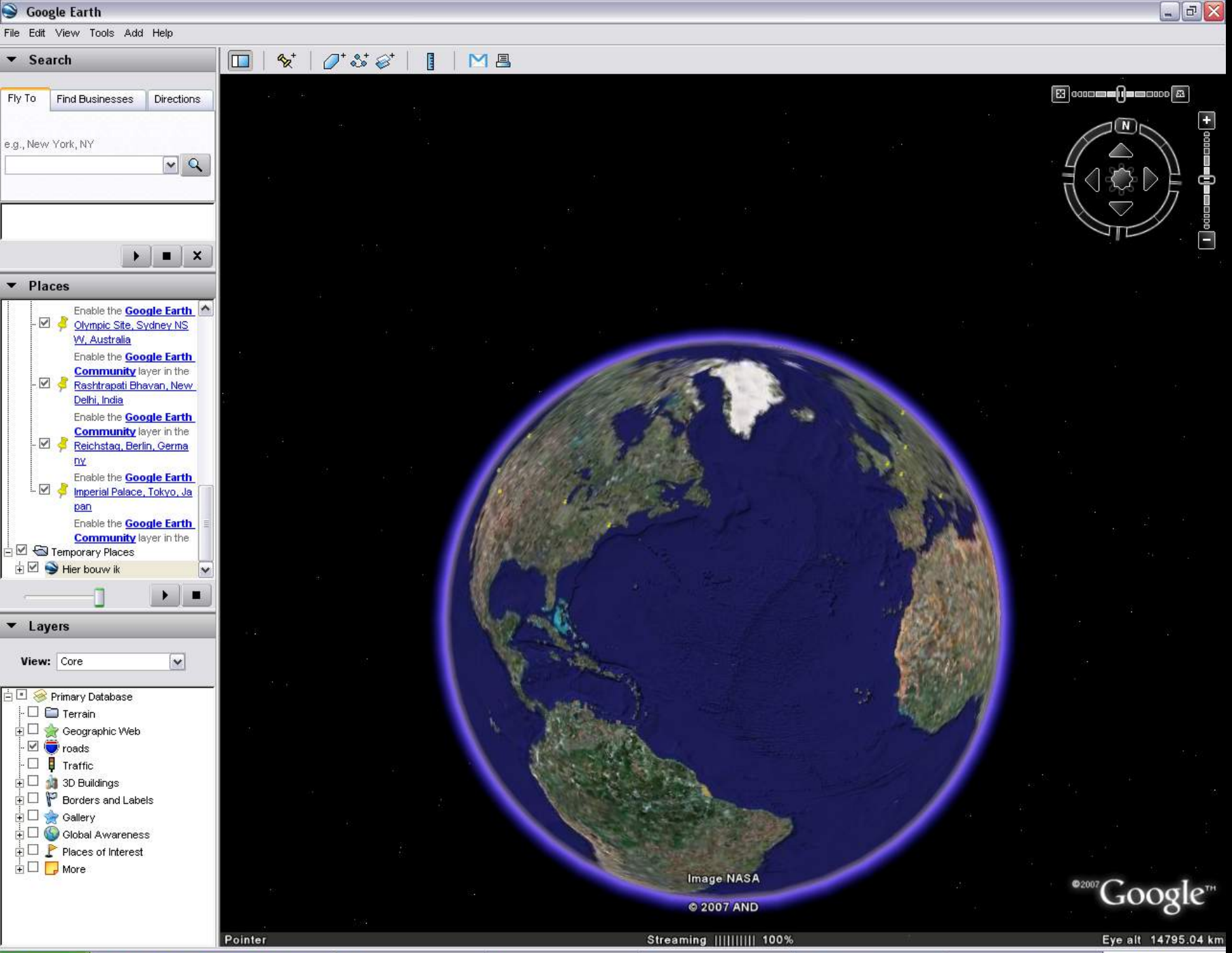
Google Earth
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Search
Fly To
Find Businesses
Directions
e.g., New York, NY
Places
Enable the Google Earth Olympic Site, Sydney NSW, Australia
Enable the Google Earth Community layer in the Rashtrapati Bhavan, New Delhi, India
Enable the Google Earth Community layer in the Reichstag, Berlin, Germany
Enable the Google Earth Imperial Palace, Tokyo, Japan
Enable the Google Earth Community layer in the
Temporary Places
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Layers
View: Core
Primary Database
Terrain
Geographic Web
roads
Traffic
3D Buildings
Borders and Labels
Gallery
Global Awareness
Places of Interest
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©2007 Google
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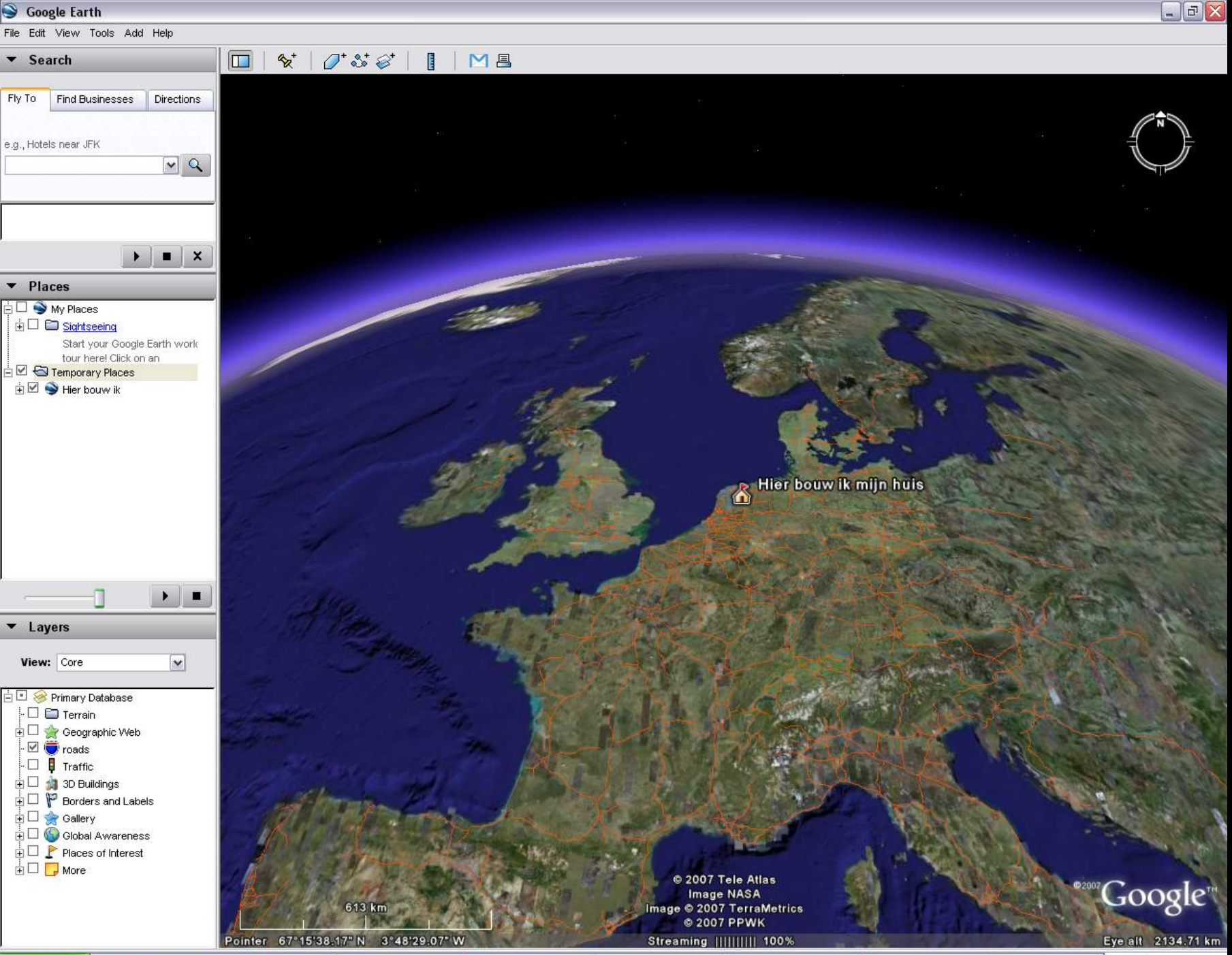
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Terrain
Geographic Web
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Traffic
3D Buildings
Borders and Labels
Gallery
Global Awareness
Places of Interest
More
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© 2007 Tele Atlas
Image NASA
Image © 2007 TerraMetrics
© 2007 PPWK
©2007 Google
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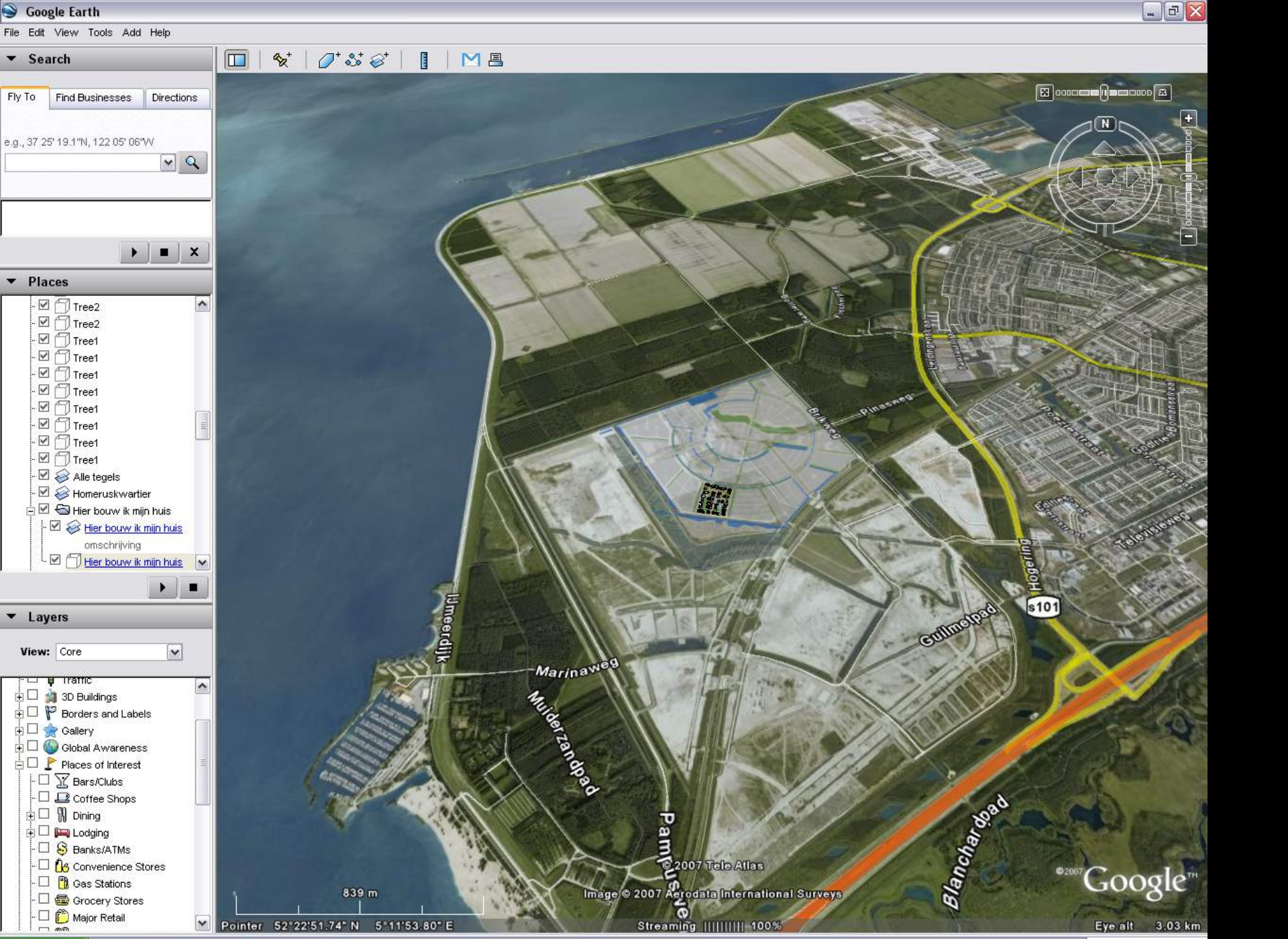
Google Earth
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Fly To
Find Businesses
Directions
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Places
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Hier bouw ik mijn huis
Hier bouw ik mijn huis
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Layers
View: Core
Traffic
3D Buildings
Borders and Labels
Gallery
Global Awareness
Places of Interest
Bars/Clubs
Coffee Shops
Dining
Lodging
Banks/ATMs
Convenience Stores
Gas Stations
Grocery Stores
Major Retail
Pinasweg
Brikweg
Hogering
s101
Guilmetpad
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Marinaweg
Muiderzandpad
Pampusweg
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Image © 2007 Aerodata International Surveys
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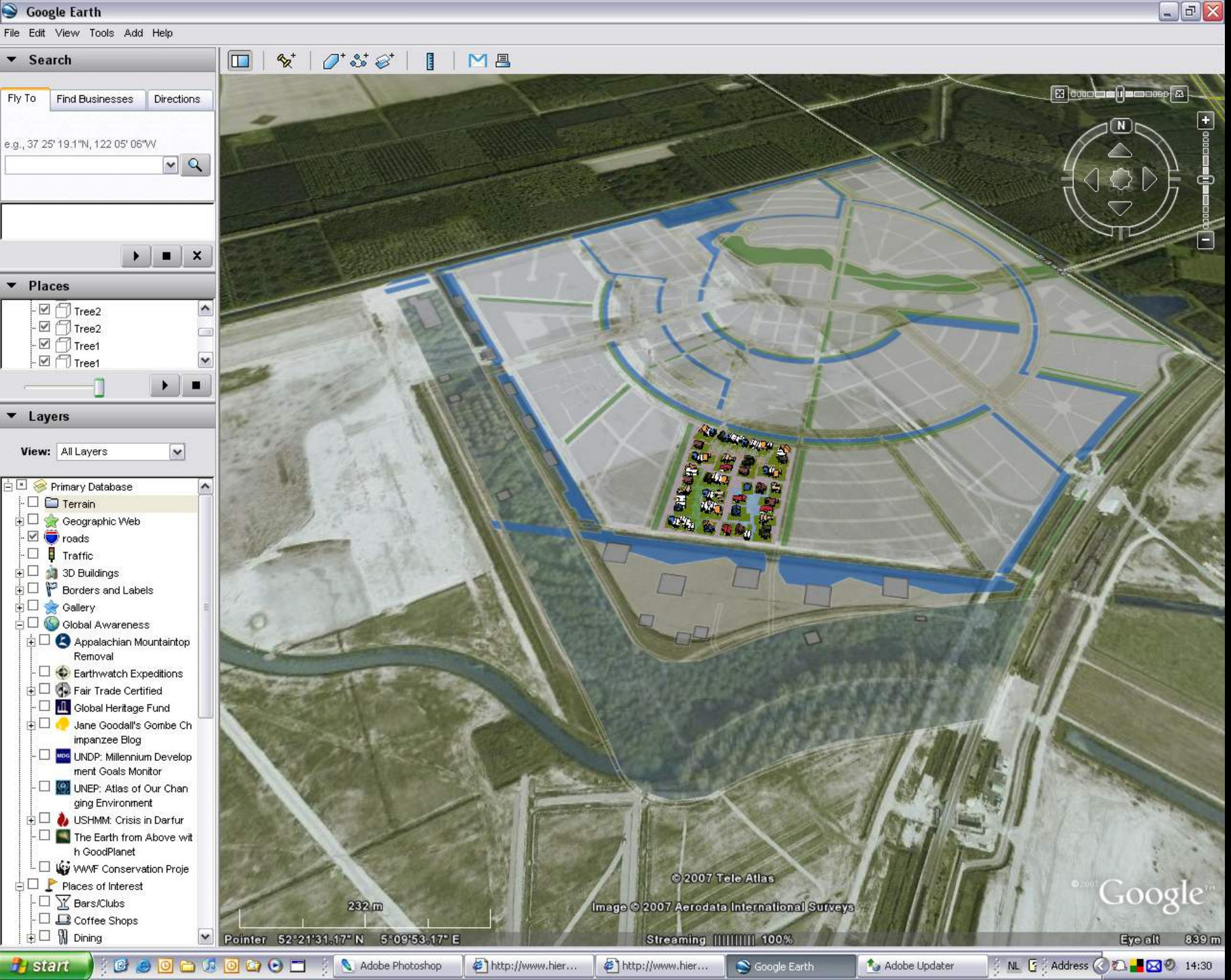
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Appalachian Mountaintop Removal
Earthwatch Expeditions
Fair Trade Certified
Global Heritage Fund
Jane Goodall's Gombe Chimpanzee Blog
UNDP: Millennium Development Goals Monitor
UNEP: Atlas of Our Changing Environment
USHMM: Crisis in Darfur
The Earth from Above with GoodPlanet
WWF Conservation Proje
Places of Interest
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Coffee Shops
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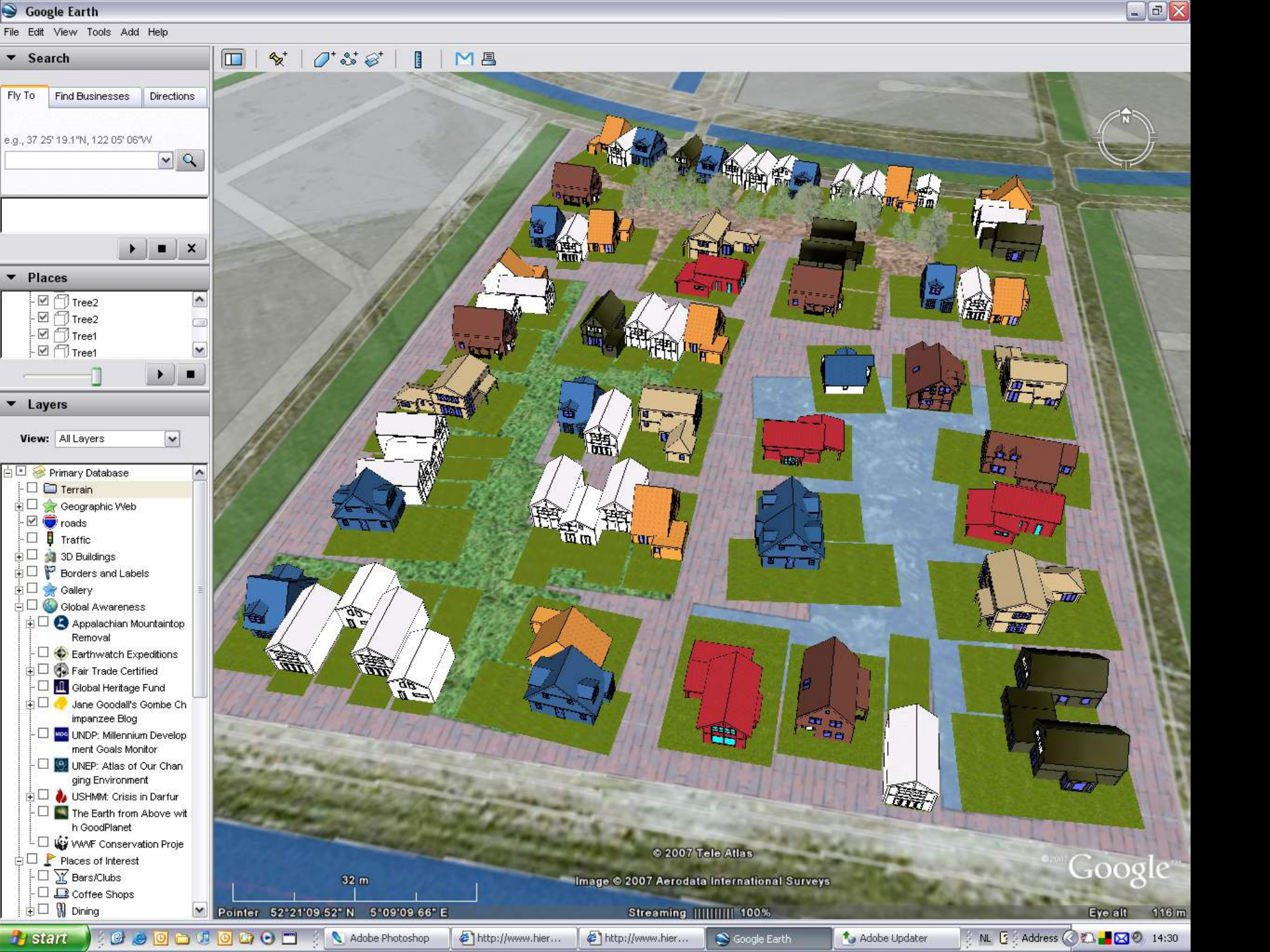
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WWF Conservation Proje
Places of Interest
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Coffee Shops
Dining
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Image © 2007 Aerodata International Surveys
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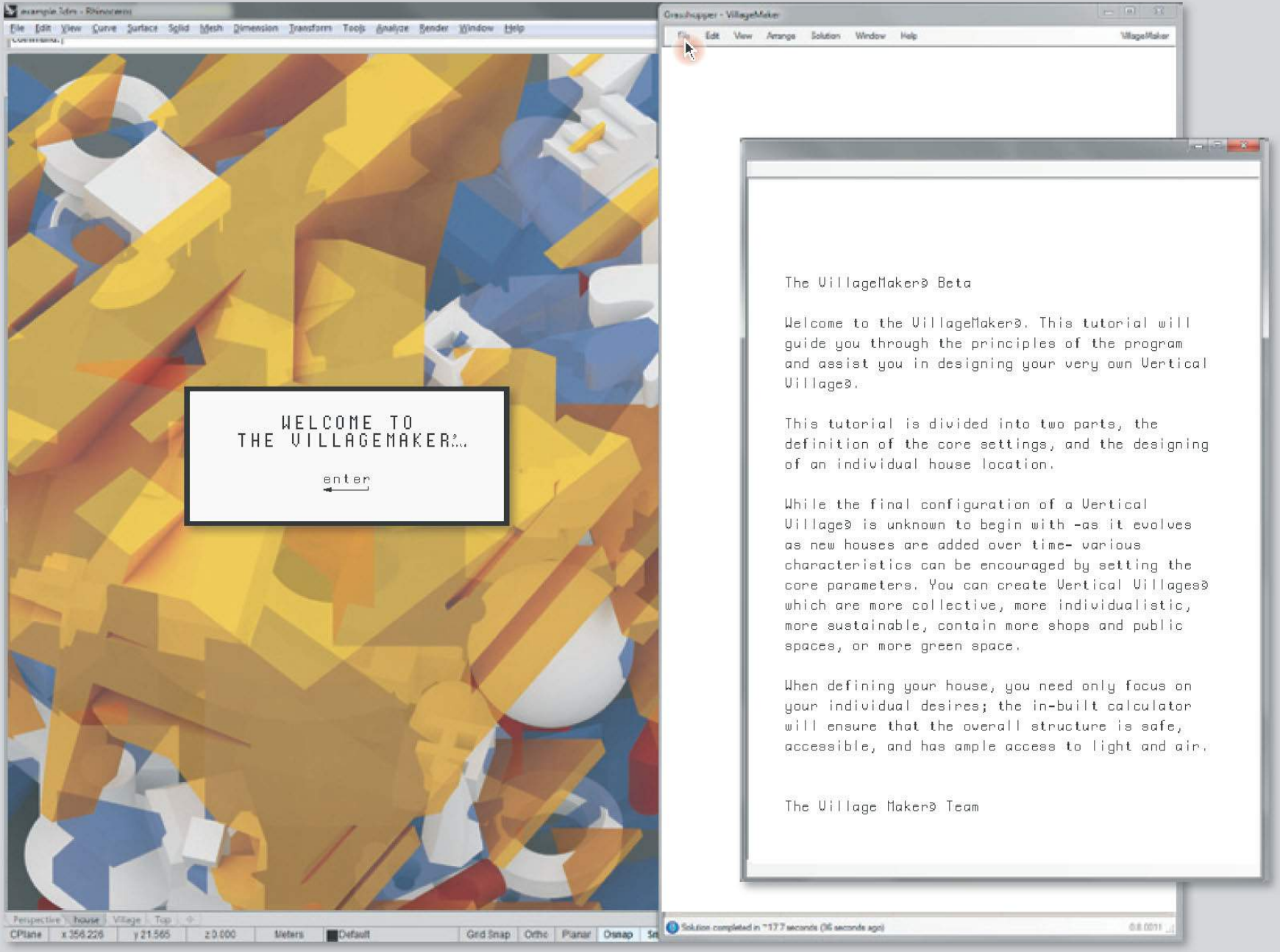
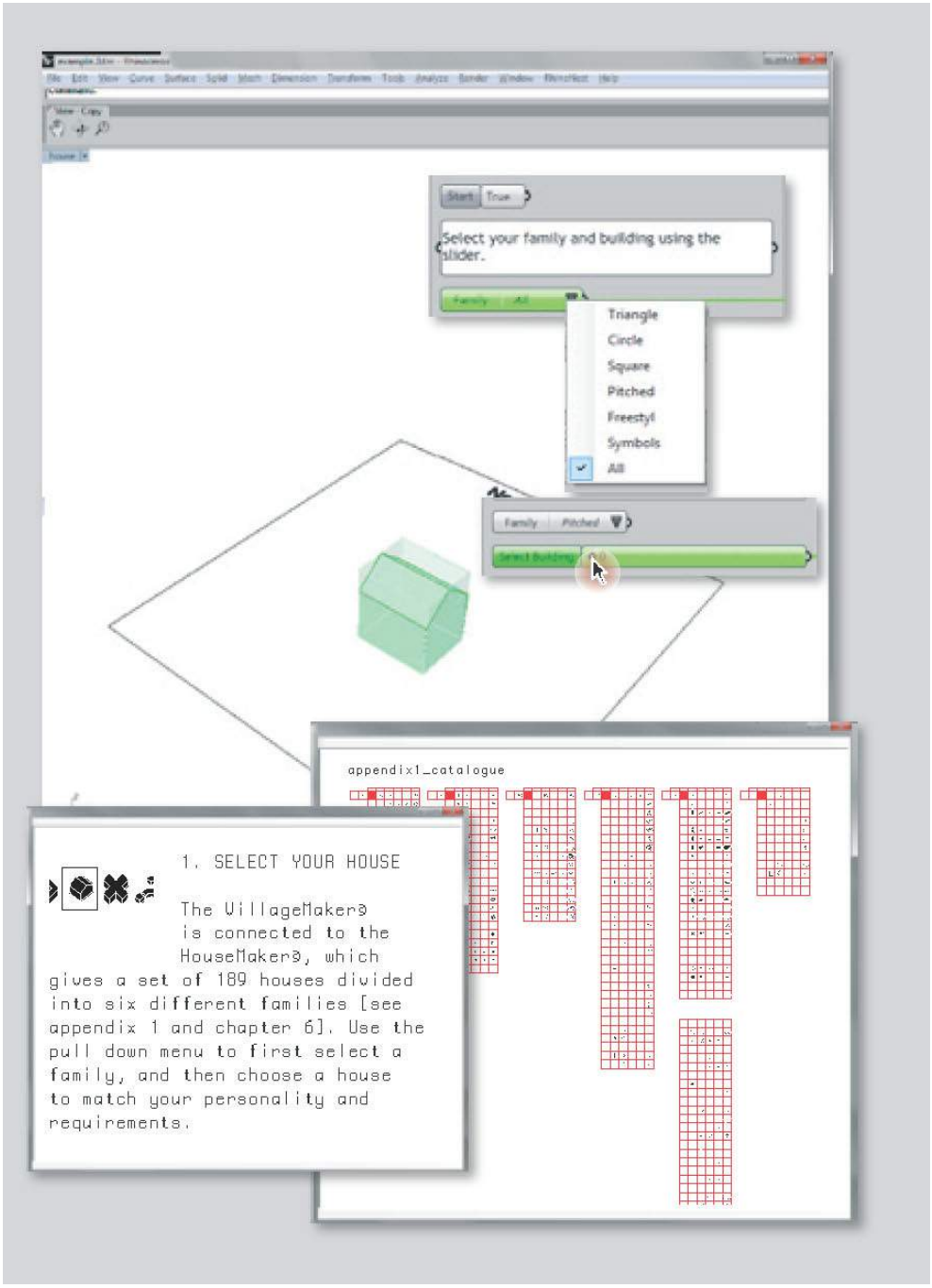
The VillageMaker

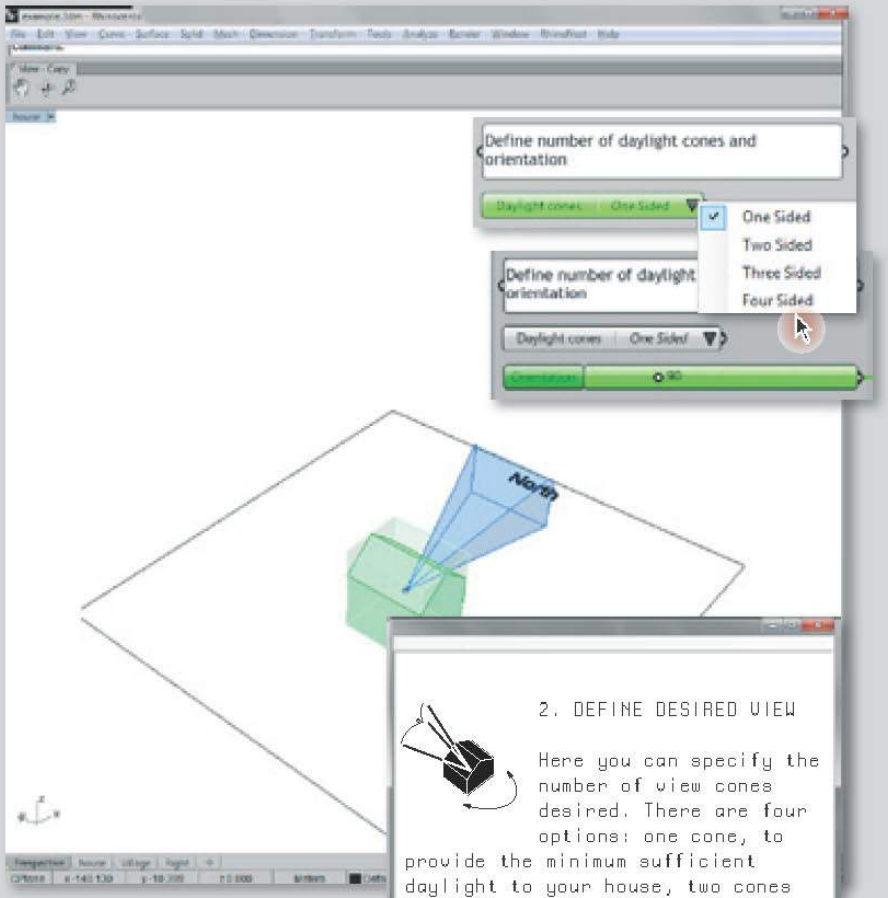
2013

parameters:

housing type, view, sunlight, private space, price range and location

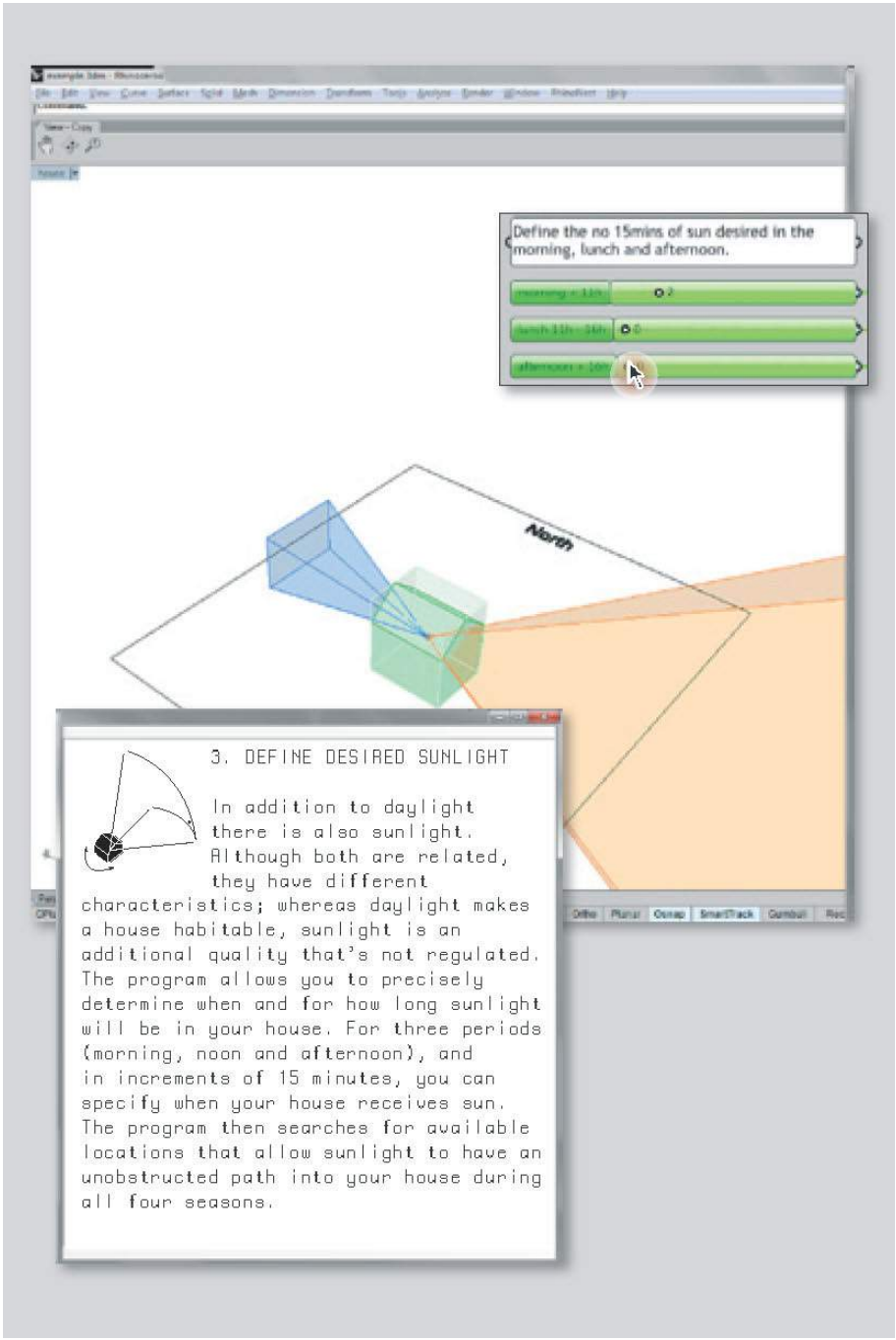

WELCOME TO
THE VILLAGEMAKER3...
enter
The VillageMaker3 Beta
Welcome to the VillageMaker3. This tutorial will guide you through the principles of the program and assist you in designing your very own Vertical Village3.
This tutorial is divided into two parts, the definition of the core settings, and the designing of an individual house location.
While the final configuration of a Vertical Village3 is unknown to begin with -as it evolves as new houses are added over time- various characteristics can be encouraged by setting the core parameters. You can create Vertical Village3 which are more collective, more individualistic, more sustainable, contain more shops and public spaces, or more green space.
When defining your house, you need only focus on your individual desires; the in-built calculator will ensure that the overall structure is safe, accessible, and has ample access to light and air.
The Village Maker3 Team

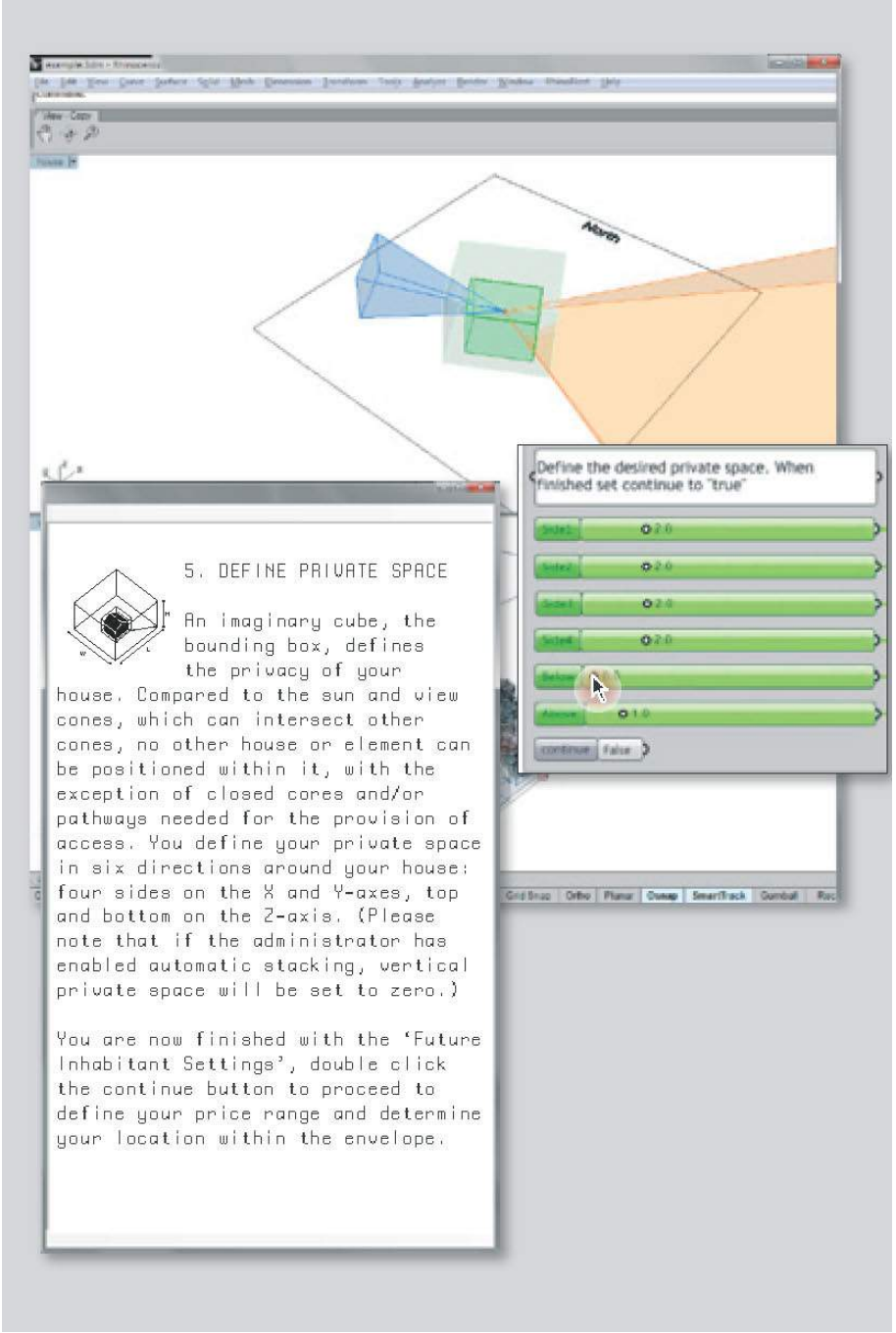

Select your family and building using the slider.
Triangle
Circle
Square
Pitched
Freestyl
Symbols
All
appendix1_catalogue
1. SELECT YOUR HOUSE
The VillageMaker9 is connected to the HouseMaker9, which gives a set of 189 houses divided into six different families [see appendix 1 and chapter 6]. Use the pull down menu to first select a family, and then choose a house to match your personality and requirements.

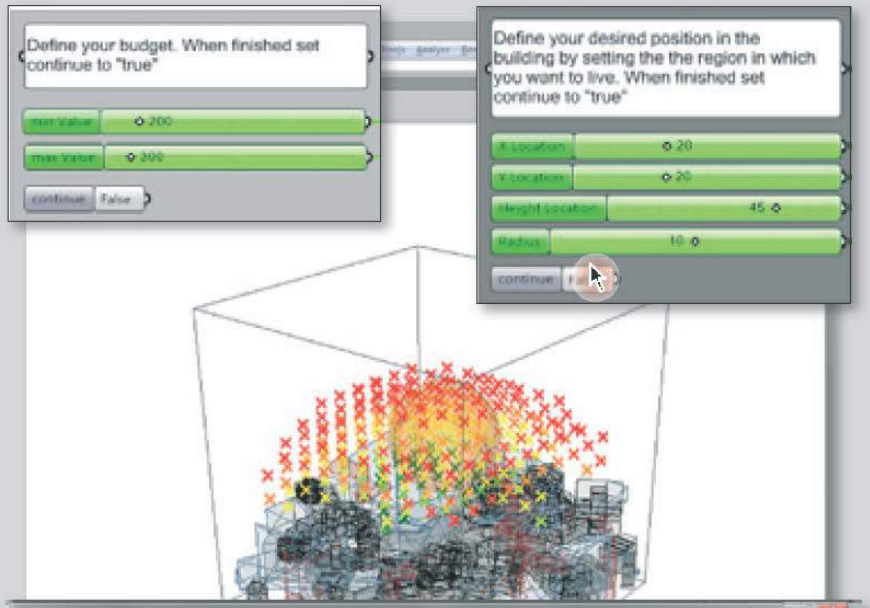


2. DEFINE DESIRED VIEW

Here you can specify the number of view cones desired. There are four options: one cone, to provide the minimum sufficient daylight to your house, two cones opposite each other, three cones, or four cones on all sides of your house. The dimensions of the cones (the horizontal and vertical angle, and the length of each) are set in the Administrative Settings. The program then searches for available locations for your house, by taking into account the locations of all other existing houses, guaranteeing that no house will block the daylight of another.


Define the no 15mins of sun desired in the morning, lunch and afternoon.
North
3. DEFINE DESIRED SUNLIGHT
In addition to daylight there is also sunlight. Although both are related, they have different characteristics; whereas daylight makes a house habitable, sunlight is an additional quality that's not regulated. The program allows you to precisely determine when and for how long sunlight will be in your house. For three periods (morning, noon and afternoon), and in increments of 15 minutes, you can specify when your house receives sun. The program then searches for available locations that allow sunlight to have an unobstructed path into your house during all four seasons.


North
Define the desired private space. When finished set continue to "true"
5. DEFINE PRIVATE SPACE
An imaginary cube, the bounding box, defines the privacy of your house. Compared to the sun and view cones, which can intersect other cones, no other house or element can be positioned within it, with the exception of closed cores and/or pathways needed for the provision of access. You define your private space in six directions around your house: four sides on the X and Y-axes, top and bottom on the Z-axis. (Please note that if the administrator has enabled automatic stacking, vertical private space will be set to zero.)
You are now finished with the 'Future Inhabitant Settings', double click the continue button to proceed to define your price range and determine your location within the envelope.



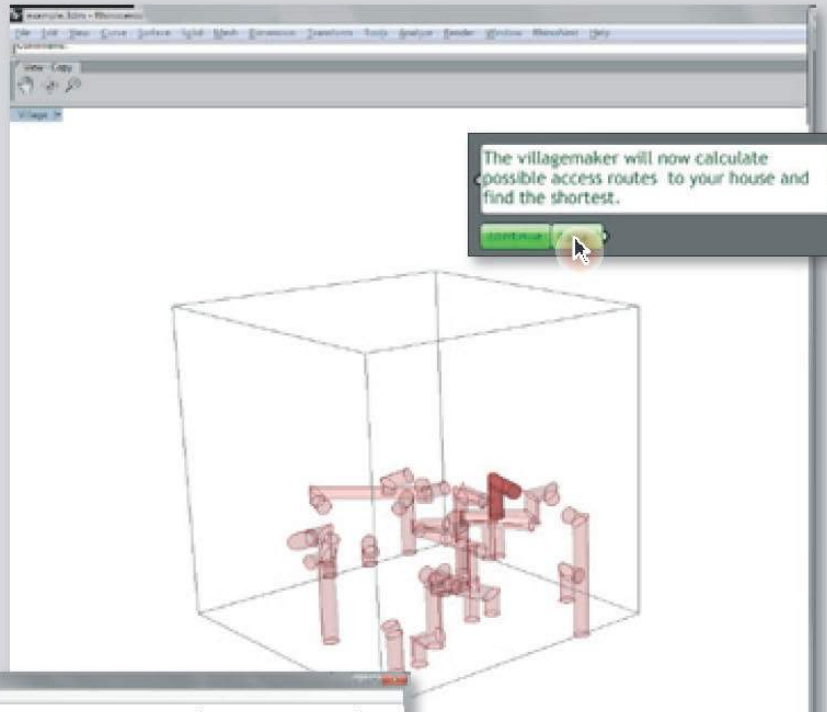
6. DEFINE PRICE RANGE AND LOCATION

By defining an upper and lower price limit the VillageMaker3 software will return a set of possible locations for your house, represented as a gradient from cheaper to more expensive. The location is then chosen with the ball, to indicate a preferable location. With the differing radius, the specificity can be optimized.

In some cases, the number of possibilities is zero, which implies that demands are too high and that the budget is not sufficient enough. By changing your settings in previous steps, you can stay within your budget, matching your desires with reality.

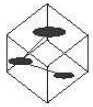
You can now choose a location using the sliders. Please note that this is an indicative tool, which uses generated information to determine the optimal ratio between desires (daylight, sunlight and privacy) and budget for an assigned location. Within these parameters, the program looks for the position that occupies the least space, and therefor is beneficial to the preset density requirements.

In the future, an online forum can be added where users with different lifestyles can come together. In that way, a Vertical Village geared towards senior or family oriented communities with accompanying ammenities can be realized.

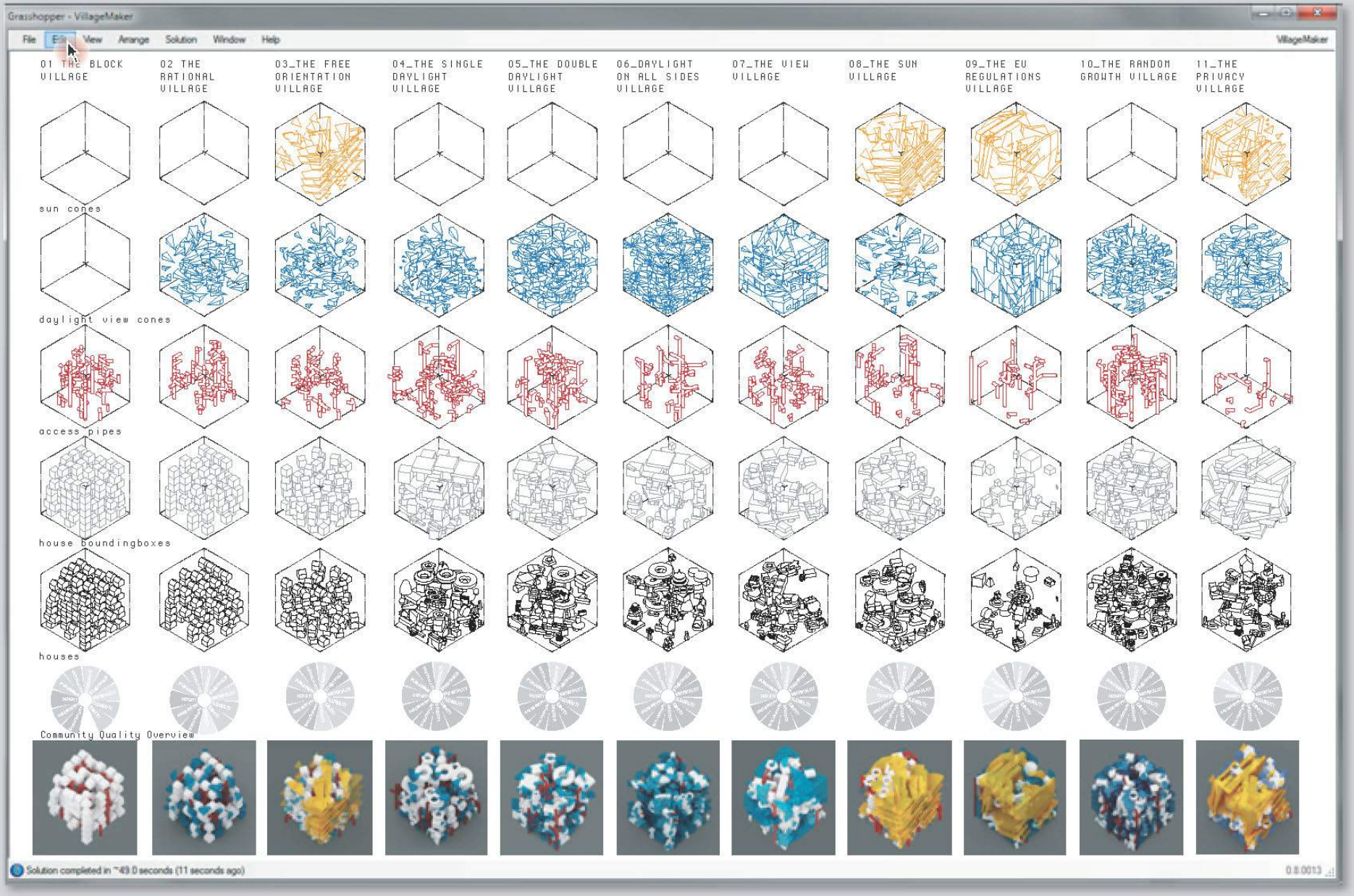


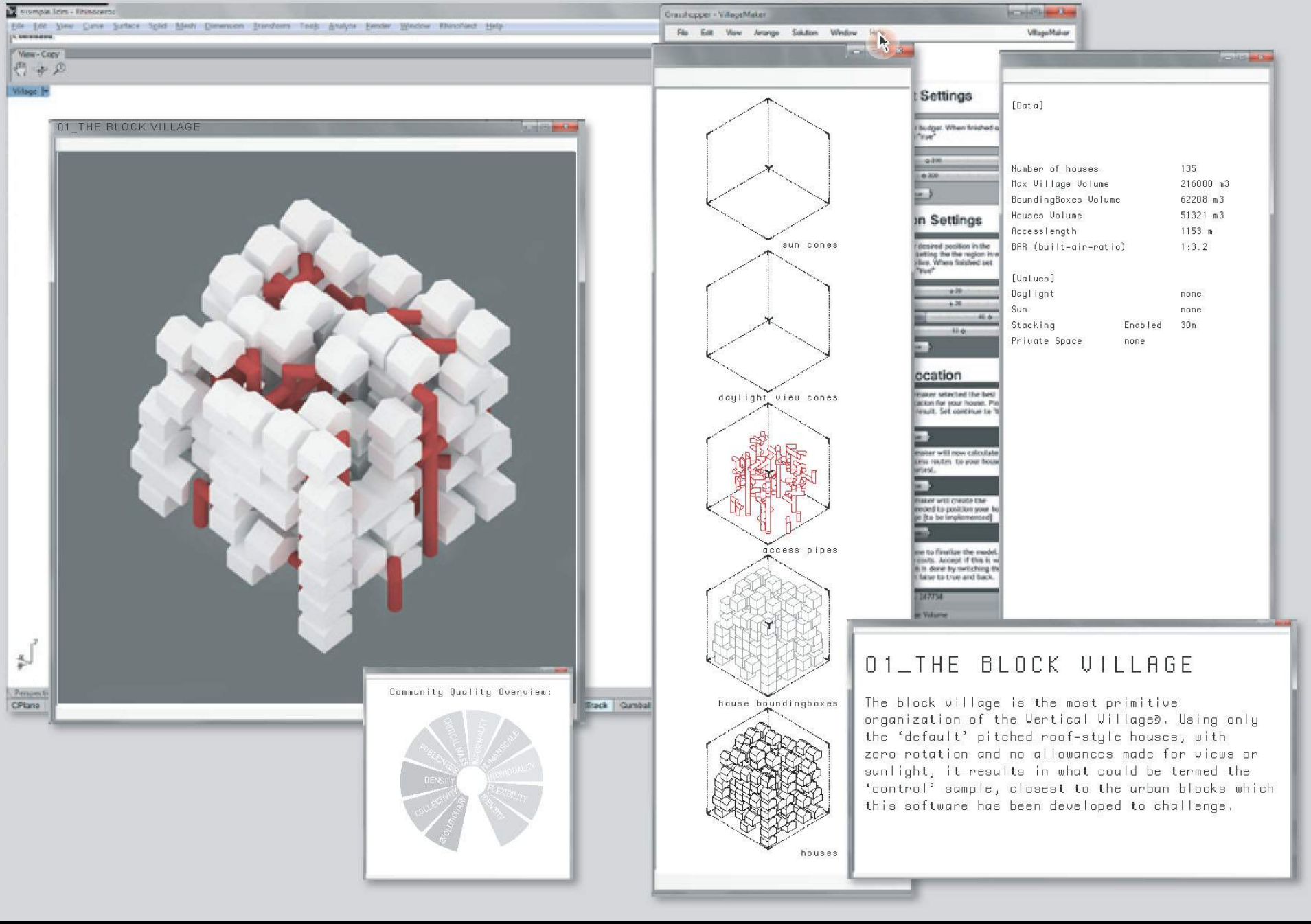
7. CREATE ACCESS (INTERNAL STEP)

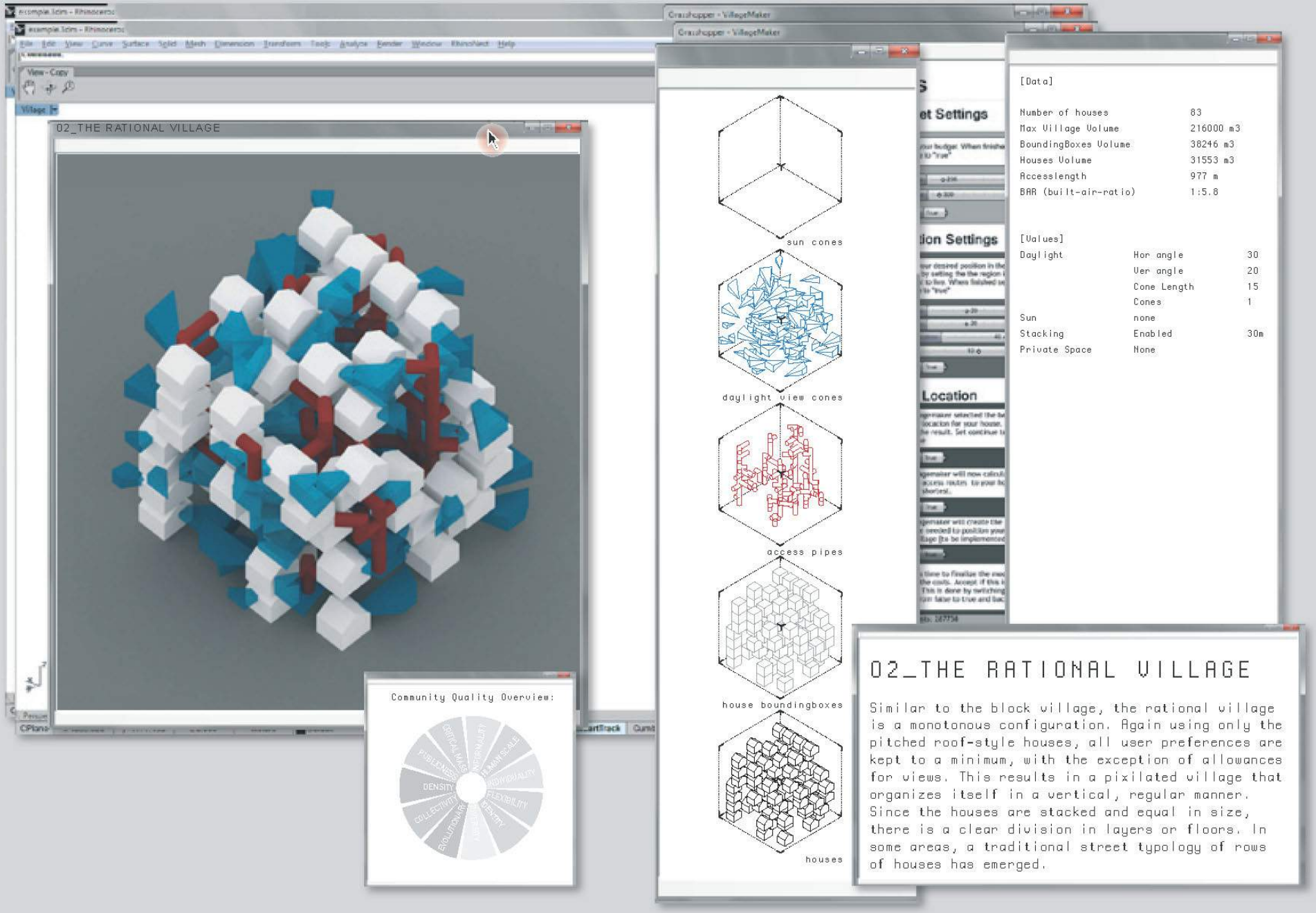
After defining your location, the VillageMaker9 software then automatically creates access to your house. There is to be a minimum of two exits to the ground level, diametrically opposite to each other. The software makes use of as many vertical connections as possible, providing the opportunity to install elevators. The curent calculated space for access is a diameter of three meters, which can be filled with either escalators, brigdes or elevators. Where possible, the roof structure of neighboring houses is used, in order to minimize the impact on its surroundings.

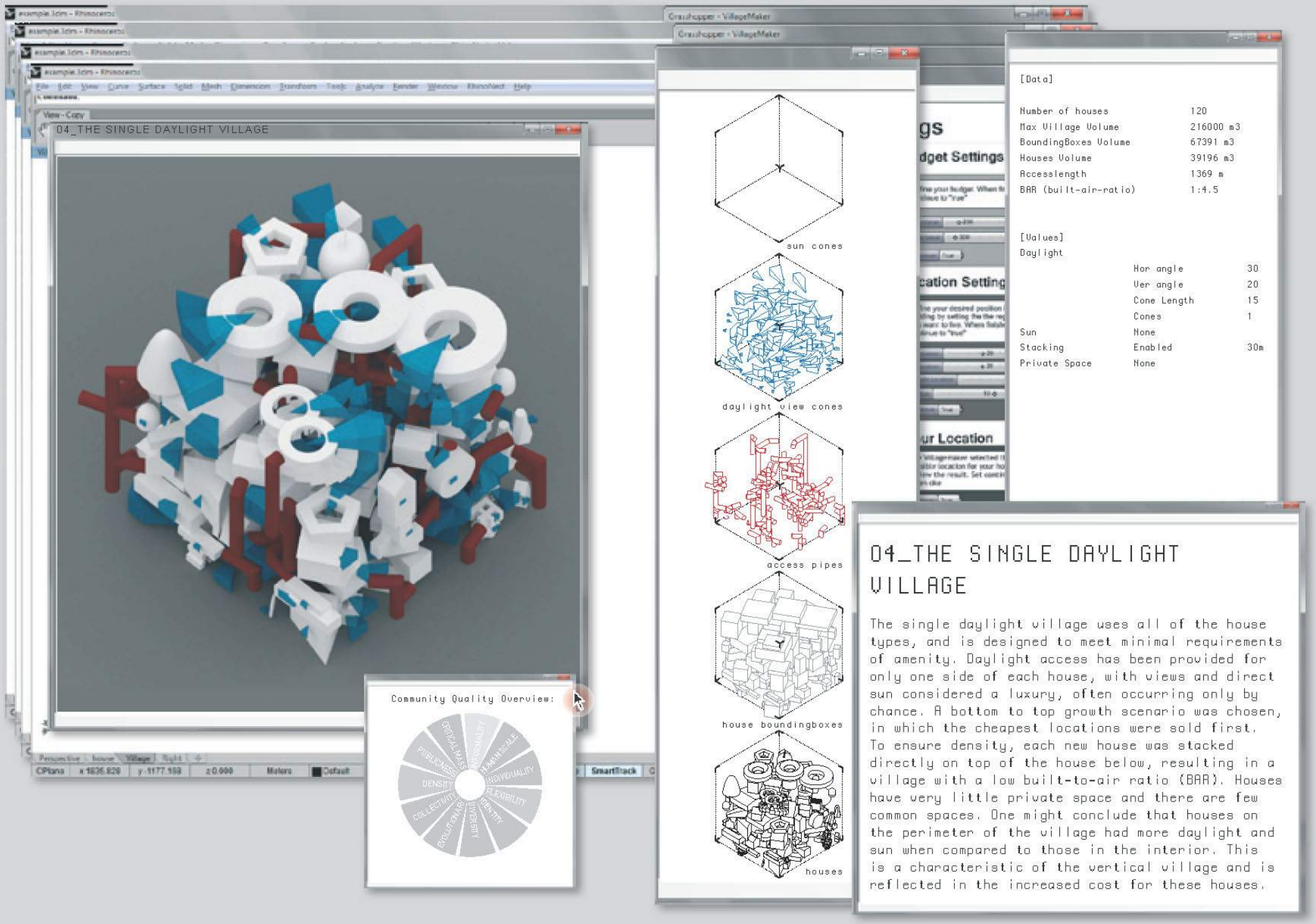


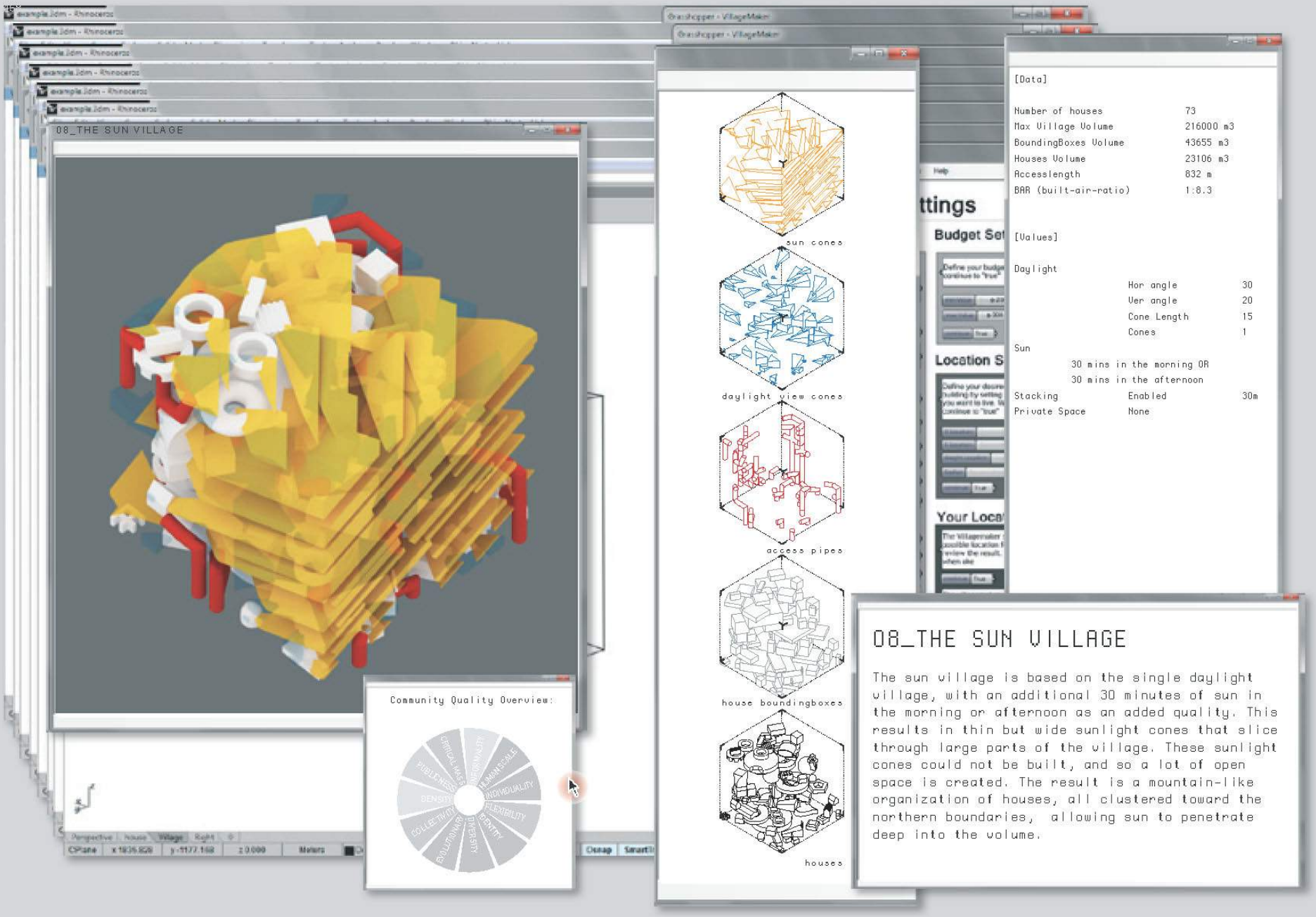
NEXT VERSION:
Public Space and Amenities: By directing the programmed traffic pipes in the model towards the nearest node in the houses' vicinety, this location therefor can be transormed into a public space, or other communal demanded areas.


Grasshopper - VillageMaker
File
Edit
View
Arrange
Solution
Window
Help
VillageMaker
01_THE BLOCK VILLAGE
02_THE RATIONAL VILLAGE
03_THE FREE ORIENTATION VILLAGE
04_THE SINGLE DAYLIGHT VILLAGE
05_THE DOUBLE DAYLIGHT VILLAGE
06_DAYLIGHT ON ALL SIDES VILLAGE
07_THE VIEW VILLAGE
08_THE SUN VILLAGE
09_THE EU REGULATIONS VILLAGE
10_THE RANDOM GROWTH VILLAGE
11_THE PRIVACY VILLAGE
sun cones
daylight view cones
access pipes
house boundingboxes
houses
Community Quality Overview
Solution completed in ~49.0 seconds (11 seconds ago)


01_THE BLOCK VILLAGE
sun cones
daylight view cones
access pipes
house boundingboxes
houses
[Data]
Number of houses 135
Max Village Volume 216000 m3
BoundingBoxes Volume 62208 m3
Houses Volume 51321 m3
Accesslength 1153 m
BAR (built-air-ratio) 1:3.2
[Values]
Daylight none
Sun none
Stacking Enabled 30m
Private Space none
Community Quality Overview:
01_THE BLOCK VILLAGE
The block village is the most primitive organization of the Vertical Village. Using only the 'default' pitched roof-style houses, with zero rotation and no allowances made for views or sunlight, it results in what could be termed the 'control' sample, closest to the urban blocks which this software has been developed to challenge.


02_THE RATIONAL VILLAGE
Community Quality Overview:
sun cones
daylight view cones
access pipes
house boundingboxes
houses
[Data]
Number of houses 83
Max Village Volume 216000 m3
BoundingBoxes Volume 38246 m3
Houses Volume 31553 m3
Accesslength 977 m
BAR (built-air-ratio) 1:5.8
[Values]
Daylight Hor angle 30
Ver angle 20
Cone Length 15
Cones 1
Sun none
Stacking Enabled 30m
Private Space None
02_THE RATIONAL VILLAGE
Similar to the block village, the rational village is a monotonous configuration. Again using only the pitched roof-style houses, all user preferences are kept to a minimum, with the exception of allowances for views. This results in a pixilated village that organizes itself in a vertical, regular manner. Since the houses are stacked and equal in size, there is a clear division in layers or floors. In some areas, a traditional street typology of rows of houses has emerged.


04_THE SINGLE DAYLIGHT VILLAGE
Community Quality Overview:
sun cones
daylight view cones
access pipes
house boundingboxes
houses
[Data]
Number of houses 120
Max Village Volume 216000 m3
BoundingBoxes Volume 67391 m3
Houses Volume 39196 m3
Accesslength 1369 m
BAR (built-air-ratio) 1:4.5
[Values]
Daylight
Hor angle 30
Ver angle 20
Cone Length 15
Cones 1
Sun None
Stacking Enabled 30m
Private Space None
04_THE SINGLE DAYLIGHT VILLAGE
The single daylight village uses all of the house types, and is designed to meet minimal requirements of amenity. Daylight access has been provided for only one side of each house, with views and direct sun considered a luxury, often occurring only by chance. A bottom to top growth scenario was chosen, in which the cheapest locations were sold first. To ensure density, each new house was stacked directly on top of the house below, resulting in a village with a low built-to-air ratio (BAR). Houses have very little private space and there are few common spaces. One might conclude that houses on the perimeter of the village had more daylight and sun when compared to those in the interior. This is a characteristic of the vertical village and is reflected in the increased cost for these houses.


08_THE SUN VILLAGE
Community Quality Overview:
sun cones
daylight view cones
access pipes
house boundingboxes
houses
[Data]
Number of houses 73
Max Village Volume 216000 m3
BoundingBoxes Volume 43655 m3
Houses Volume 23106 m3
Accesslength 832 m
BAR (built-air-ratio) 1:8.3
[Values]
Daylight
Hor angle 30
Ver angle 20
Cone Length 15
Cones 1
Sun
30 mins in the morning OR
30 mins in the afternoon
Stacking Enabled 30m
Private Space None
08_THE SUN VILLAGE
The sun village is based on the single daylight village, with an additional 30 minutes of sun in the morning or afternoon as an added quality. This results in thin but wide sunlight cones that slice through large parts of the village. These sunlight cones could not be built, and so a lot of open space is created. The result is a mountain-like organization of houses, all clustered toward the northern boundaries, allowing sun to penetrate deep into the volume.

Our situation changed radically with the Vertical Village and the two generating software-packages. I still remember the introduction of the HouseMaker©, which allowed us to compose the house of our dreams, and the VillageMaker©, which helped us find our dream location.