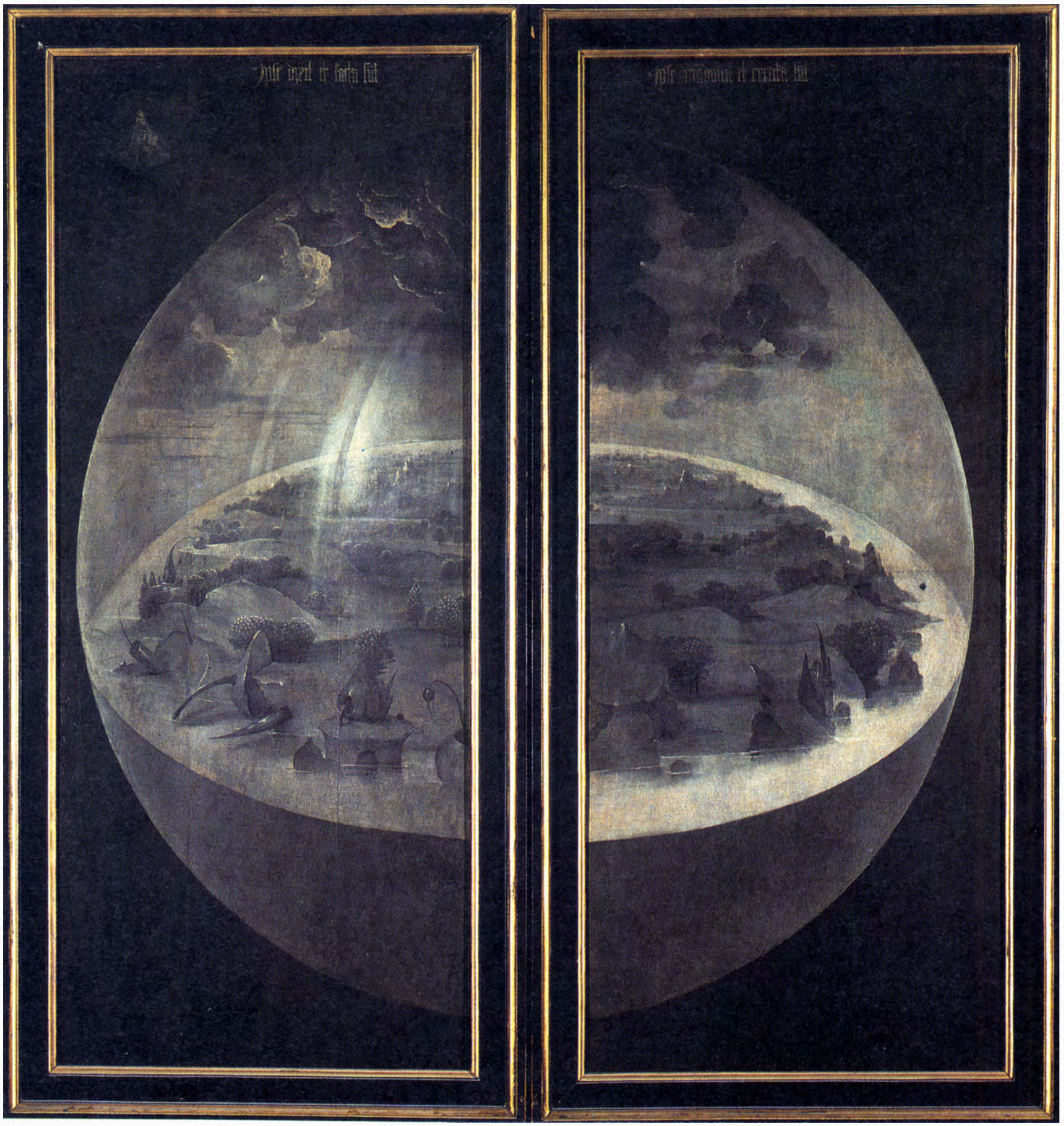
Wim van den Bergh

INTROVERTED EXTROVERSION

REBUILDING PARADISE

2nd Sustainable Design and Building Encounter
April 24-26, 2013, Museo Technológico CFE
2 Sección de Chapultepec, México D.F. México

Rebuilding Paradise



In line with the title of this congress, 'Rebuilding Paradise', I would like to start with an image of 'The Garden of Earthly Delights', which is actually the modern title given to a triptych painted between 1490 and 1510 by the Dutch master Hieronymus Bosch. You should keep in mind that this triptych saw the light of day in the same period that Christopher Columbus was discovering the Americas (1492-1502), initially thinking that by traveling west, he had now traveled around the world and reached Japan and the East Indies. In this respect the outside of this triptych is interesting since it actually shows us three spatial concepts of a finite world, that is, a world that is limited in its extent:
One concept is as an island surrounded by water (the ancient mythical view of the world).
The second is as an introverted spatial unit, a flat world enclosed within a huge transparent dome *à la* Buckminster Fuller, or like in the famous Flammarion woodcut, from 1888.
And the third, that we could visualize today, is as the surface of a globe, an idea that Columbus thought he had proved.

In the context of this conference on the theme of sustainability, we should understand that all three views are finite in terms of space and material, or better said, that the world as we know it today is finite in terms of territory and resources. Paradoxically, it was at the time we slowly found out that the world was a globe that our urge to colonize all its territories and exploit its resources also took center stage, and we conveniently forgot that, ultimately, the surface of this globe, with everything it had to offer us in terms of territory and resources, was finite.

So, what I would like to talk about today is territory and resources in terms of housing and its design (since that is my chair at the Faculty of Architecture at Aachen University). More specifically, I want to make a case for the introverted house that allows its inhabitants to live in a state of INTROVERTED EXTROVERSION. In other words, I want to address the house as the concept of a rebuild 'paradise', from ‘*pairi-daeza’*, which, as you probably know, means surrounded by a wall in Old Persian. So, consider the house as a 'comfortable domain', a

totality of interior and exterior spaces for its inhabitants to dwell in, home as a safe and protected private territory.

Now, as we open the triptych we could ask the question, “Did Adam and Eve initially need something like a house in paradise?”
Let’s take a closer look at Bosch’s ‘Garden of Earthly Delights’, beginning with the left panel where he starts his triptych with an image that represents Adam and Eve (together with God) in Paradise.
The middle panel of his triptych, then, represents the ‘Garden of Earthly Delights’, a kind of dream of a reconstituted paradise following the expulsion of Adam and Eve.
And the right panel of the triptych shows us the final outcome of this dream, a kind of nightmare, or a sort of apocalypse

As to the answer to the question, "did Adam and Eve need a house in paradise?" For Bosch the answer is simple: no, they did not, since they where protected not only by God, but also by an imaginary 'wall' (the *pairi-daeza*) enclosing the ‘comfortable domain’ of their garden. As we can see, this garden only

contained the two of them (next to God) and some small animals that weren’t dangerous.
In the middle you can see how a river and a mountain range create a natural borderline confining the larger and dangerous animals in the upper half of the painting. This ‘outside of paradise’ is where you would need a kind of 'wall' or 'house' to protect yourself. And as you can see the birds in the upper half have protective houses in the form of caves.

The middle part of the triptych shows what happened after the expulsion. They went out and multiplied and thus founded mankind. But as it seems they didn’t yet realize that man is not only a social 'animal' but besides that a territorial 'creature'. Well, soon enough they were going to find out that envy among each other (from *en*=upon + *videre*=to see, i.e., to cast an 'evil' eye upon) would quickly lead to both social and territorial conflicts.
In the middle part of the triptych, in the so called ‘Garden of Earthly Delights’ as the dream of a rebuilt paradise, everything still seems to be OK. Groups, couples, different races mingle and look rela-

that some of them retreat playfully into house-like places as in a game of 'hide and seek'. In the middle of the painting itself you see another type of people, riding all kinds of animals, a sort of nomadic people who don’t need something like permanent houses. And then at the top you can see a kind of fantasy of a city with larger high-rise structures housing both people and animals.

Next, on the right of the triptych we get the nightmare. This is where you can see envy at work giving rise to social conflicts, leading to religious and ethnic clashes, trade disputes and ultimately to brutal territorial wars, in which the borders of one's initial 'comfortable domain', the walls of the city and its houses are under threat.
This is where the enclosure of paradise as a spatial form, a wall that protects you and your loved ones within a 'save territory', turns into its opposite for your envious enemy.
In other words, hell, which derives from the proto-germanic *‘haljo’*, meaning something covered up, something hidden.

In this sense of safety and protection the etymology of words like ‘comfortable’ and ‘domain’ is also interesting.
Comfortable is derived from *‘com’*, intensive and *‘forte’*, meaning ‘strength’, like in fortified (also think of comforting, as a source of alleviation or relief).
Domain in the same line combines Latin expressions like *‘dominium’*, property, *‘dominus’*, master and *‘domus’*, house.

It seems that it was only at the end of the 20th Century -- the time in which globalization as a territorial concept became a fact-- that we slowly started to realize that our world, with everything it has to offer us in terms of territory and resources, is finite. But this was something that Adam and Eve and their offspring didn’t know yet because they, like us, had to find out the hard way.
After being thrown out of their ‘comfortable domain’ because of their curiosity (their thirst for knowledge) they would have to survive on their own within the realm of themselves and nature.
They had to protect themselves against the elements, against dangerous animals and, just a little later, against other peoples as well. Therefore, they had to learn empirically how to create the artifacts they needed for their survival, such as how to construct shelters against the elements, how to build enclosures to protect themselves against dangers from the outside, and how to make tools to make life easier.
In short, the Creature created by God, i.e. man in Paradise, needed, after his expulsion, to learn how to create his own ‘comfortable domain’: humankind had to learn to Re-build Paradise.

If we look at the ‘legend’ of Adam and Eve in Genesis, it is as if we are looking at a piece of cultural history in a nutshell. This is a piece of ancient history dealing with the spatial foundations that underlay the construction of culture or better said, the spatial foundations of living together with others. Accordingly, we can read the story as the history of early mankind’s mounting problems of territory and resources.

In this representation of Adam and Eve with Cain and Able (by Julius Schnorr von Carolsfeld), we can view Adam and Eve as mankind's initial hunter-gatherers. In the same vein we can see

how their oldest son Cain (with the apple) has become the farmer and young Abel the herder. These represent two strategies for (a more comfortable) survival that mankind developed after being hunter-gatherers, but fostering fundamentally different ideas about territory. In this image you can also already see social envy brewing, since the younger one gets all the attention and Adam does not even look at the apple that Cain hands him.

The extra attention that the parents give the younger one might be understandable while he is still an infant and needs extra protection and care. But if the Supreme Being also prefers the offerings

Adam & Eve with Cain & Abel
Julius Schnorr von Carolsfeld (1794-1872), woodcut from "Das Buch der Bücher in Bildern", 1908, Leipzig

of Abel the herder more than the offerings of Cain the farmer, a fundamental envy and conflict is created. So we can understand how Cain here casts a really evil eye upon Able.

Thus a conflict is born that is both a social conflict (envy amongst family members) and a conflict over territory and resources. One is Able, the herder who as such leads a more nomadic life, lives in temporary encampments and wants to roam around freely to find grazing grounds for his herd and freely accessible watering places. The other is Cain, the farmer who lives a more sedentary life close to his land, protecting his territory and crops against grazing herds

God Prefers
Julius Schnorr von Carolsfeld (1794-1872), woodcut from "Das Buch der Bücher in Bildern", 1908, Leipzig

and needing a secure water supply to water his crops. Under these circumstances a lethal conflict is often inevitable.

After Cain killed Abel, he, his clan, and his fellow farmers had to leave the domain of the tribe (of the family and the bloodline), in a kind of second expulsion. They wander off outside the territory of the nomadic herders and he eventually founds mankind's first city, Enoch (named after his first son).

Now he (his clan or tribe) becomes sedentary again and cultivates the land around the city. Within the city specialized crafts then develop, markets are in-

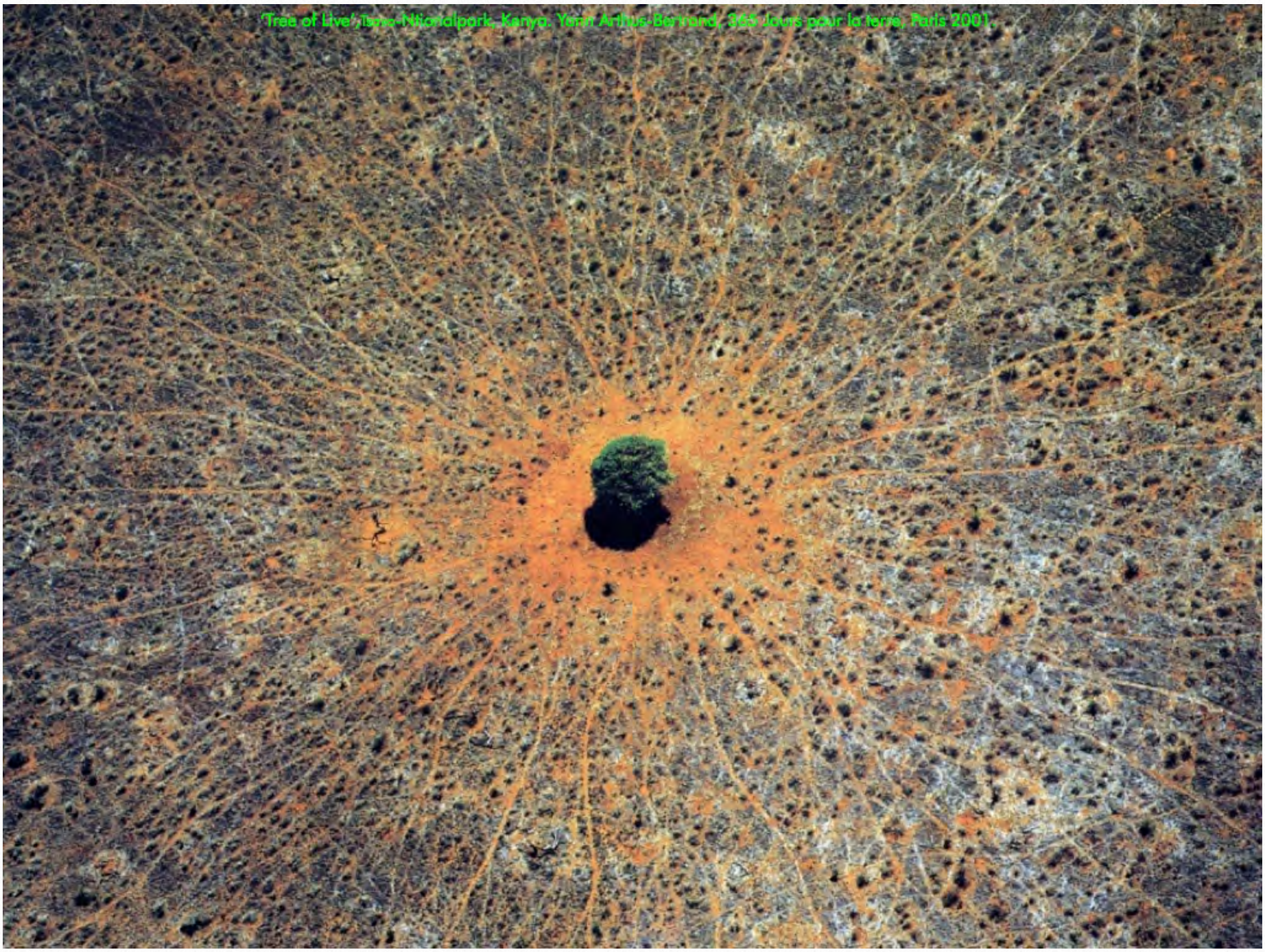
Cain Kills Abel
Julius Schnorr von Carolsfeld (1794-1872), woodcut from "Das Buch der Bücher in Bildern", 1908, Leipzig

stitutionalized in terms of time and place and trade becomes a crucial factor in picking the right location for subsequent cities.

On the other hand, the nomadic tribes, who are now envious of the wealth accumulated within the cities, are developing their warrior skills, so that they are able to seize the valuable resources produced in and among the cities.

Cain Builds the City of Enoch
Julius Schnorr von Carolsfeld (1794-1872), woodcut from "Das Buch der Bücher in Bildern", 1908, Leipzig

You can see this fundamental difference in the understanding of 'Space and Place', the concept of 'Territory' in a microcosm within this image of the so-called tree of life, in the Tsavo National Park in Kenya. The monumental tree gives an idea of place and orientation in the immense space surrounding it. And it provides shade and indicates the presence of water, which are valuable resources in a hot and arid environment. And as such it is ideal for all nomads whose only property is mobile, namely their herds.



'Tree of Live', Tsavo-Nationalpark, Kenya. Yann Arthus-Bertrand, 365 Jours pour la terre, Paris 2001.

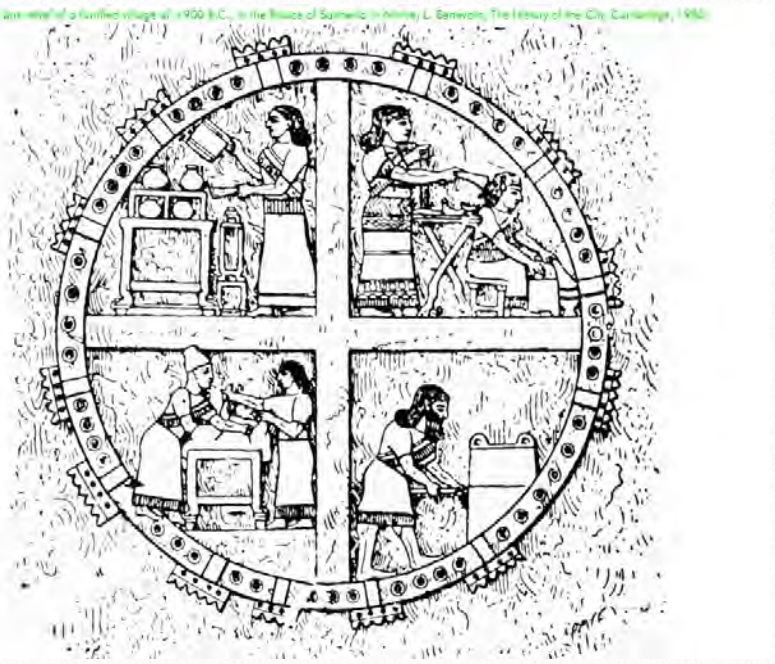
But this is not the case with the sedentary people. Their property is not mobile (it's immobile); it is 'Territory' that is defined/marked-off by a perimeter, representing an agreement among people, a border, a wall or a fence, not to be breached. It is in fact a *pairi-daeza*, which, as I mentioned before, means surrounded by a wall in Old Persian.

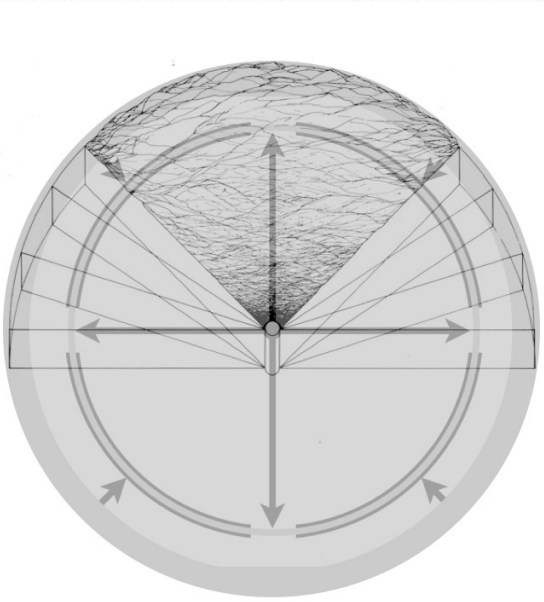
So how to create your own comfortable domain, your 'Paradise', your home? In German you have the expression *'Eingefriedet'*, which indicates a territory 'brought to peace' (*Frieden*=peace) by means of a *'com-fortifying'* (*fortis*-=strong) wall or fence.
So this is what you could call your domain, the space you dominate, your *do-*

Palm on the hills of Musandam, Oman. Yann Arthus-Bertrand, 365 Jours pour la terre, Paris 2001.

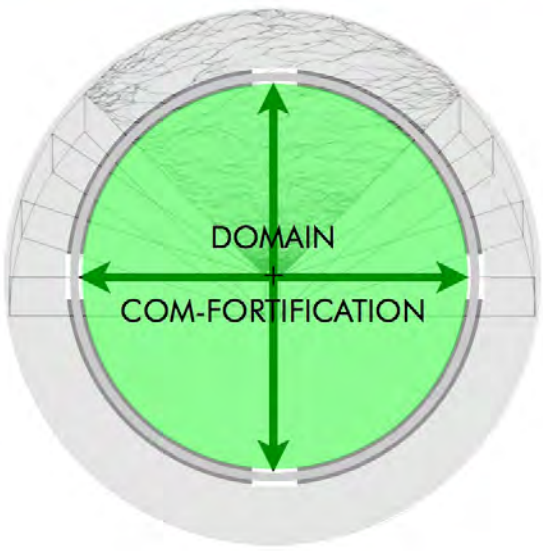
mus, your house. In Arabic dwelling is *'Sakan'*, which means tranquility and peace.

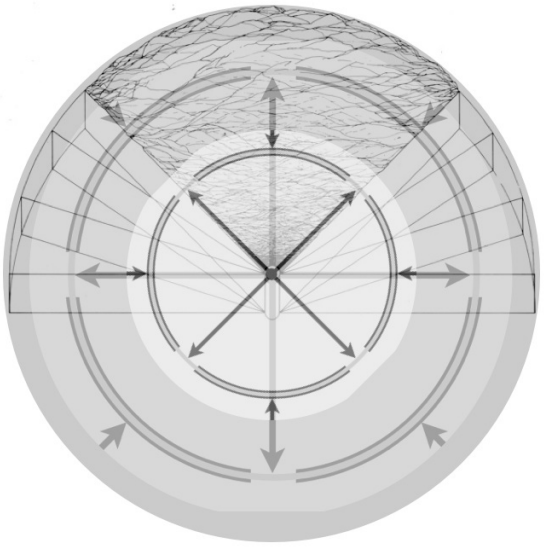
There are many spatial layers of '*com-fortifying*' or '*einfrieden*' and many mechanisms to filter what or who comes in and what goes out. This Assyrian bas-relief of a fortified village of ±900 B.C. (in the Palace of Sennacherib in Nineveh) gives us a clear image of protection and order by means of the perimeter wall, the gates with crenellations and the division in quarters.
You can read such a fortified village as a system of spatial layers with different scales. That is, as the city-wall, the quarters and the surroundings;





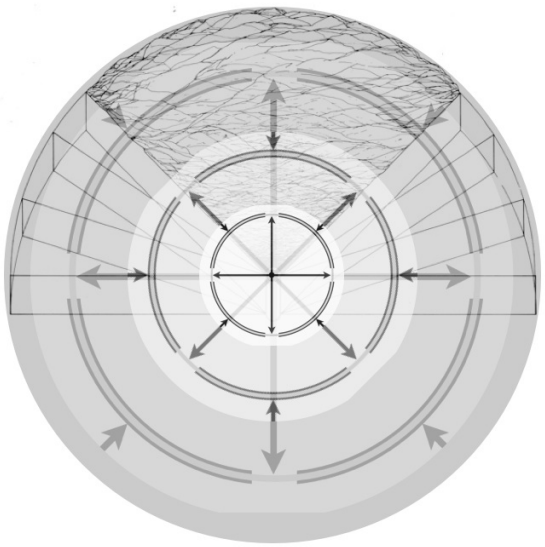
Field of perception, segment of perception, space of perception ; Hans Dieter Schaal, Paths and Passages, Berlin, 1984.

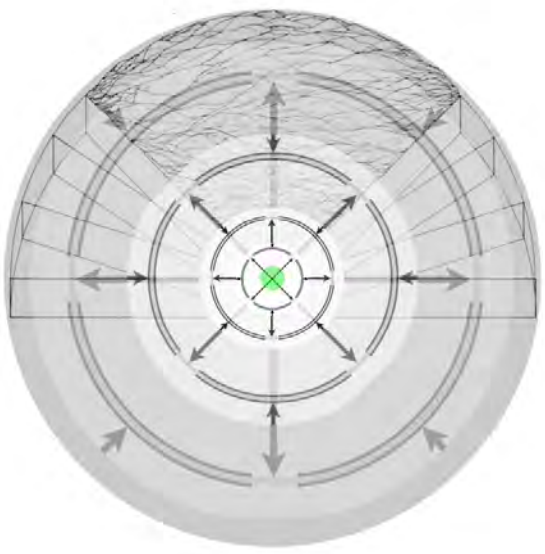




the sub-division of the quarters into urban-blocks;
the sub-division of the urban-blocks into separate houses;
and finally the house itself with its internal transition from public to private spaces, its entrance(s), its system of filters and locks and interior and exterior rooms.

To find out what this means for the house itself in terms of typology, we can do the same with one of the cities that came after Cain's city of Enoch. This city of Enoch was built east of Eden in the land of Nod. So if (according to the legend as described in Genesis) we consider paradise to be located somewhere in Mesopotamia, this should be in the vi-





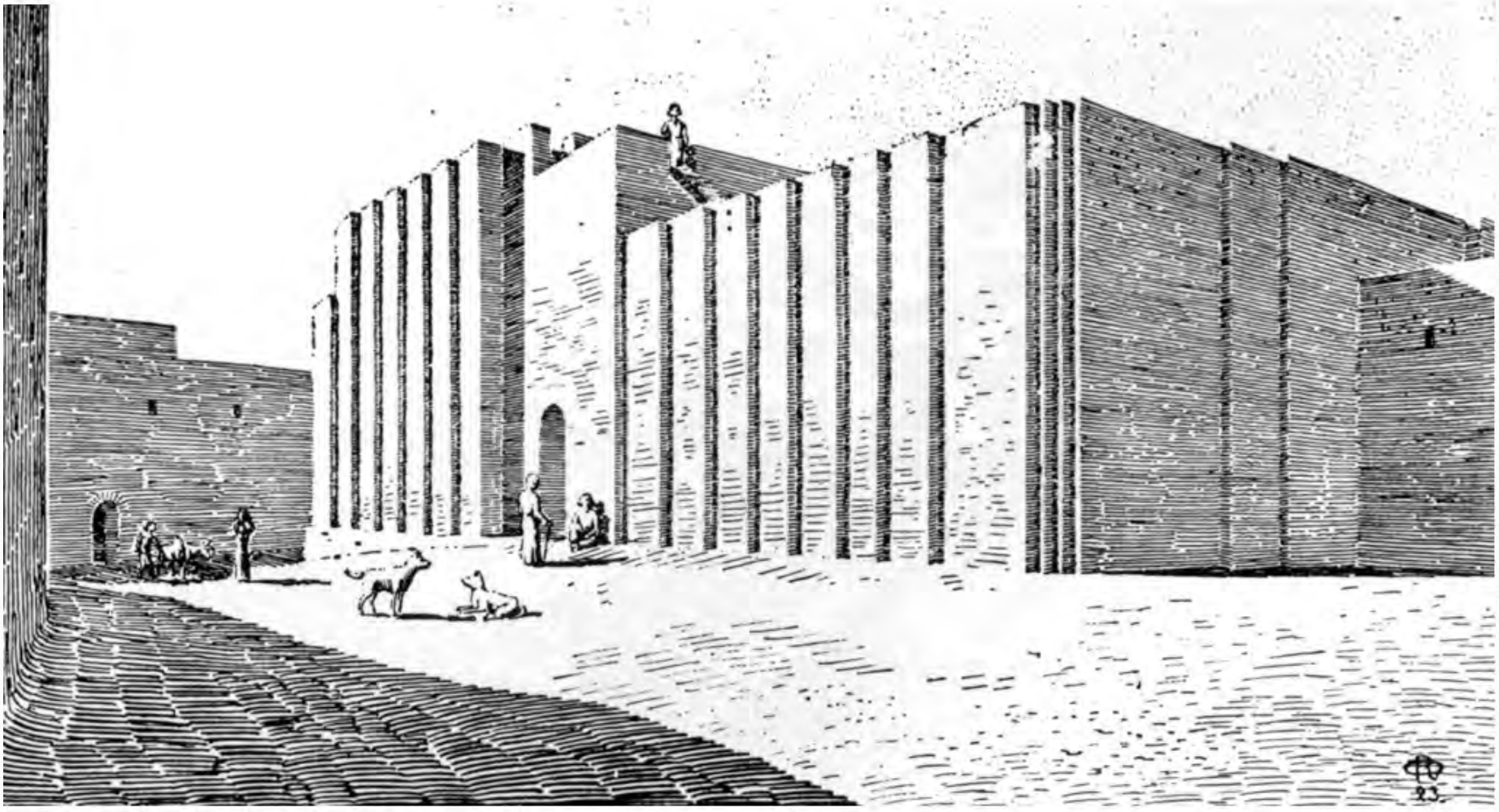
cinity of ancient cities like Ur, Uruk, Nineveh, Babylon or the like.
Let's take Babylon for example, up the Euphrates River. Its roots lay in the 4th millennium B.C., but it doesn't become important until the period 1770-1670 B.C. and then again a thousand years later between 620-320 B.C. (the new Babylonian empire).

What mainly interests us are the housing types of which these cities consisted, since in a way they show us the different social units and the manner they are spatially related to each other.
In spatial terms within these cities you would have the districts or the quarters, the blocks and then the houses. Within the houses themselves you would have

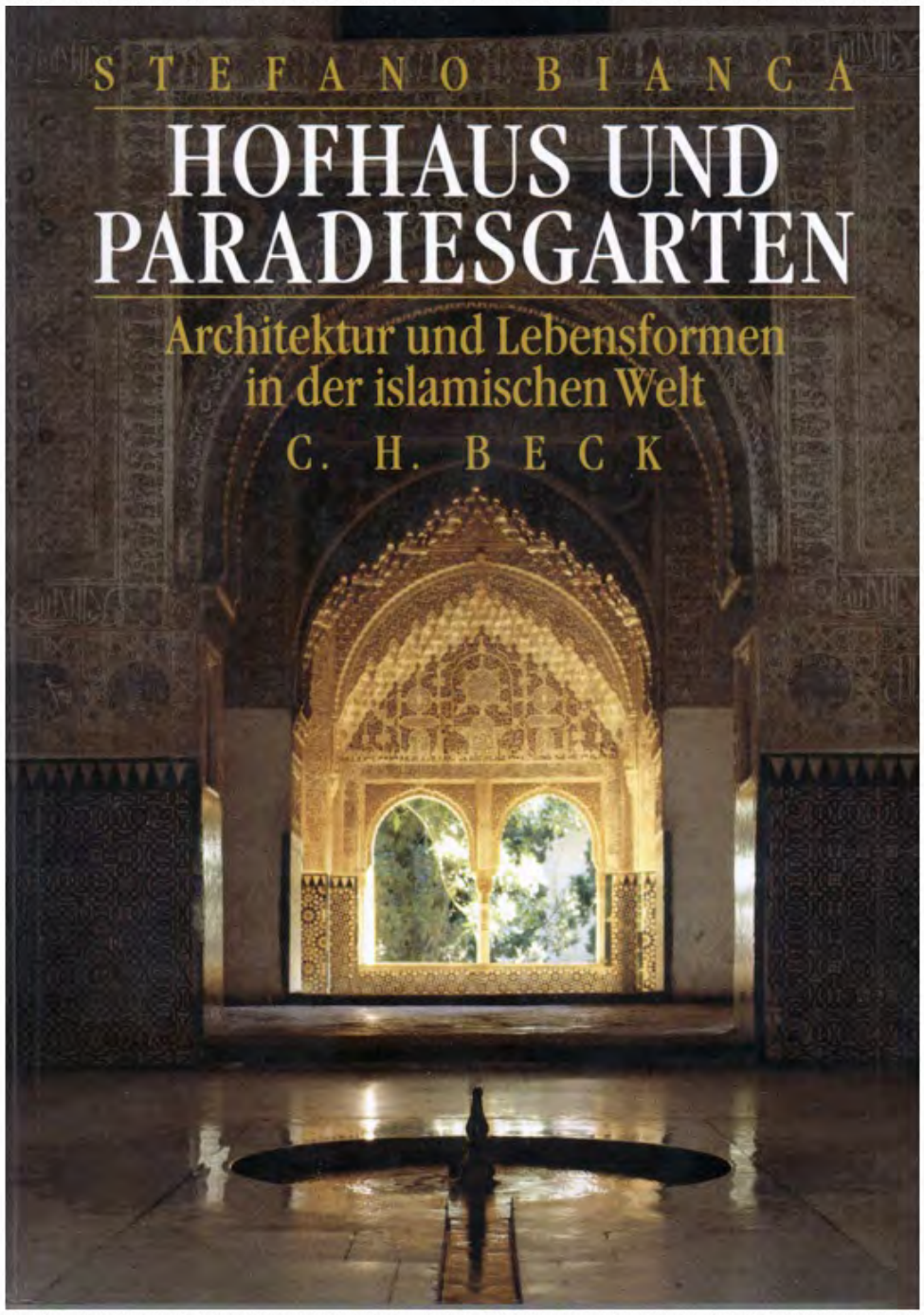
the filters, the locks and different in-between spaces, on the route from the public street to the heart of the house and then the most private quarters of the house.

In essence, what all these houses did was to group the different rooms around the courtyards that provided them with light and air. These courtyards were the actual centers of the house, the private ‘paradises’ of the inhabitants, small spatial interfaces between man and nature/culture.

Neubabylonisches Haus III von Nordwesten, Die Innenstadt von Babylon (Merkes), Oskar Reuther; Deutsche Orient-Gesellschaft, 1926, Leipzig



The tradition of the introverted house and garden, however, is not something restricted to Mesopotamia. The introverted house and garden is what you could call a universal dwelling type, a type of dwelling in which the ‘outside’ space also is an ‘inside’ space.
Mexico itself has some of the most beautiful modern examples originating from the Islamic roots of Spanish colonial architecture.



I can't express the essence of the introverted house better than with the words of Johannes Spalt:
“Set in the midst of the universe, man needs a place of peace, of seclusion, as part of the greater, hostile, amorphous world outside, a space which, all the same receives its share of day and night, sun and moon, heat and cold and rain.

This space, which is subservient to the passage of the days and years and the rules that order existence, is the ‘courtyard’.“

The history of the courtyard house by Johannes Spalt, in ‘Atrium, five thousand years of open courtyards’, Werner Blaser, Basel 1985, p.7.

THE PHILOSOPHY OF THE COURTYARD
by Johannes Spalt

“

SET IN THE MIDST OF THE UNIVERSE,
MAN NEEDS A PLACE OF PEACE, OF SECLUSION,
AS PART OF THE GREATER, HOSTILE, AMORPHOUS
WORLD OUTSIDE,
A SPACE WHICH, ALL THE SAME
RECEIVES ITS SHARE OF DAY AND NIGHT,
SUN AND MOON,
HEAT AND COLD AND RAIN.
THIS SPACE
WHICH IS SUBSERVIENT TO THE PASSAGE OF
THE DAYS AND YEARS
AND THE RULES THAT ORDER EXISTENCE,
IS THE
‘COURTYARD’.

”

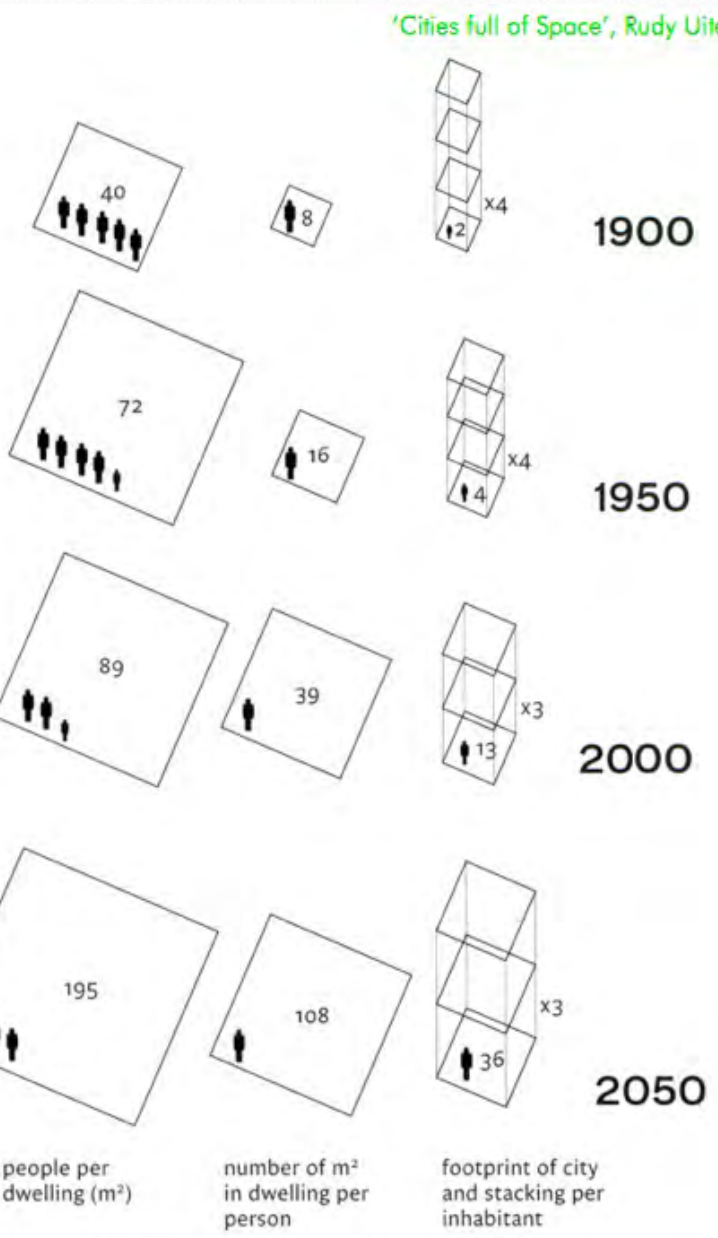
Introverted Extroversion

A Plea for the Introverted House

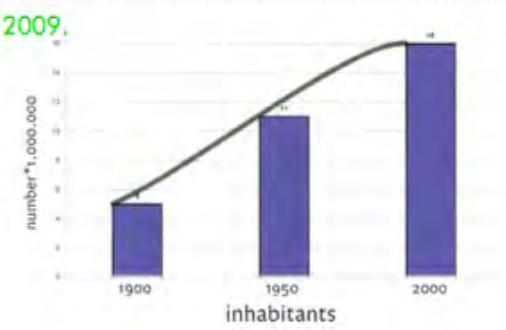
The world as we know it today is finite in terms of territory and resources. And as I said before, what I want to talk about today is territory and resources in terms of housing and design. More specifically, I want to make a plea for the introverted house -- the house as ‘paradise’, or better said, the house as a ‘comfortable domain’ for you and your loved ones.

I also want to show you that an introverted outside space (call it patio, courtyard, atrium or garden court) has much more value than the extraverted space around our house.

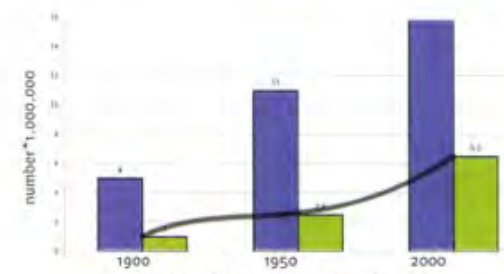
Where, today, are the problems of territory and resources in terms of housing and design that we have to deal with? If, for example, we take the Netherlands we can see the following:



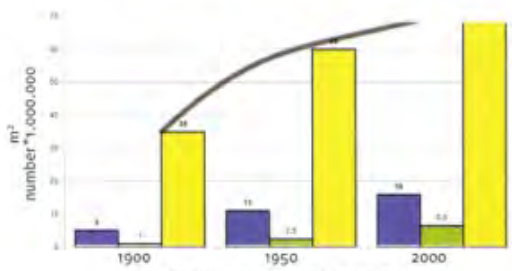
increase in use of space per person in the netherlands



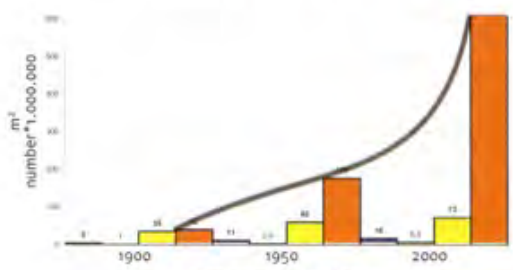
inhabitants



halving of dwelling occupancy



doubling of dwelling size



net square metres

total necessary housing surface area has increased by a factor of 16

In 1900 the Netherlands had 5 million inhabitants, the average dwelling unit was 40 m^2 and there were on average 5 people living in it, meaning 8 m^2 of interior dwelling space per person.
In 1950 this grew to 11 million inhabitants, the average dwelling unit was 72 m^2, and there were on average 4,5 people living in it, meaning 16 m^2 of interior dwelling space per person (so it doubled in 50 years).

In 2000 this then grew to 16 million inhabitants, the average dwelling unit was 89 m^2, but there were on average only 2,3 people living in it, meaning 39 m^2 of interior dwelling space per person.
So in the subsequent period of fifty years it more than doubled again, since every dwelling unit only accommodated half the number of inhabitants. In other words, within a hundred years our personal interior dwelling space grew al-

'Cities full of Space', Rudy Uitenhaak, Rotterdam, 2009.

	1900	1950	2000
dwelling occupancy	5	4,5	2,3
net m^2/dwelling	35	60	75
gross m^2/dwelling	40	72	89
m^2/person	8	16	38,7
open space in city	30 %	35 %	50 %
net built percentage	70 %	65 %	50 %
stacking factor	4	4	3
FSi	1,9		0,75
net city/inhabitant	4,2 m^2		51,6 m^2
gross city surface area*	31 m^2		275 m^2

indicative schedule of space needs development:
around 2050, the surface area of an average suburban home will be 150 m^2

the personal space occupied per inhabitant of the netherlands:
in 1800, 2 million inhabitants had 17.000 m^2/inh; in 1900, 5 million inhabitants had 7.500 m^2 /inh;
in 1990, 16 million inhabitants occupy 2.300 m^2 per inhabitant.
in red the expected development of the built footprint per inhabitant of the netherlands

most five-fold to what we occupied in 1900. But even more extreme is the change in so-called ‘net city space per inhabitant’. This is the average exterior territory belonging to each dwelling unit (the garden, the exterior space for storage, private parking, etc.) and it went from 4,2 m^2 per inhabitant in 1900 to 51,6 m^2 per inhabitant in 2000, so a more than twelve-fold increase.

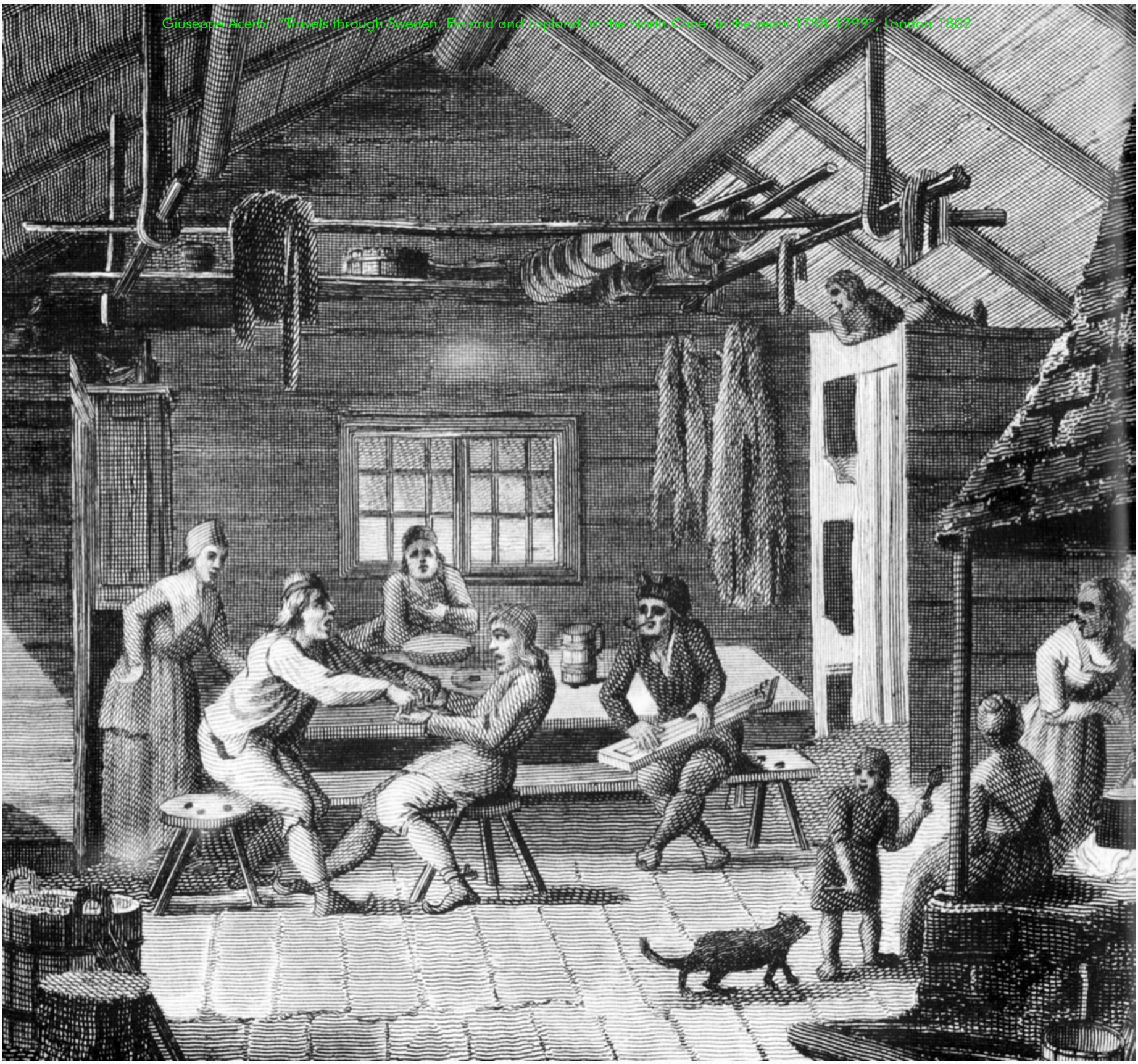
Thus if we want to discuss today’s problems of territory and resources, in terms of housing and design, we have to address the problems caused by this steadily growing territorial footprint. In other words, next to the five-fold increase of our interior territory (with all its energetic consequences), we also have to deal with the more than twelve-fold increase of our exterior territory (with all its environmental consequences).

What was/is the cause?
The enormous growth of our territorial footprint, specially in the second half of the 20th century, was only possible because of the fact that a much wider spectrum of the population experienced the relative affluence of the former (upper) middleclass, which in turn also nurtured their steadily growing demand for more ‘spatial comfort’, i.e. spatial (mono-) functionality and individual privacy within the house, next to more green and privacy outside and not to forget the growing (territorial) space needed for the car(s).

Comfort!
This, as we saw before, is an ambivalent term that nowadays refers to 'something producing physical ease and well-being, like freedom from constraint or the pleasant lifestyle secured by prosperity'.
Now, in architectural terms there are two types of ‘comfort’: one we could call ‘mechanical comfort’, as among others described by Giedion in his "Mechanization takes command," and another type which we can call ‘spatial comfort’.

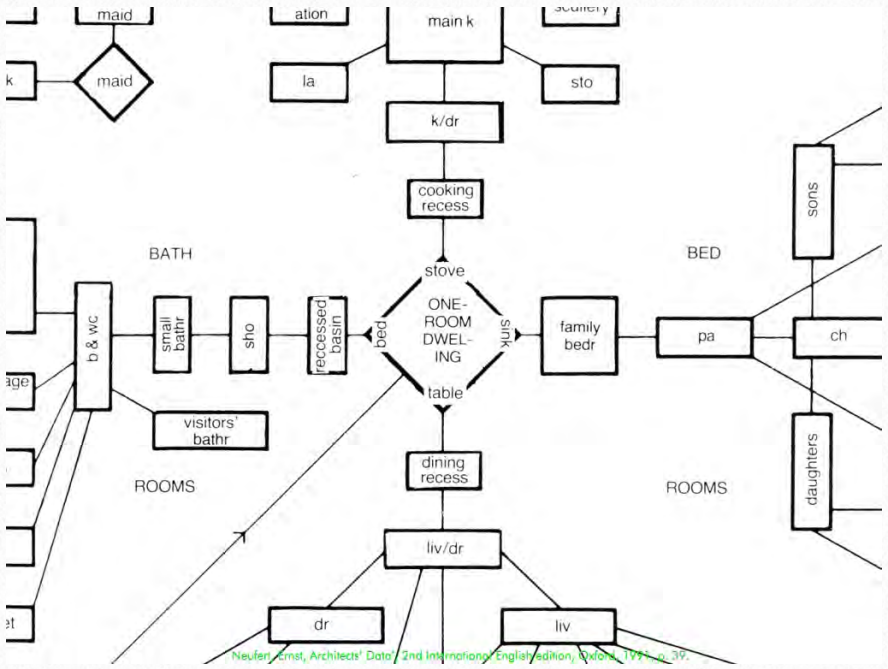
We can demonstrate both forms of comfort if we imagine how the one-room dwelling in this image developed over time to become a modern house. If we take the fireplace, in the right hand corner of the picture, we can imagine how over the years it technically developed from an open fire to present day central

heating, and from a fireplace with a cooking pot, via the cast iron stove to a fully automatic cooking range with a turbo oven and a microwave.
Likewise, we can see it in the left hand corner with the water bucket that developed from getting water from a nearby creek or a well, via a pump over a sink, to having running hot and cold water in all rooms that need it.
The far corner on the right with the stacked bed bunks developed from



Giuseppe Acerbi: "Travels through Sweden, Finland and Lapland, to the North Cape, in the years 1798-1799", London 1802.

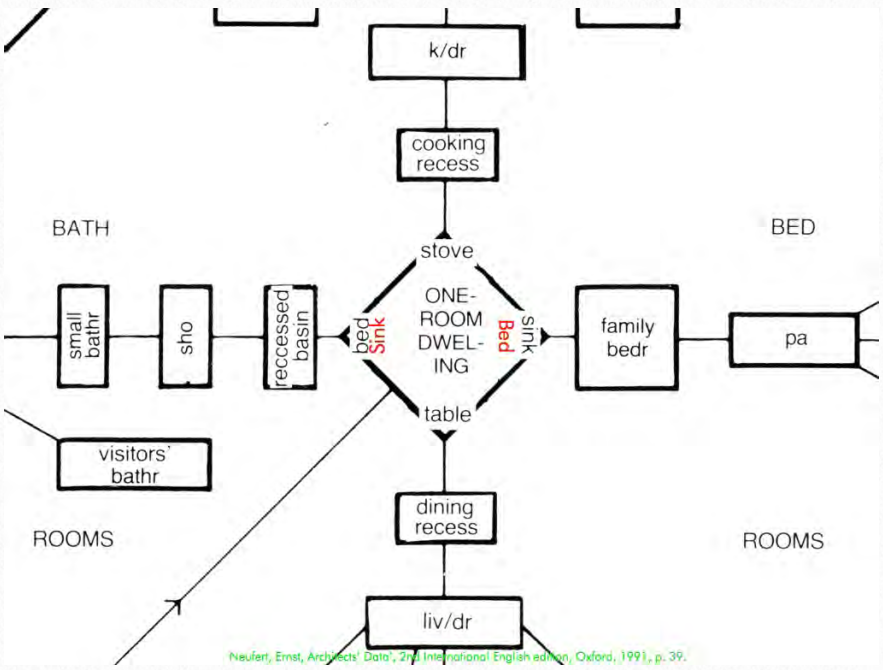
sleeping on a bed of leafs or straw, via the spring bed, to the fully adjustable beds we can get today.
And the corner with the closet and the table developed, from one multi-functional table used for all aspects of live in the same room, to several mono-functional tables for different aspect of life each within its own room.

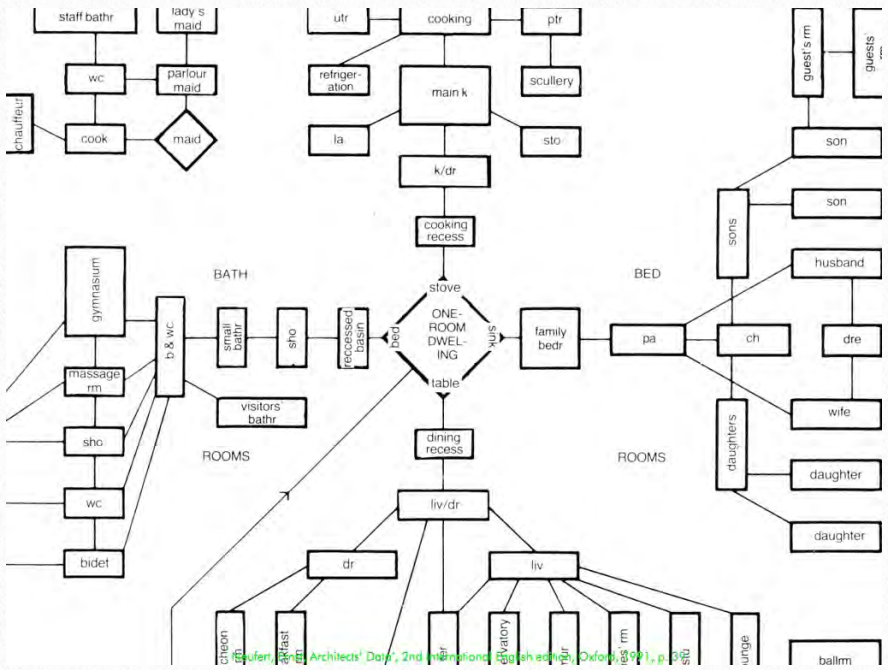


It was actually Ernst Neufert who described this development of spatial comfort as a development of the four corners of a one-room dwelling, and how these corners gradually developed into recesses, then separate rooms and then how these rooms, by means of a kind of ‘cell division’, transform into independent rooms and areas of ever more specialized functions.

This, in Neufert’s graphic depiction of this development, for instance is where a working-class house was developing towards in the first half of the 20th century (3 bedrooms for, respectively, parents, boys and girls).

This is where it developed to in the second half (every child having its own bedroom).





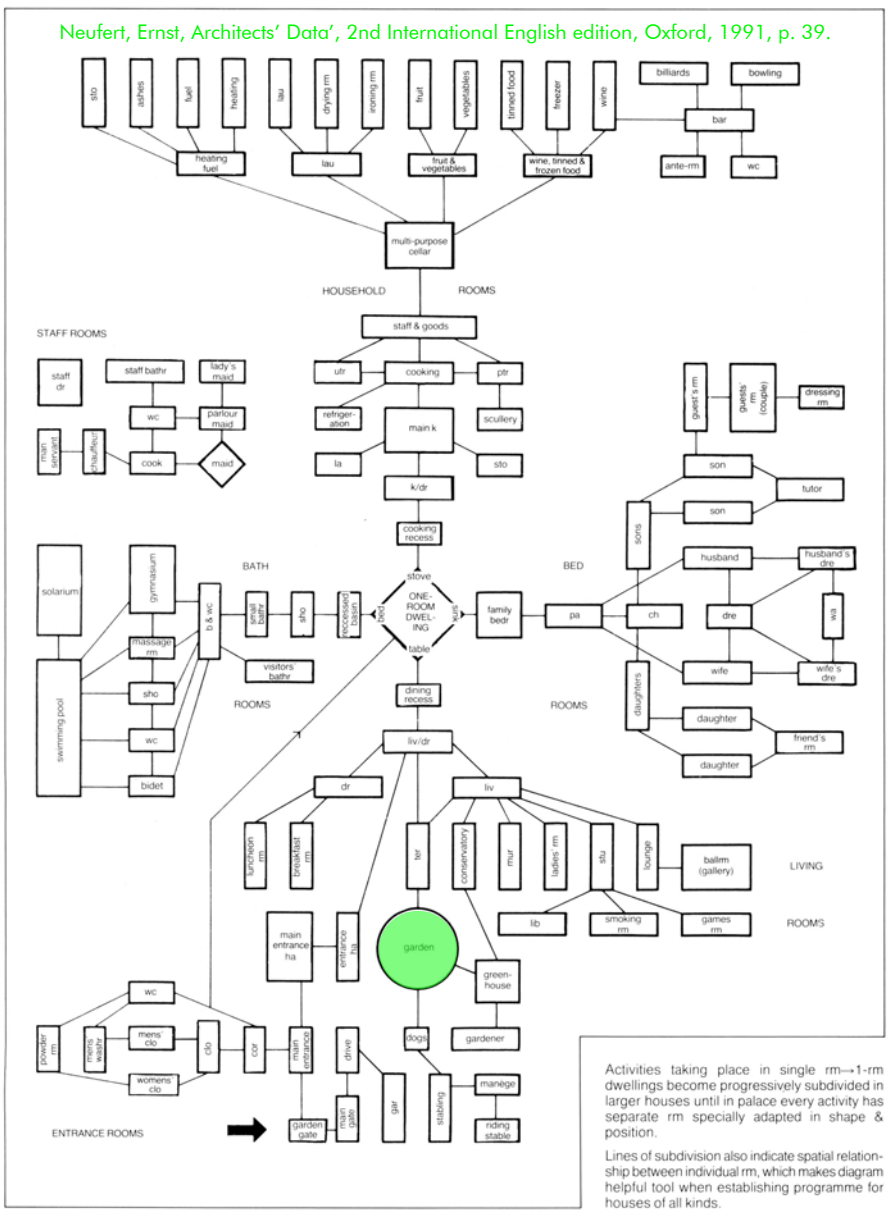
And this is Neufert's overall image of this 'subdivision of space, from one-room dwelling to palace'.
The only shape that somehow doesn't fit Neufert's rectangular graphics is that of the garden, or should we say the outside space, which is drawn as a circle.

This outside, uncovered space or 'garden', has always been an ambivalent space. In times when the surroundings weren't safe and secure, this open space of the 'palace' was introverted into a courtyard and the palace became a castle. In times when the surroundings were safe and secure the open space of the 'palace' would get extroverted into a surrounding garden and the palace became something like a huge extroverted pavilion in a park.

What now would be better in our times -- not only in terms of territorial footprint and resources, but also in terms of comfort -- an extroverted house or an introverted house? Remember these are times in which the safety and security of our surroundings, both communal and individual, are becoming ever more ambivalent.

To understand what we are talking about when we speak of our territorial footprint, I did put two comparable countries (Netherlands and Germany) next to each other. They are comparable countries in terms of spatial and mechanical comfort, but with different prevailing types of dwelling (single-family/multi-family respectively).
However, before we come to that we can first see from these statistics that the average territorial footprint (plot) per

SUBDIVISION OF SPACE, FROM 1-ROOM DWELLING TO PALACE

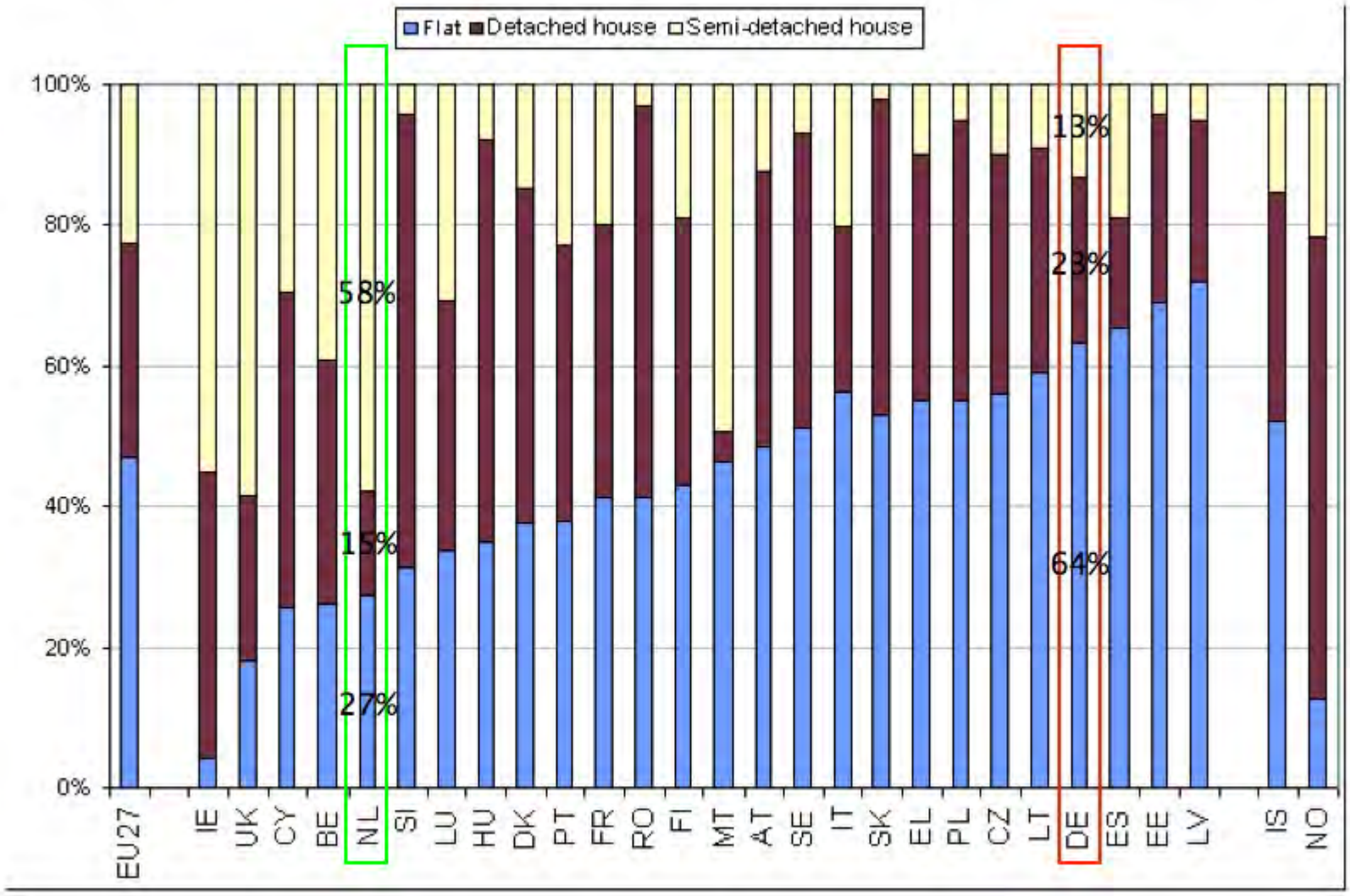


dwelling-unit in the Netherlands as compared to that in Germany is almost the same (18x18m. in The Netherlands and 17x17m. in Germany). Also the average floor surface of a new dwelling is comparable, 115 to ±114 m^2, respectively. At the bottom is a little figure and ground experiment to show what an extroverted and an introverted house would mean in terms of inside-outside space. The green is the respective plot (territorial footprint) of 18x18 and 17x17m. and indicated on it in black is the respective floor surface of a one storey extroverted/introverted house, 115 and 114 m^2. But we'll come back to that later.

2000 / 2010 Source Eurostat	Germany		Netherlands
Number of Inhabitants	82.501.000	>> 5x	16.306.000
Land Surface in km^2	357.031,00	>> 10x	35.518,00
Inhabitants/km^2 Land Surface	231	<< 2x	459
Net Dwelling Surface in km^2	11.295,10	>> 5x	2.280,07
% Land Surface = Net Dwelling Surface	3,16%	<< 2x	6,42%
Number of Dwelling-units	39.362.909	>> +5x	6.974.326
Net Dwelling Surface/Dwelling-unit in m^2 (Plot)	287 (17x17)	< 10% = Type	327 (18x18)
Average Number of Dwelling-units/ha	34,85	> 10% =Type	30,59
Average Number of Inhabitants/Dwelling-unit	2,12	±	2,28
Number of Inhabitants/ha	73	±	71
Average Size/Dwelling-unit in m^2	89,7	< 10% =Type	98
Average Dwelling-space/Inhabitant m^2	40,1	±	41
Average Surface of a new Dwelling-units in m^2	113,9	±	115
Average new Dwelling-space/Inhabitant m^2	53,7	±	50,7
Dwelling Surface - new Dwelling-unit = 'outside' m^2	173,1	< 20%	212
FIGURE - GROUND EXTROVERTED / INTROVERTED		garden privacy car legal distances	

As can be seen from this EU-statistic, the prevailing dwelling type in the Netherlands is the ground-bound, single-family house with private garden, whereas in Germany the prevailing type of dwelling is the stacked multi-family house or flat, which features the communal garden. So, even if both countries are comparable in their average territorial footprint and the size of new dwellings, there is a significant difference between the Netherlands and Germany in terms of typology.
The Netherlands has a large percentage (58%) of semi-detached single-family houses, 15% detached single-family houses and only 27% multi-family Flats with apartments.

Households broken down by type of dwelling in the EU



Netherlands: 27% Flats, 15% Detached houses, 58% Semi-detached houses
Germany : 64% Flats, 23% Detached houses, 13% Semi-detached houses

Germany on the other hand has a large percentage (64%) of multi-family houses or flats, 23% detached single-family houses and only 13% semi-detached single-family houses.
But more important is the relationship these differing typologies have to the outside space or garden and the distinction of whether this is a private outside space or a communal outside space.
In the Netherlands 73% of the houses have private gardens while in Germany only 36% of all houses have a private garden (so a little less than half of the Dutch).

This raises a fundamental question towards our concept of territory, since, as said before, man not only is a social creature, he also is a territorial creature, which means that the territory he marks out on the earth as being his domain of safety and comfort, his house and garden, his inside and outside dwelling space, is primarily bound to the earth (the *terra*).
Thus stacking 'territories' on top of each other must have been a fundamental change in the human mind and in man's concept of territory and control of a domain. Therefore, somewhere in ancient history there had to be a very strong reason to start to do so.
As far as I could find out, the first to start to stack separately owned (that is, not rented or leased) dwelling-units on top of each other were the Carthaginians.

The reason for was the very small territory they had been granted to start to build their new city on, which was soon followed by huge economic success in trading. This in turn acted as a magnet on people that wanted to be part of that success, which resulted in an explosive growth of population and wealth.

The founding myth of Carthage tells the story of the Phoenician princess Dido who had fled her city Tyre (in present day Lebanon) in 814 BC. She landed in what is present day Tunisia, its then ruler, the Berber king Larbas, however, only allowed her and her entourage to take up refuge within a piece of territory as large as that which could be 'covered' by an ox-hide. In turn the King, after making the deal, discovered that this refugee was a very clever lady. She had

the ox-hide cut in very fine strips, still connected to each other, and with that she ‘encircled’/’covered’ a complete hill, which would become the nucleus of Carthage. This city would very soon start to prosper and attract many new settlers, but expansion was always very difficult, so it seems that stacking territorial property was the only possibility (with all its attendant legal difficulties, since territorial properties now become dependent of one another).

The Romans quickly adopted the idea of stacking and realized that it was an excellent way to exploit private territorial property in the city. They did so by building high, multi-storey tenement and apartment blocks with some small com-

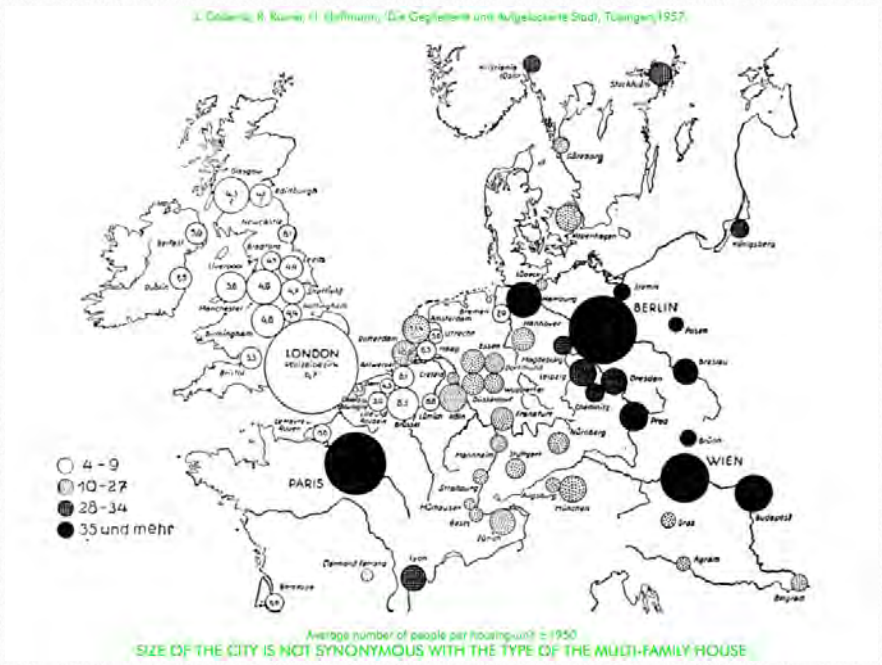
Matthäus Merian the Elder (1593-1650), 'Dido Purchases Land for the Foundation of Carthage', in Historische Chronica, Frankfurt am Main, 1630

munal courtyards and calling them *insulae*, whereas the Greeks' concept of this was an urban block with a set of individually owned houses.

Map drawn up in 1844 showing the initial territory of Carthage and the later Phoenician and Roman expansions of the city's walls.

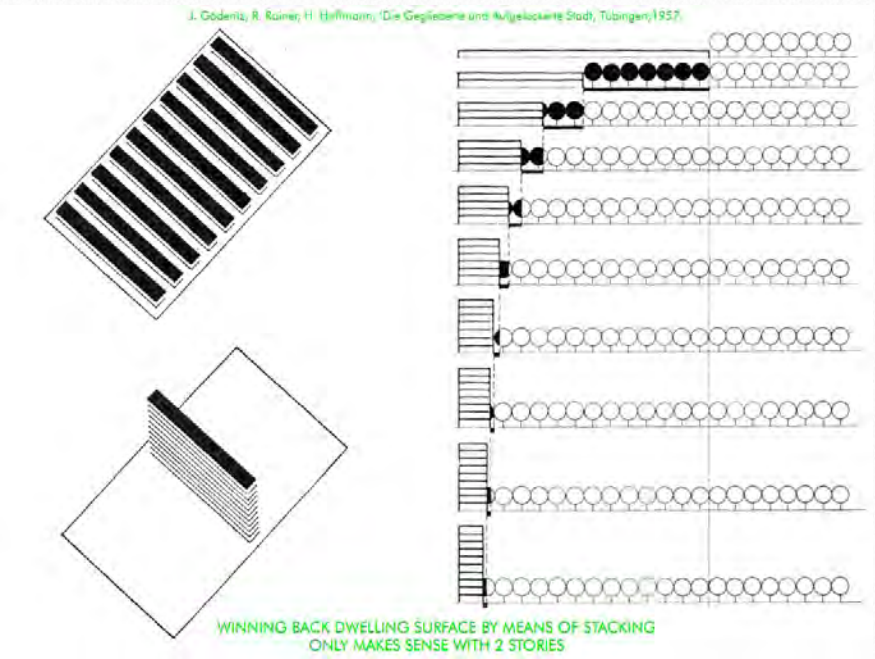
Artist impression of Carthage during the so called Sicilian wars with the Greeks in 480-307 B.C.

These concepts of the tenement block and later the 'cooperative' apartment building have survived, or better to say they were specifically introduced again by real estate and land speculators, to make as much profit as possible with their urban property.

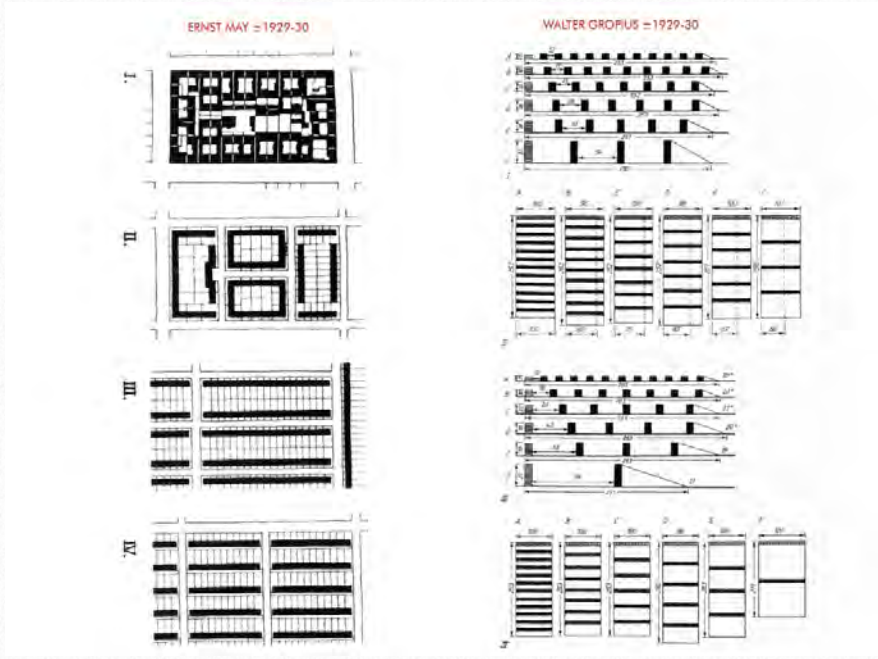


This map, drawn up by Roland Rainer around 1950, shows you that it was clear to most architects and urbanists that density and the size of the city, however, is not synonymous with the type of the multi-family house.

And it is also that trying to win back dwelling surface by means of stacking only makes sense with two or at maximum three storeys.



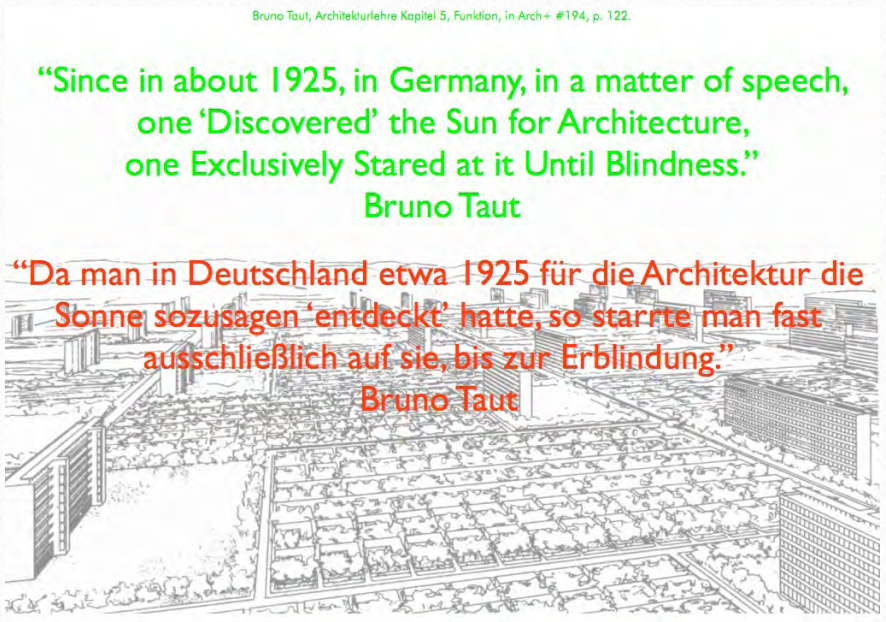
The book "Die Gegliederte und Aufgelockerte Stadt" (The Structured and Loosened-up City) that Göderitz, Rainer and Hoffmann published in the second half of the 1950's was again a reaction to the 'modern' trend of stacking that started at the end of the 1920's, driven by Gropius and Le Corbusier. As we could see before it initially were the property owners that, for economic gain, opted for stacking dwelling units on top of each other. At the end of the 19th century, however, the overcrowding of the cities became so extreme that new solution had to be found.
The impetus for this was the idea that more sunlight and fresh air would bring physical and social hygiene to those overcrowded cities.



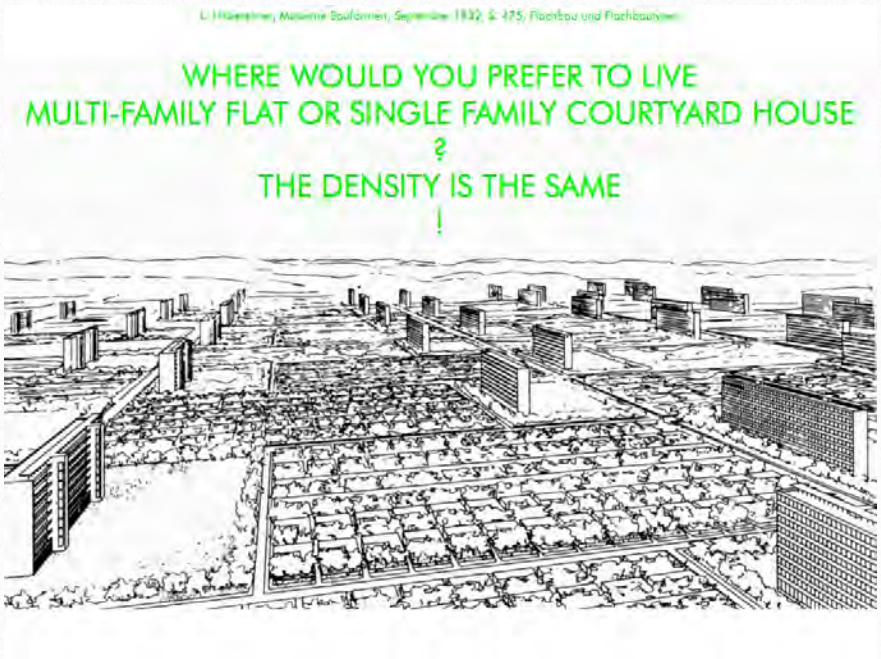
To the left, see Ernst May's idea of ± 1929-30, about the development from the closed urban block of the 19th century, via the urban block with green inner court of 1910, to the open Block of 1925 and finally to the new (low-rise) ribbon development *(Zeilenbau)* in 1930.
In fact, he also wanted to go to the modern version of the semi-detached row-house typology with a private garden, as preferred by the Dutch and most other countries west of Germany and north of France (England, Belgium, and Scandinavia). For an illustration of a modern version of the semi-detached row-house think of the 1927 examples designed and build by J.J.P. Oud and Mart Stam at the Weißenhofsiedlung in Stuttgart.

To the right the counter movement, here we have Walter Gropius' illustration accompanying his 1930 lecture at the CIAM 3 in Brussels, entitled “Low-, Mid- or High-rise Building?” The theme of this CIAM 3 was “Rational Lot Development” and it was here and then that Le Corbusier, under the heading of "The Subdivision of the Land in Cities", showed his Ville Radieuse again. In 1930 Ernst May and also Mart Stam were in Russia, so there was no real opposition to the preoccupations of both Le Corbusier and Gropius for re-planning the existing urban areas with high-rise housing for the working classes.

Gropius' main argument in determining the density and the building type was the angle of the sun. And this solar angle started to influence architecture in Germany in such a way that Bruno Taut could later say:
“Since in about 1925, in Germany, in a matter of speech, one ‘Discovered’ the Sun for Architecture, and one exclusively stared at it until blindness.”

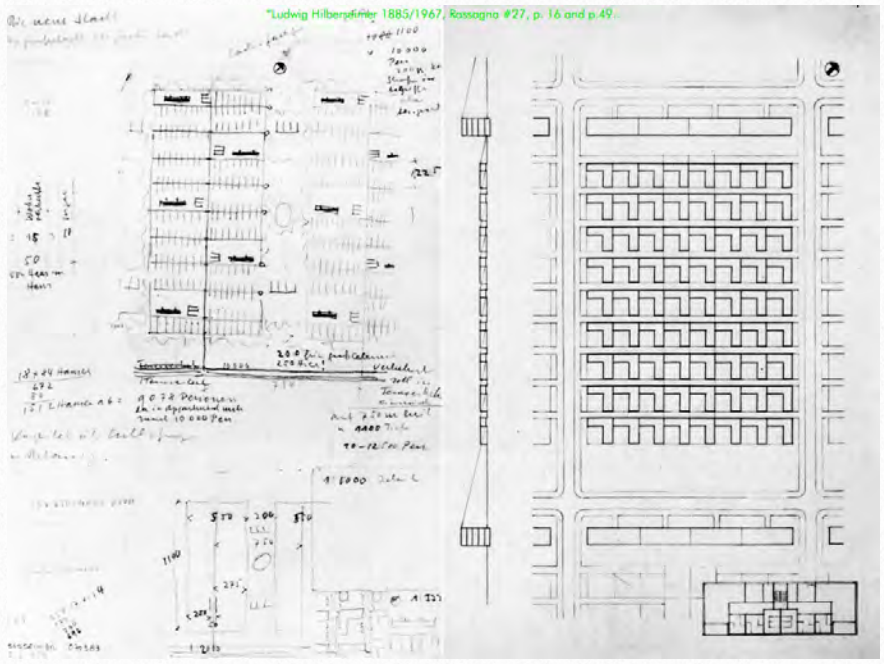


Another critic of Gropius' single minded view is Ludwig Hilberseimer.
In his “Die neue Stadt / The New City”, of around the same period, he proves that the density is the same whether you go up nine storeys or you build one-storey courtyard houses (of the famous L type), even if you stick to the lowest sun angle in winter, which is about 14 degrees.



Hilberseimer does not have a preference for one or the other type of dwelling; for him it's important that people can choose how they want to live.

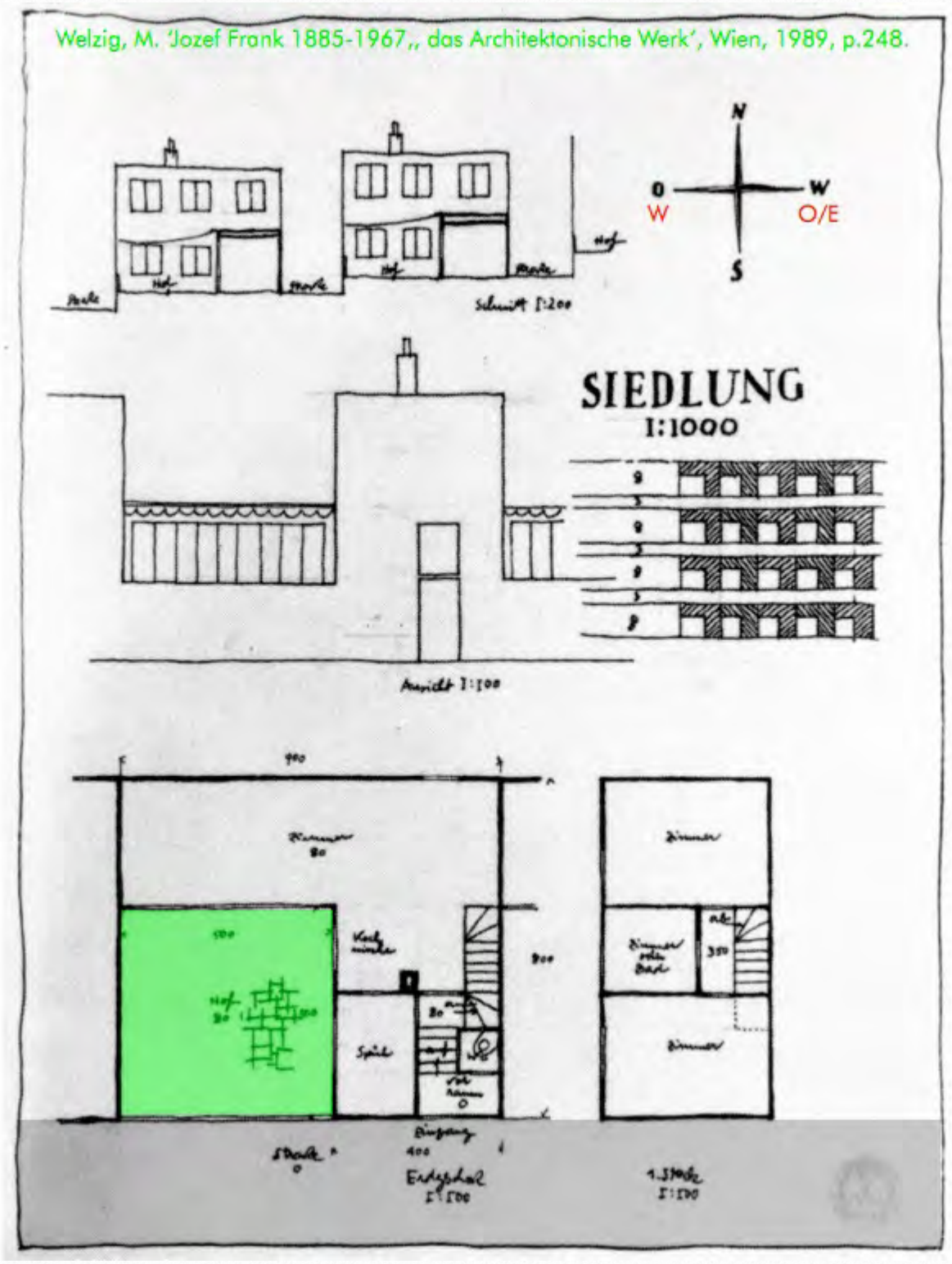
Thus with Hilberseimer the private garden is back in the picture again, but has to fight the large open spaces that Le Corbusier and Gropius prefer as the places where the workers can restore themselves.



(Ludwig Hilberseimer die Neue Stadt 1928-31, here are his calculations.)

Yet the modern courtyard house was somehow also in the air in that period. Think for instance of the designs by Hugo Häring in 1928, or here in another example of an L shaped courtyard house from 1927 or earlier, by Jozef Frank, from Austria.

Interesting, also, is the territorial footprint occupied by this house, which is 9 by 8 meters, so 72 m^2, with a courtyard garden of 5 by 5, is 25 m^2. The inside dwelling surface is 47 m^2 (72-25) at ground level and 32 (4x8) at the first level. So in total you have 79 m^2 of inside dwelling surface and 25 outside (which might even be enlarged by a roof terrace over the living room of 3x5 is 15 m^2). The intelligence of the introverted house is (as we can see in this example) to be found in the distribution of the inside and outside spaces and in the way these are relating to each other.

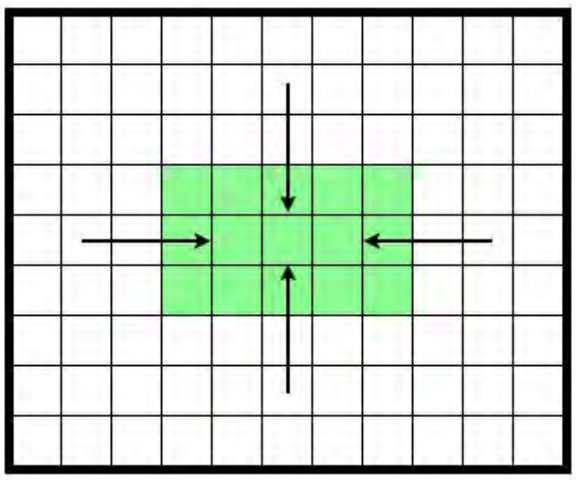


Let us now have a closer look at this distribution of inside and outside spaces, in combination with the possibility to receive light and look out into the garden. What this figure-ground example shows very clearly is that introversion creates an outside space (a courtyard or atrium of three by five units) with a scale that matches the inside spaces. In other words it becomes an outside room. While on the other side the extraverted type of the pavilion becomes somehow ridiculous. Both are the same in terms of plot size (11x9=99 units), inside space (84 units) and outside space (15 units).

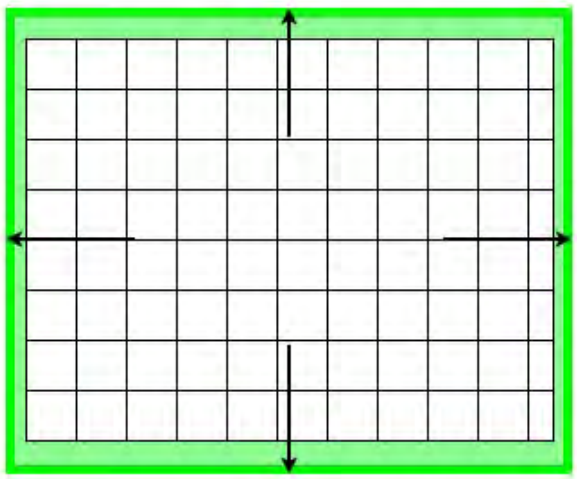
HOUSE & GARDEN
OR THE DISTRIBUTION OF INSIDE/OUTSIDE SPACES

INTROVERTED HOUSE
TOTAL PLOT 9 x 11 = 99 UNITS
PATIO GARDEN 3 x 5 = 15 UNITS
INSIDE AREA 99 - 15 = 84 UNITS

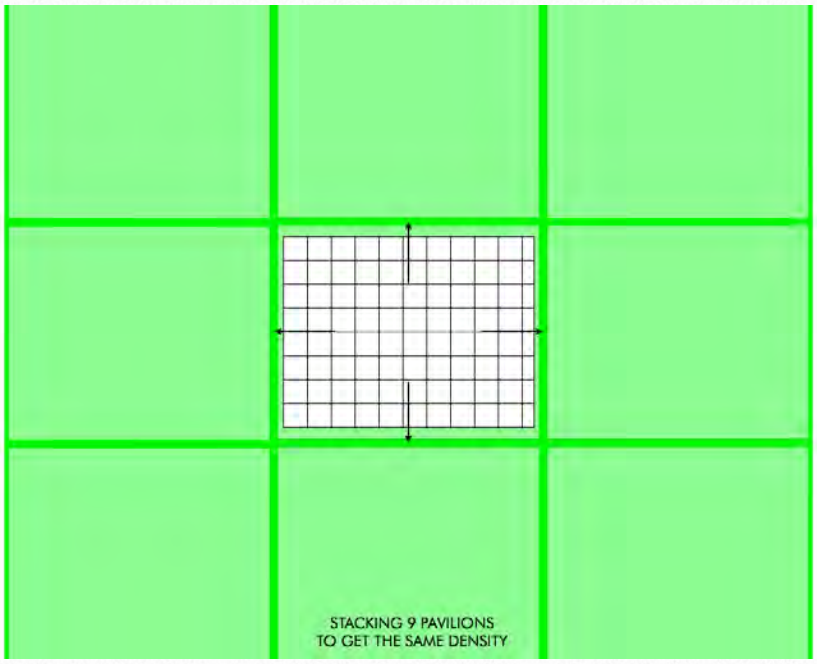
EXTRAVERTED HOUSE
TOTAL PLOT 9 x 11 = 99 UNITS
'GARDEN' 99 - 84 = 15 UNITS
INSIDE AREA 8 x 10,5 = 84 UNITS



COURTYARD
INTROVERTED

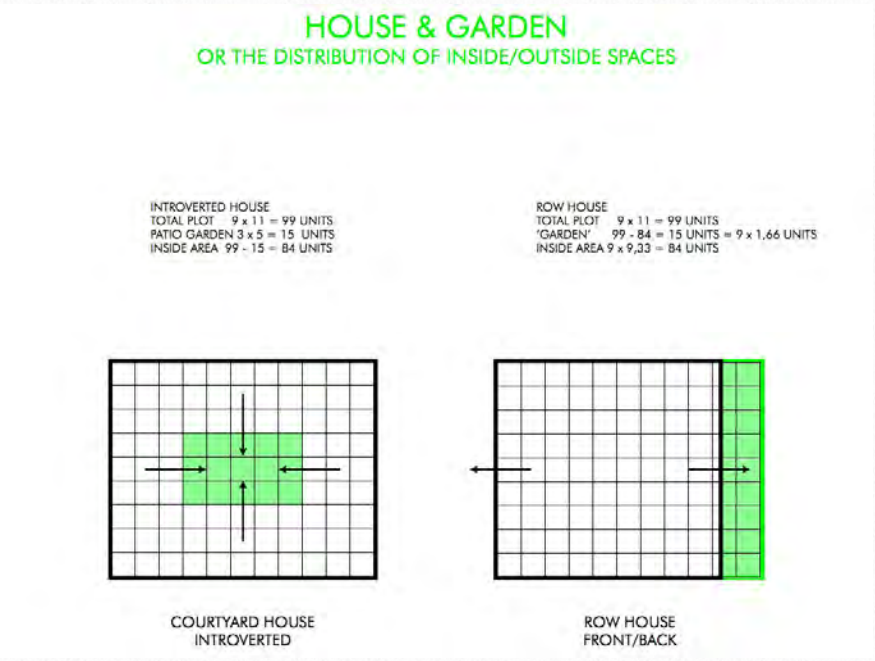


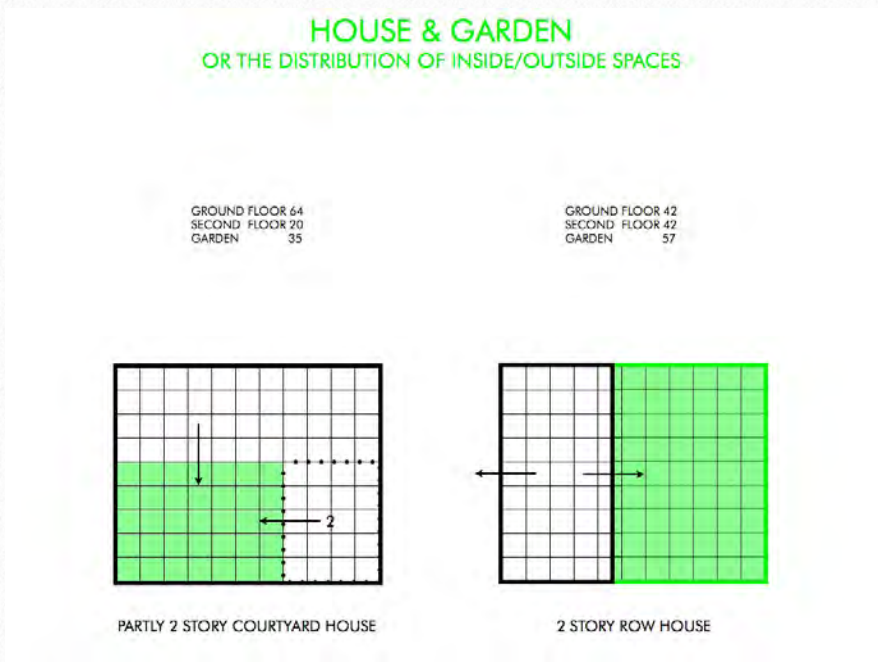
PAVILION
EXTRAVERTED



To get a reasonable ‘green belt’ around the extraverted house you need a kind of nine-square grid of equally large plots, meaning that to get the same density you would have to stack nine extraverted units on top of each other.

Or what if we would distribute the whole outside space of the extraverted house to one side, like in a row-house? Still rather ridiculous: the garden would be 1,66 units deep.





What if we go to an only partly two-storey courtyard house and a two-storey row house? Although the garden of the courtyard house is smaller it seems bigger since all rooms have a relation to the private garden. In the row house on the other hand, only the rooms in the back have a relation with the ‘private’ garden.
Courtyard house: The total plot is still 99 units, the private garden is now (7x5=) 35 units, on the ground floor we get (11x4 + 5x4=) 64 units of inside dwelling space and on the second level (5x4=) 20 units, which again gives a grand total of 84 units.
Row house: The total plot is also still 99 units, the inside dwelling space is distributed over two stories of each (9x4,66=) 42 units, total 84, the garden now becomes (99-42=) 57 units (=9x6,33).

What if we look at the enclosing walls and facades of these 2 types? Open facades normally have more heat-loss in winter and more heat-gain in summer, because of the large glass surfaces. Normally, they are also more expensive than closed facades, because of the window and door openings and the work of joining the whole together.

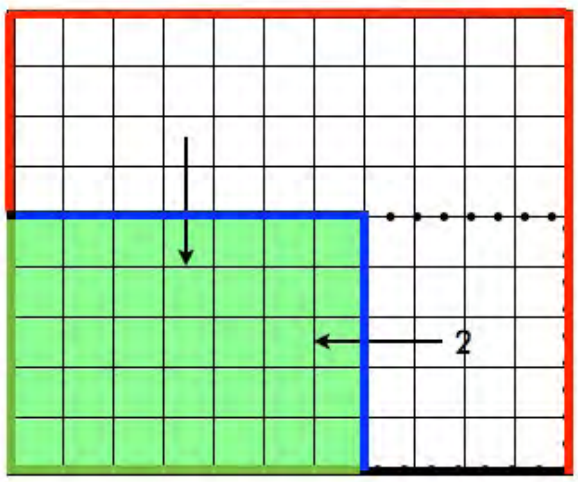
Moreover, an open facade is also more expensive in terms of maintenance than a closed facade. Best are party walls, since they have almost no heat loss or gain, they are relatively cheap since you share the wall (50/50) with your neighbor and they also don't need much maintenance since they are interior walls.

HOUSE & ENCLOSURE

OPEN FACADE (MORE HEAT-LOSS OR GAIN/EXPENSIVE/MAINTENANCE)
GROUND FLOOR 12 x H
SECOND FLOOR 5 x H
TOTAL 17 x H

CLOSED FACADE (LESSER HEAT-LOSS OR GAIN/ LESS EXPENSIVE/MAINTENANCE)
GROUND FLOOR 4 x H
SECOND FLOOR 8 x H
TOTAL 12 x H

PARTY WALL (NO HEAT-LOSS OR GAIN/CHEAP/NO MAINTENANCE)
GROUND FLOOR 24 x H
SECOND FLOOR 5 x H
TOTAL 29 x H

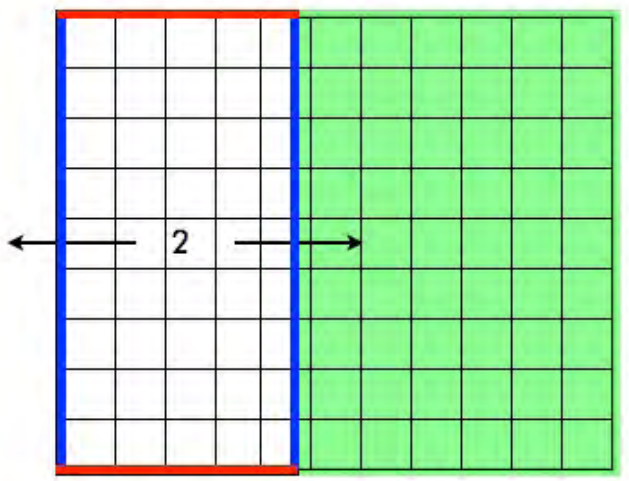


PARTLY 2 STORY COURTYARD HOUSE

OPEN FACADE (MORE HEAT LOSS OR GAIN/EXPENSIVE/MAINTENANCE)
GROUND FLOOR 18 x H
SECOND FLOOR 18 x H
TOTAL 36 x H

CLOSED FACADE (LESSER HEAT-LOSS OR GAIN/ LESS EXPENSIVE/MAINTENANCE)
GROUND FLOOR 0 x H
SECOND FLOOR 0 x H
TOTAL 0 x H

PARTY WALL (NO HEAT-LOSS OR GAIN/CHEAP/NO MAINTENANCE)
GROUND FLOOR 9,33 x H
SECOND FLOOR 9,33 x H
TOTAL 18,66 x H



2 STORY ROW HOUSE

So we can see significant differences in both types in terms of open facade, 17 to 36 (more than double), closed facade 12 to none (even if you would count open and closed facades together you only get 29 for the courtyard house and 36 for the row house) and also in terms of party walls the courtyard house is significantly better with 29 to 18,66.

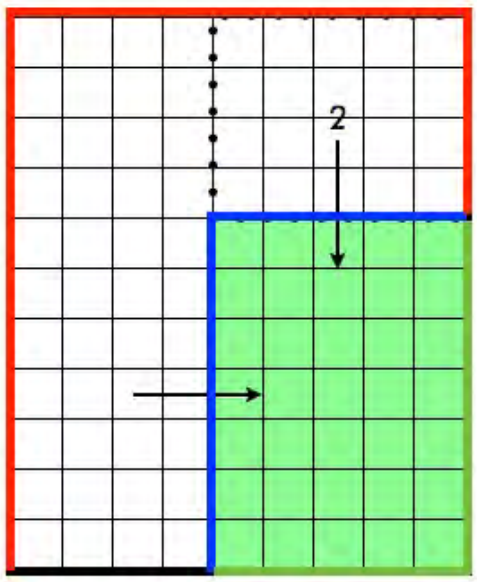
What if we make the row house narrower and deeper and we turn the courtyard house so the double high closed facade at the front can become a double high party wall? We can see that now they start to get closer to each other, but still the courtyard house performs better.

HOUSE & ENCLOSURE

OPEN FACADE (MORE HEAT-LOSS OR GAIN/EXPENSIVE/MAINTENANCE)
GROUND FLOOR 12 x H
SECOND FLOOR 5 x H
TOTAL 17 x H

CLOSED FACADE (LESSER HEAT-LOSS OR GAIN/ LESS EXPENSIVE/MAINTENANCE
GROUND FLOOR 4 x H
SECOND FLOOR 4 x H
TOTAL 8 x H

PARTY WALL (NO HEAT-LOSS OR GAIN/CHEAP/NO MAINTENANCE)
GROUND FLOOR 24 x H
SECOND FLOOR 9 x H
TOTAL 33 x H

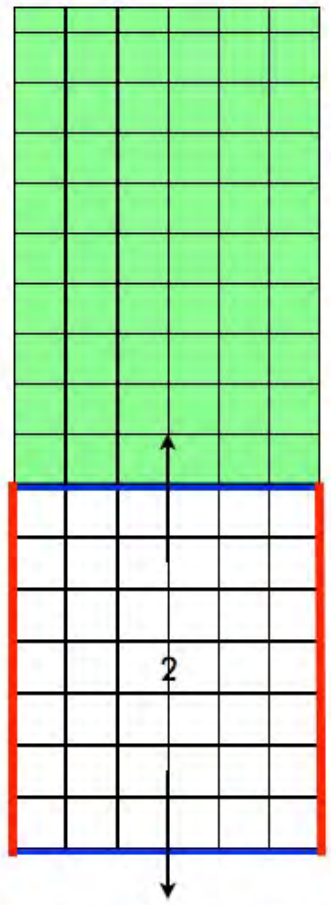


PARTLY 2 STORY COURTYARD HOUSE

OPEN FACADE (MORE ....)
GROUND FLOOR 12 x H
SECOND FLOOR 12 x H
TOTAL 24 x H

CLOSED FACADE (LESSER ....)
GROUND FLOOR 0 x H
SECOND FLOOR 0 x H
TOTAL 0 x H

PARTY WALL (NO .....)
GROUND FLOOR 14 x H
SECOND FLOOR 14 x H
TOTAL 28 x H



2 STORY ROW HOUSE

Making the row house even narrower would bring them closer, but there is a limit to the depth of the row house while still receiving enough light.

Now, there is also another question that starts to come in, namely, where would you prefer to live and what is the potential for (relatively cheap) further developments of the house?

The only way the row house can develop (expand) is towards the garden side, but this has its limits in terms of the depth because of natural lighting. The part of the garden needed for the extension could be gained back as a roof terrace on top of the extension. Or you could go further up to a third storey, but that will be rather expensive.

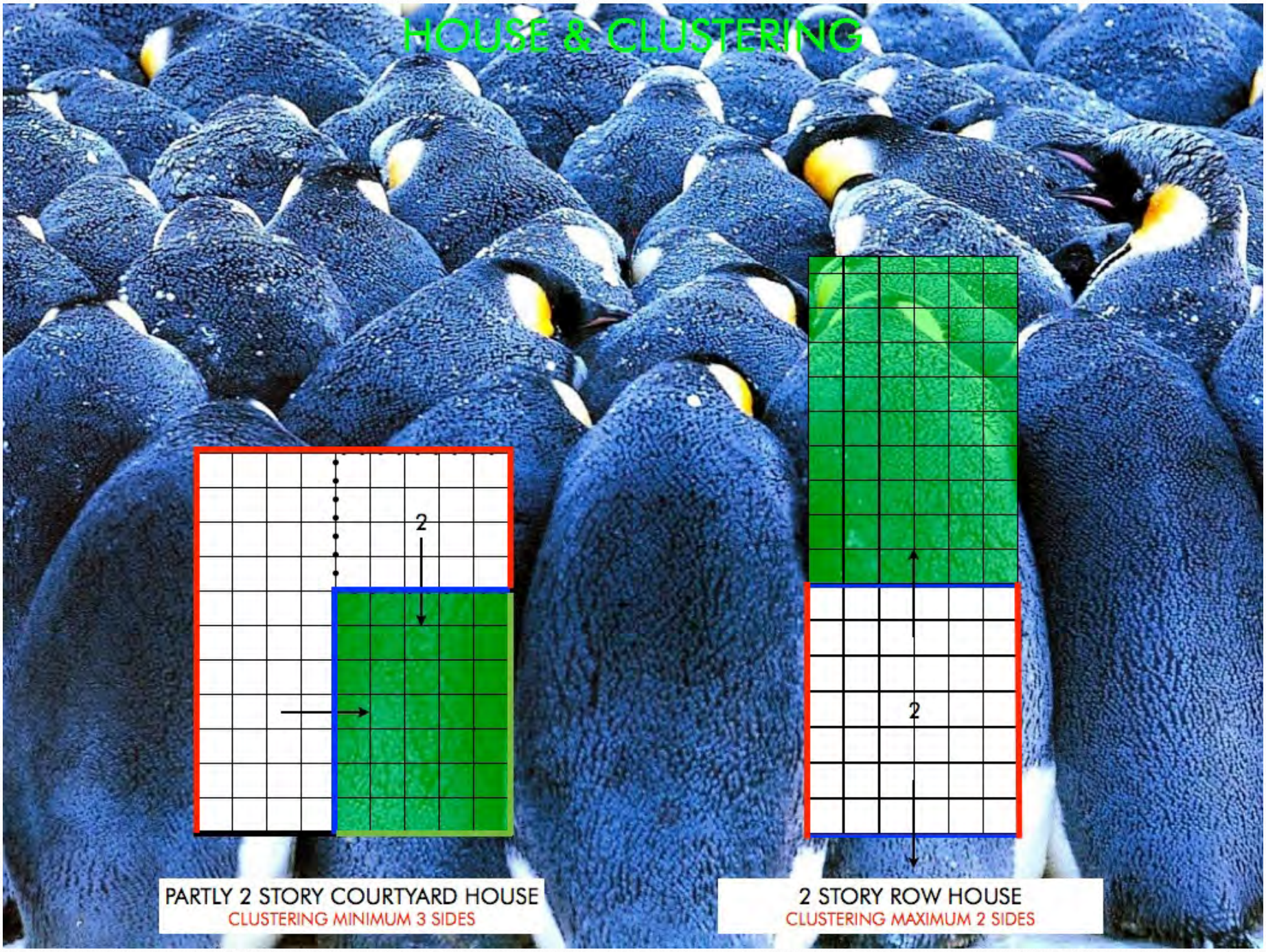
The courtyard house, on the other hand, could easily use the roof terrace on the first floor as an extra outside space, it could easily and relatively cheaply expand the second storey and still use the rest as an extra roof terrace.

What about the roof, you might ask? Well, in former times the roof was always the weak spot, since this was a large surface losing internal heat in winter and gaining external heat in summer. In present time, however, we have very good and cheap insulation materials and its thickness does not play an important role since, in contrast to extra thickness in walls, you don’t lose surface and thus usable space.

In fact, if we think about this large surface turned to the heavens we can see its enormous potential for harvesting solar energy, for collecting rainwater and should even consider all the microclimatic advantages of turning our roof into a green oasis.

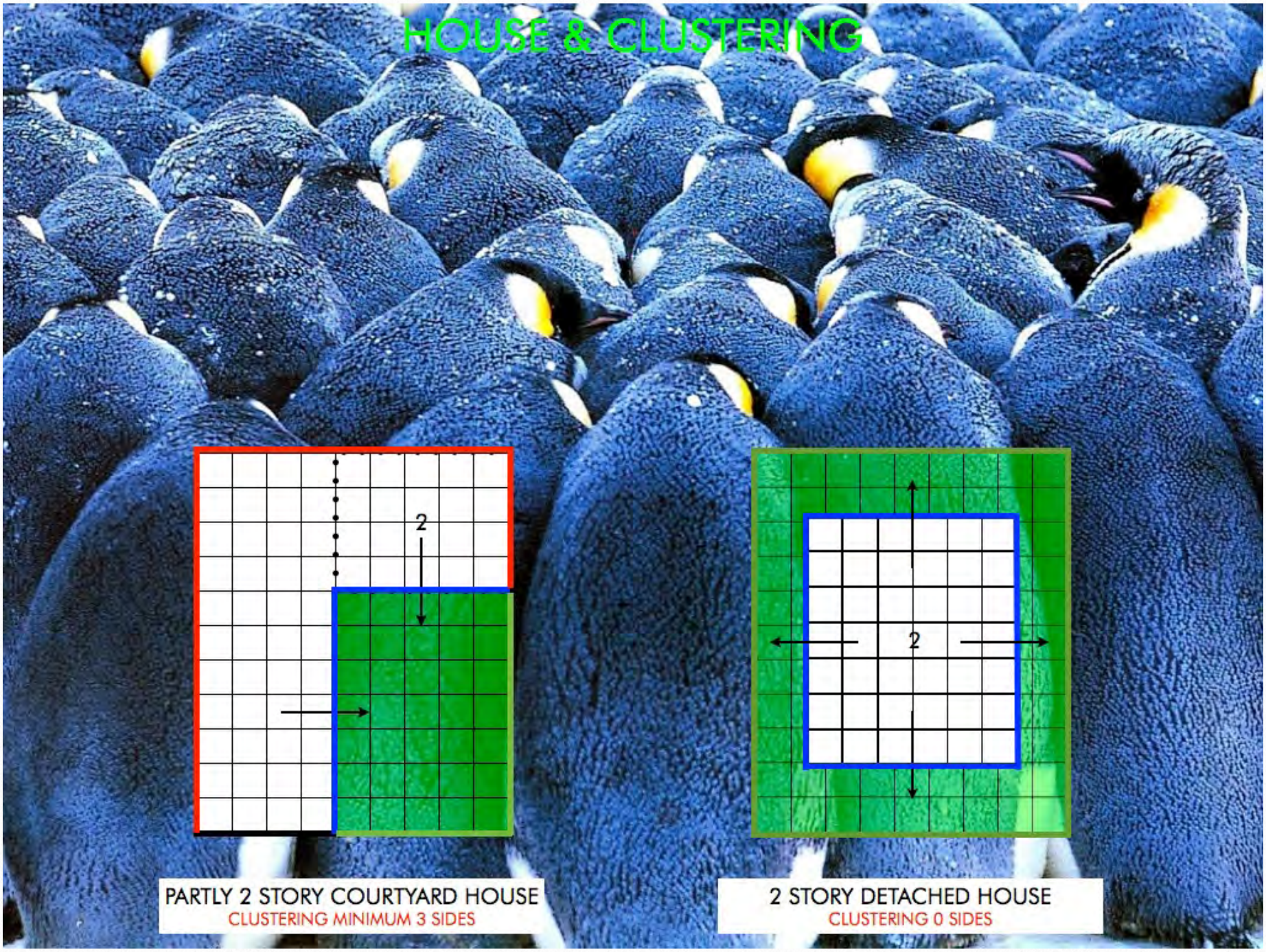
What about the possibility of clustering? We already saw what it means to share walls in terms of heat loss in winter and heat gain in summer. Clustering is a form of horizontal stacking and these emperor penguins know exactly what the advantages of clustering are in a harsh climate.

Around the beginning of the 20th century we started to forget about these advantages and we started to consider clustering to be identical with overcrowding. This, as we saw before, produced among certain leading architects and urbanists a trend towards freestanding (high-rise) buildings in space.



However, for those architects their own private ideal very often was also the free-standing ‘villa’ surrounded by a garden, or as the ancient ‘villa's’ next evolutionary state, being the penthouse that by means of its roof terraces overlooks the city.

But we can see from the representation of a two-storey detached house on the right that, to achieve something coming close to that ideal of the villa, or the pavilion-like palace that opens up towards its natural surroundings, it needs a much larger territorial footprint to also provide for the necessary privacy outside.



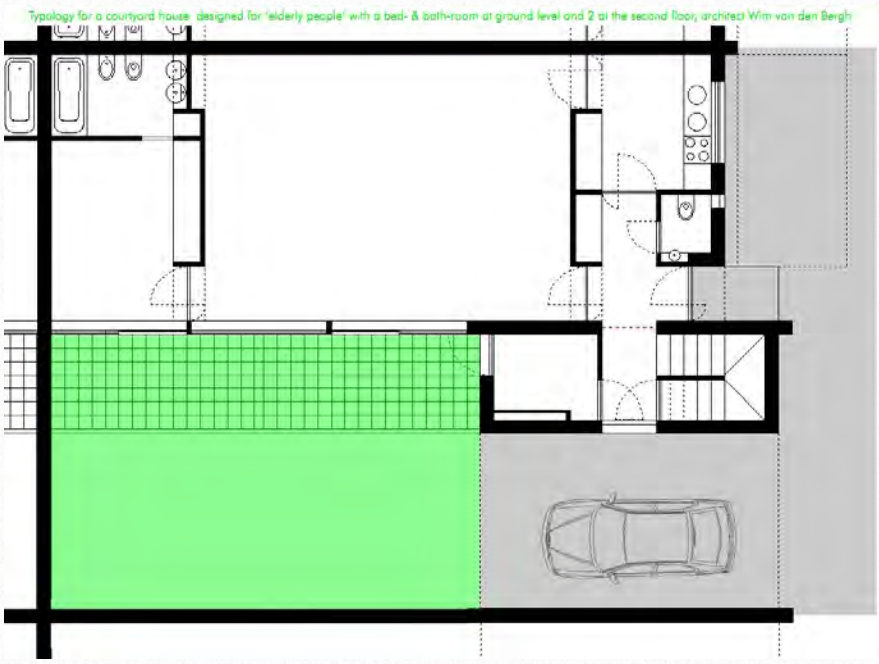
As I tried to show with these simple territorial-footprint-examples, clustering in combination with an introverted typology saves (surrounding) territorial space and also improves the privacy of the garden or outside space.

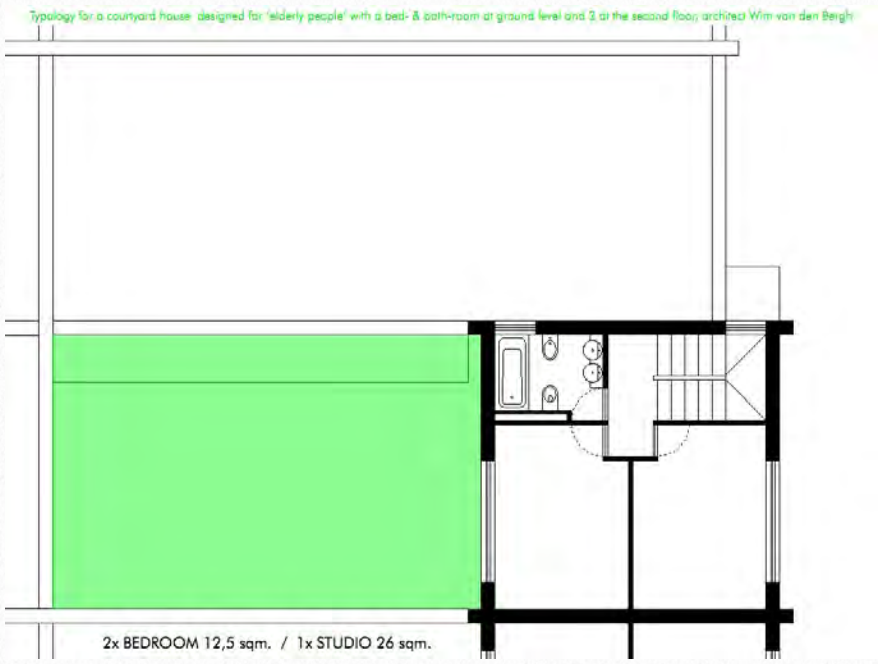
The plot size I used in these examples is 9 by 11 units. If we take 1 unit to be 1,5 meters, we get 13,5 by 16,5 meters, which is about 223 m^2, which is very reasonable for a courtyard house and still somehow reasonable for a row-house, but not so for a detached house.

Just how realistic such a courtyard house might be in terms of spatial and functional layout can be shown in one of my own designs.
The total plot size of this example is 16 x 12 meters, so 192 m^2.

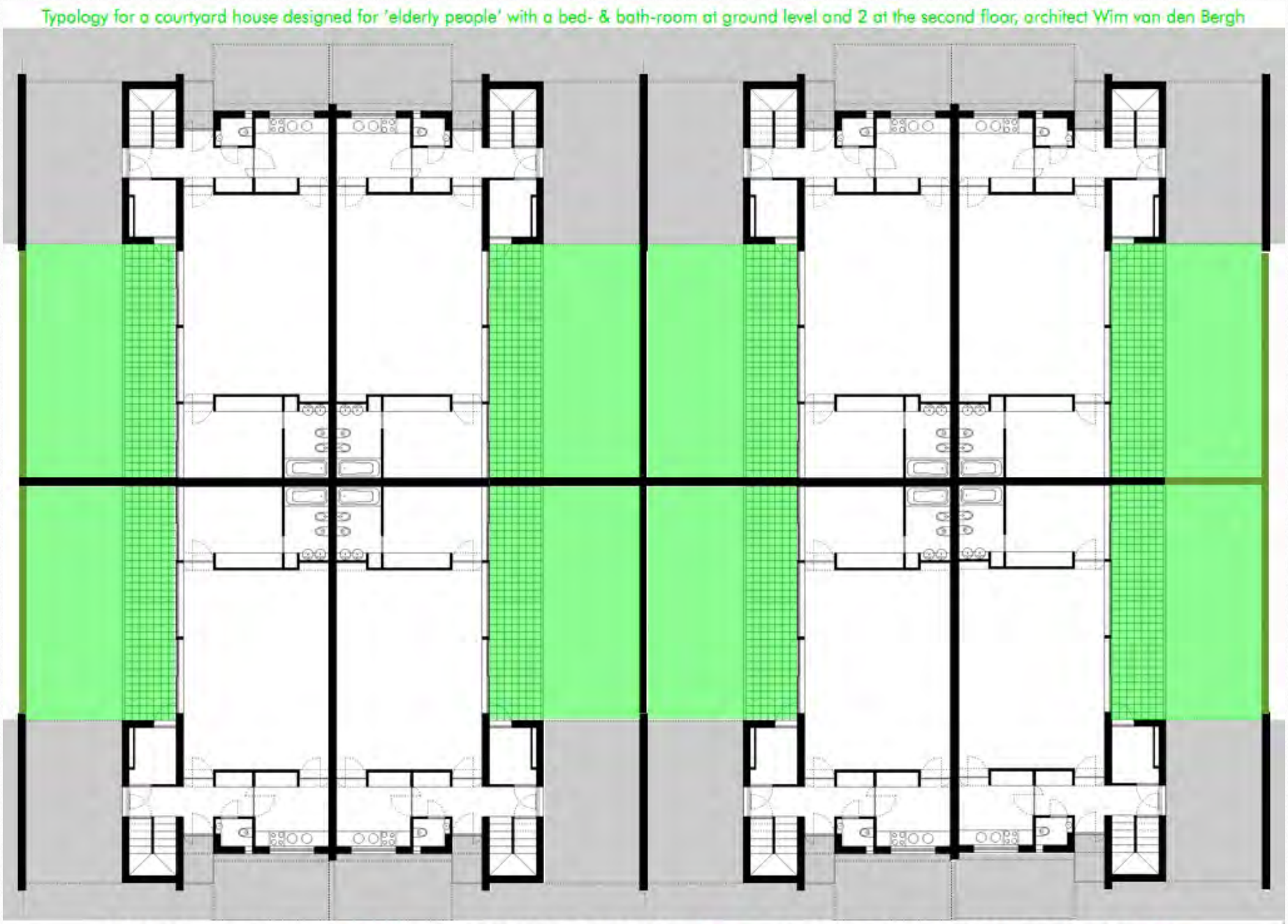
The dwelling area, without the 36 m^2 of the carport and storage, would be 86 m^2 (on the ground floor) with a garden of 60 m^2.
It's a typology with a certain type of flexibility built in.
First, it had to be able to be a relatively inexpensive starter house. That is this situation, if you ignore the staircase for a moment.

Then it needed to grow when the family expanded, which would be possible by introducing the staircase and a second floor just over the carport, storage and staircase. If both of the extra upstairs bedrooms were not used, the (bed)room at ground level could become a study. Here, the second level has 2 bedrooms (each 12,5 m^2) and a bathroom, in total ±36 m^2





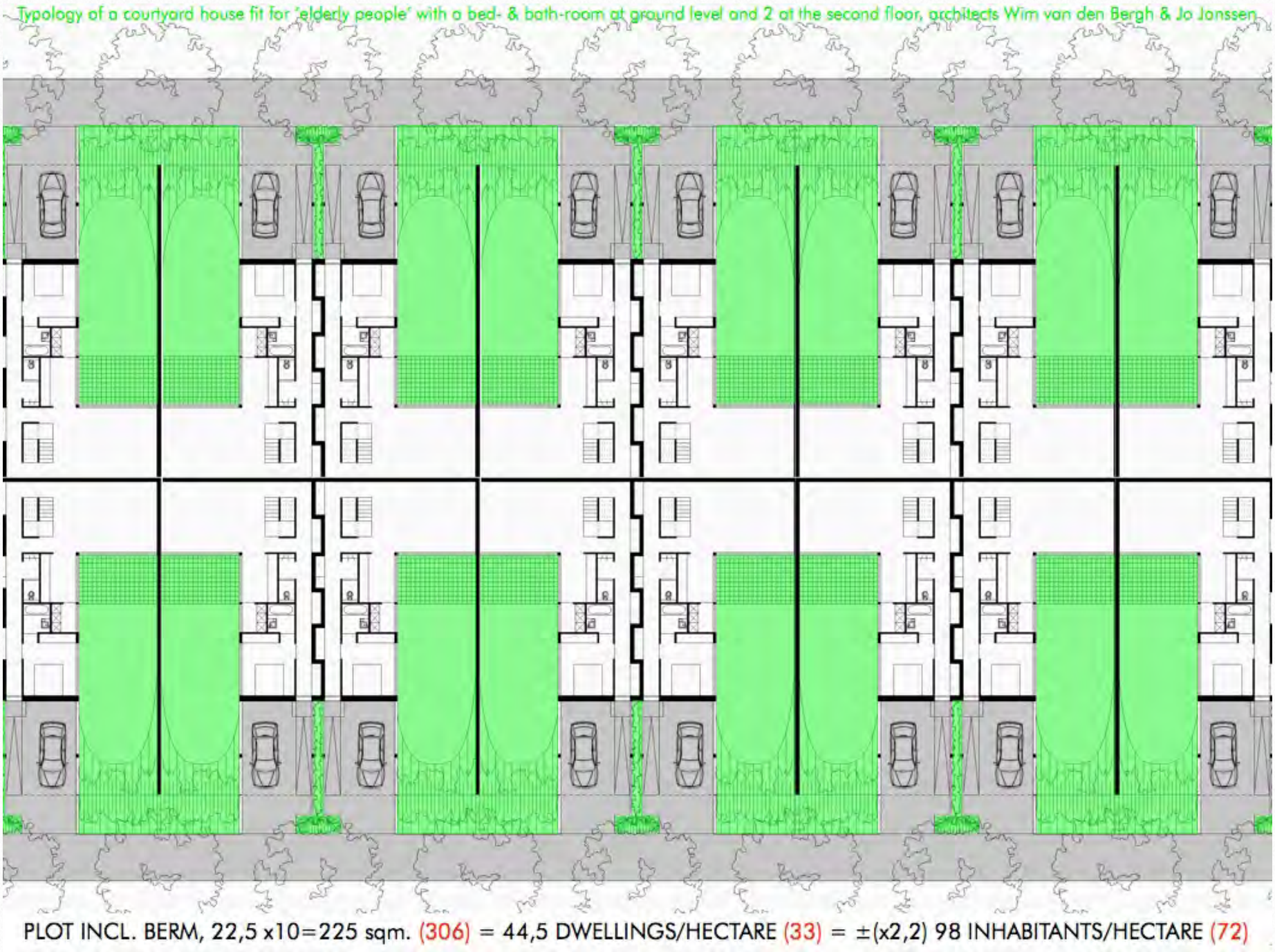
But this second storey could also be used as a completely separate living unit, a kind of studio (without the walls separating the 2 bedrooms). A kitchen unit could be placed against the bath-room wall and on the other side you would get a wardrobe and storage unit, the rest would be living/sleeping area. This would be a good option for this space then after the children have left the house. The elderly inhabitants could again return to their starter house and of-fer the space above for rent. Individual entry for the studio or the two rooms up-stairs would be via the ‘back or side door’ down under the carport. And the open connection to the house could be closed off by an extra door (red dotted



line). Thus, in its flexibility (its inhabitation career) as well it is a rather sustainable typology.

And (opposite page) this could be one of the ways to cluster them, resulting in a density of 52 houses per hectare, in comparison to the Dutch/German average of 33 that we saw before. The dividing garden walls do not necessarily have to be walls; they could also be high hedges (especially at the ends).

Another possibility for replacing the garden walls (as we can see in the example below) might be to use plant-covered earthen berms at the public side. An important consideration here is that the

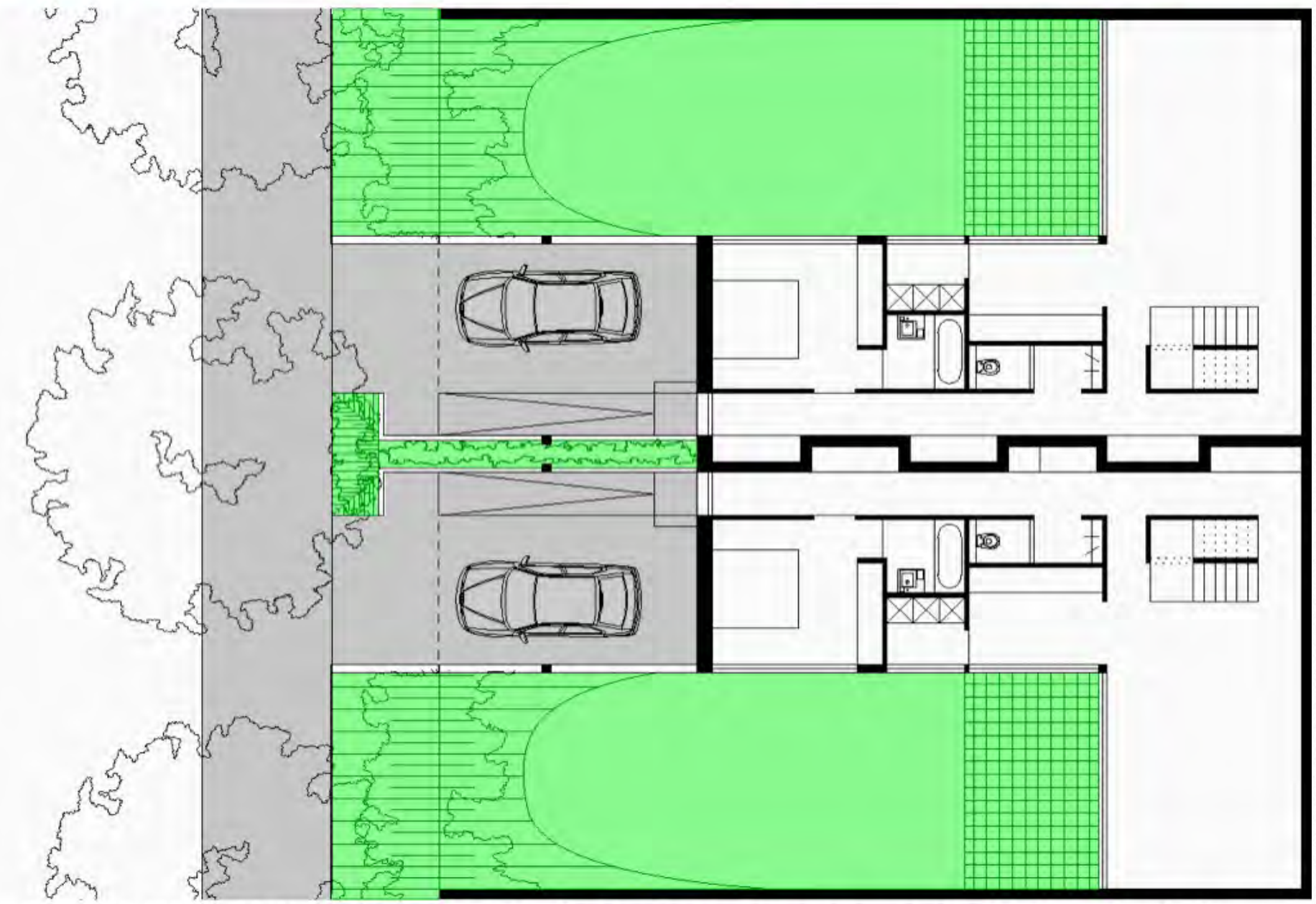


public space of the street gains the character of a park-like setting, the green berms work as vertical front gardens and, in combination with the trees that line the street, they form a kind of avenue (which does not necessarily have to be straight; it could also meander or take on a more organic form).

Plot size including berm here is (22,5x10) 225 m^2. The total dwelling area is 132 m^2 (84 plus 48). The garden including the berm is 89 m^2.

The garden level is a good 50 cm higher than the pedestrian walkway, which means that the overgrown berm is lower

Typology of a courtyard house fit for 'elderly people' with a bed- & bath-room at ground level and 2 at the second floor, architects Wim van den Bergh & Jo Janssen



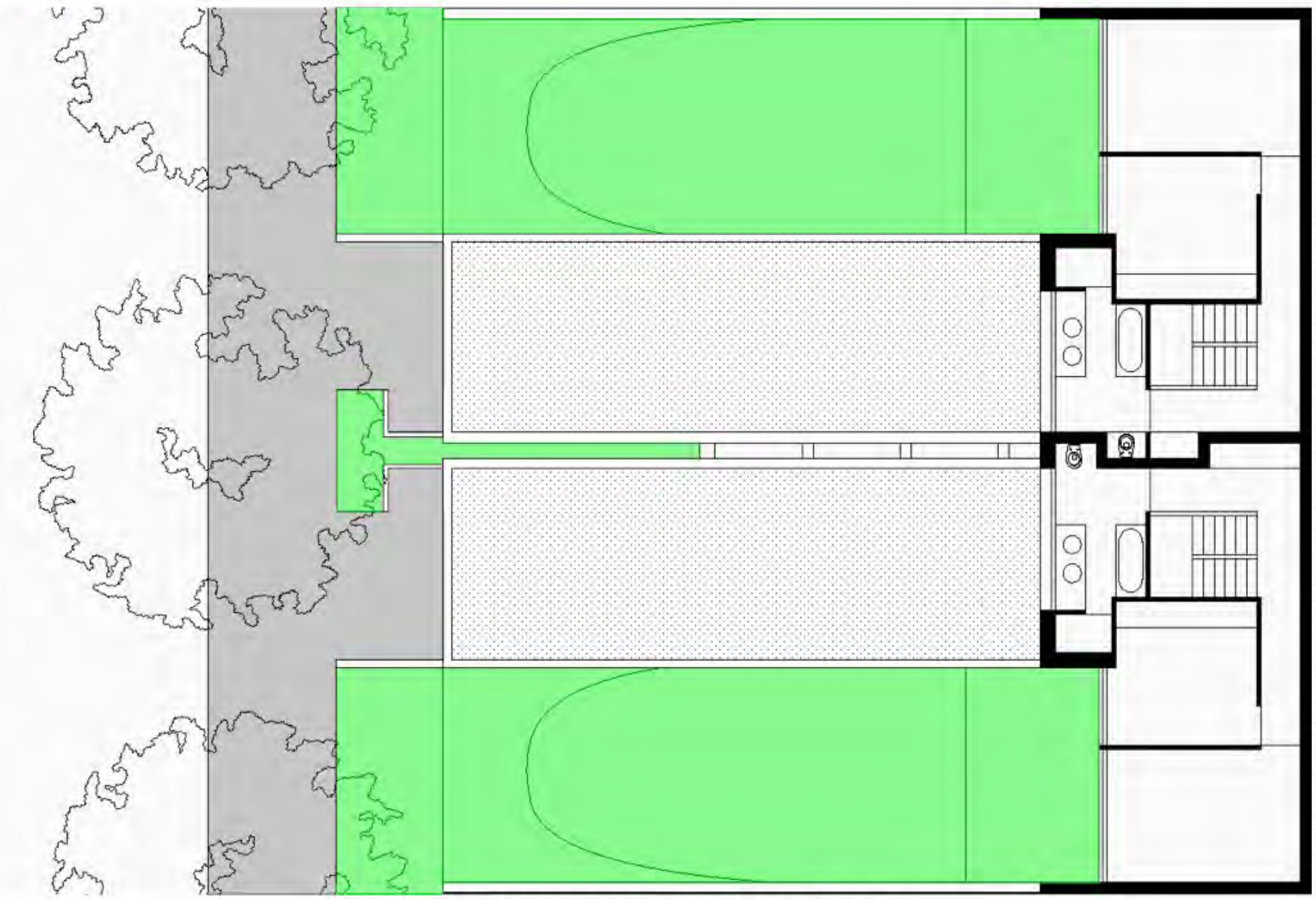
PLOT INCL. BERM, 22,5x10=225 sqm., DWELLING AREA GROUND FLOOR 84 sqm. (TOTAL 132 sqm.), GARDEN 89 sqm.

from the inside, but the privacy from the public side is still secured.
It's a trick often applied in a traditional Japanese garden, a kind of enforced perspective that gives the impression that the garden is deeper and over the plant-covered berms you can see the trees as a borrowed landscape.

Ground floor area, without the carport, 84 m^2.

Second floor two bedrooms, bathroom and staircase total 48 m^2.

Typology of a courtyard house fit for 'elderly people' with a bed- & bath-room at ground level and 2 at the second floor, architects Wim van den Bergh & Jo Janssen



SECOND FLOOR 2 BEDROOMS, BATH TOTAL 48 sqm.

Up to now we talked about an average density of dwelling-units and inhabitants and we saw that they are comparable in Germany and the Netherlands even if there are significant differences in dwelling types, multi-family houses versus one-family houses (flats versus semi-detached and detached houses).
Let's now have a closer look at the density and the distribution of public and private space, plus the distribution of inside and outside dwelling space, if we look at different types.

A good example in this case is Jørn Utzon's Kingo housing complex in Helsingør, Denmark, designed in 1953 (center- right). To the left we see a ribbon development *(Zeilenbau)*, a housing complex of flats over 3 storeys, and sandwiched between we see a development with detached houses (mostly one storey with a pitched roof).

In plan, to the north is the ribbon development with large lawns between the flats. Under it are the detached houses, each on its own plot and in the south are the courtyard houses of Utzon clustered around some park-like public spaces.

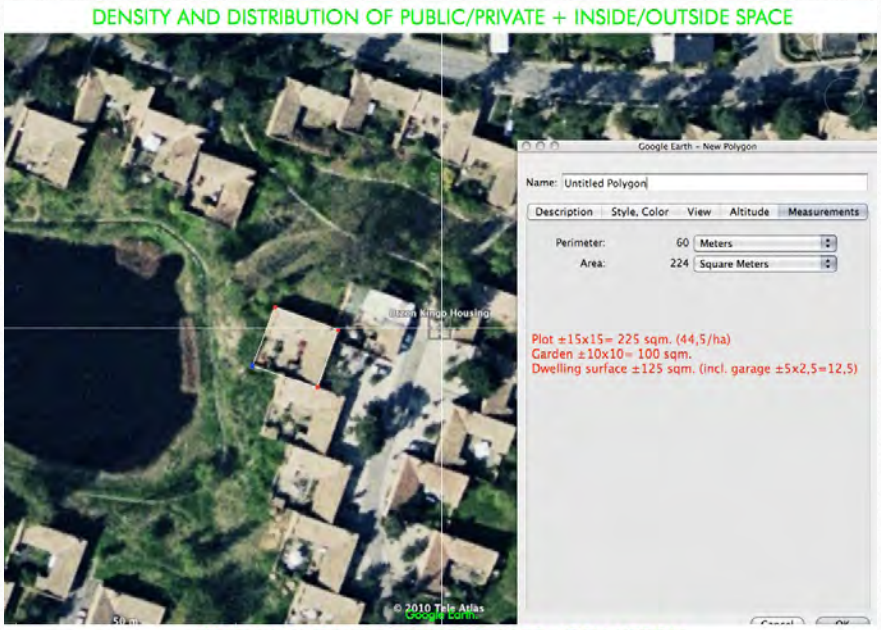
DENSITY AND DISTRIBUTION OF PUBLIC/PRIVATE + INSIDE/OUTSIDE SPACE

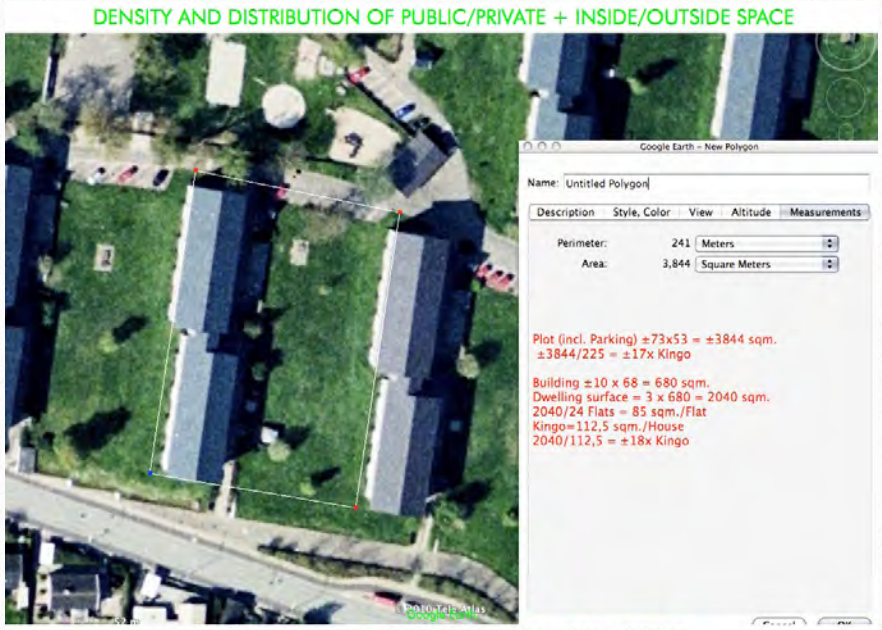
KINGO HOUSING, HELSINGØR,1953, JØRN UTZON

DENSITY AND DISTRIBUTION OF PUBLIC/PRIVATE + INSIDE/OUTSIDE SPACE

KINGO HOUSING, HELSINGØR,1953, JØRN UTZON

If we look at the plot size (territorial footprint) of one of the Kingo houses (next page) we can see in Google Earth that it is around 15 x15= 225 m^2.
The Garden is about 10x10=100 m^2, which leaves a dwelling surface of about 125 m^2 that often includes a garage.





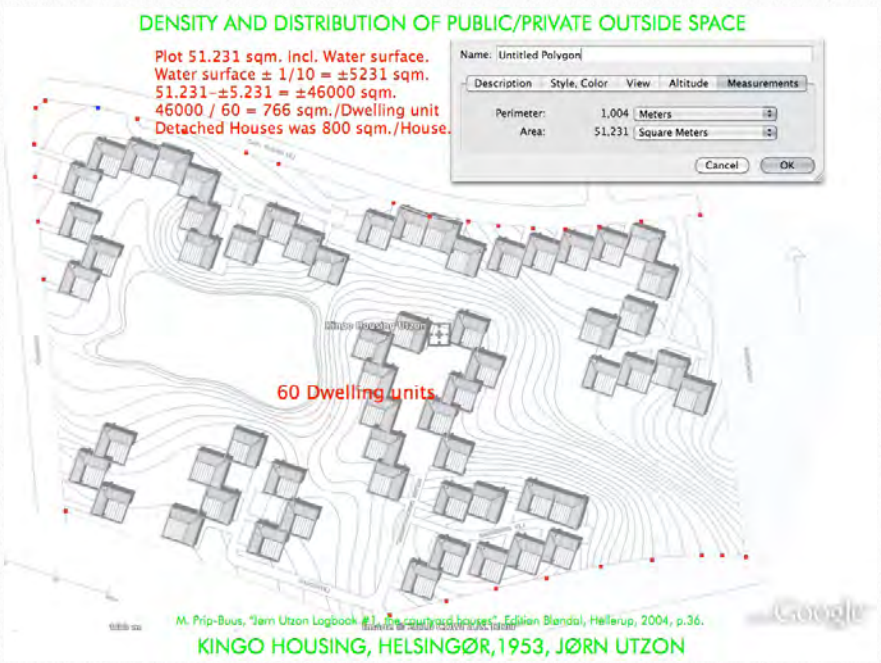
If we compare that to the three-storey ribbon development (Zeilenbau) with each having 24 flats, we can see that the plot (including some parking) is about 3844 m^2, divided by the 225 m^2 of the Kingo development, this means that in terms of plot size it could hold 17 Kingo houses.
In terms of dwelling surface we are talking about 2040 m^2. Dividing this by 24 means that each flat is about 85 m^2 whereas a Kingo house has about 112,5 m^2. In terms of dwelling surface it is 2040/112,5, or 18 Kingo houses.

So in general we could say that these two types are about comparable in plot surface and in total dwelling surface. The ribbon development generates more yet smaller dwelling-units, but it's a multi-family house with only a kind of balcony/loggia for private outside space as the lawn between the houses is communal.
On the other hand, with the Kingo development we are talking of one-family houses with each having 100 m^2 of private garden space.

Now, if we look at the detached houses (next page) we can see that the average plot could hold about 3,5 Kingo houses. The footprint and dwelling surface is an average based on the measurements of the more simple volumes and comes down to around 200 m^2, which is about 1,8 times Kingo. On the other hand, the garden is more than 5 times that of a Kingo house and still looks much too small to give this extraverted typology the necessary privacy in relation to its neighbors.

With 76 houses it would have been (46000/76) 605 m^2/house, with the actual 60 houses it is (46000/60) 766 m^2/house.

This is still less than the 800 m^2 of the detached houses to the north of the site, but at the same moment Utzon's houses look much more like villas in a park than do the detached houses with their own ‘private’ territory do.



If now we compare the distribution of public and private outside space, we can see that the total plot size, including the water surface, is 51.231 m^2.

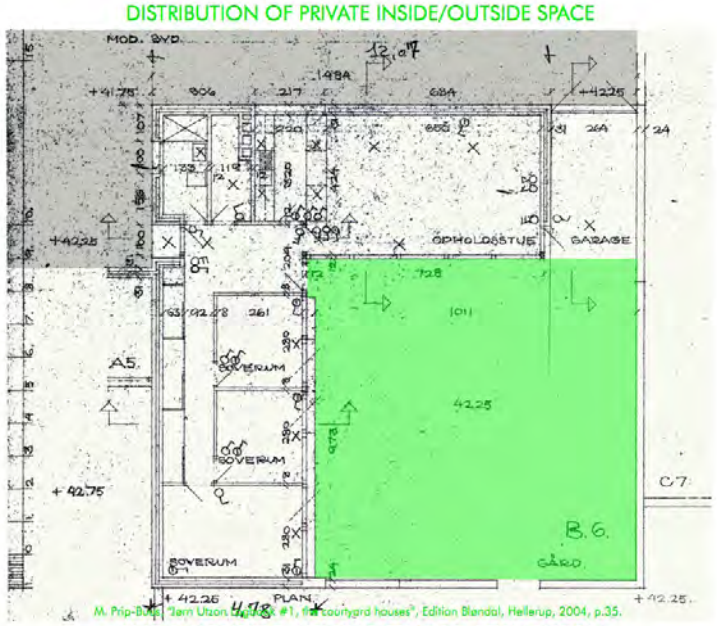
If we deduct the water surface we have about 46.000 m^2 for building houses left.

Initially, Utzon planned to put 76 houses on the site, but then reduced it to 60.

As we can see here, the Kingo houses, with their clearly defined private patios, are clustered in such a way that they are grouped around a set of park like spaces. In effect, these are borrowed landscapes that the houses open up to via the patio in a very controlled way, which is achieved by means of modulating the height of the delimiting patio’s wall.

What Utzon creates are essentially archipelagos of houses grouped around a kind of open spaces in a semi-public park, however without compromising the privacy of the houses and their patios. In addition, all houses can be reached by car and the routes to do so are integrated in the green space of the park-like setting that the houses are placed in.

DISTRIBUTION OF PRIVATE INSIDE/OUTSIDE SPACE



M. Prip-Buus, "Jørn Utzon Logbook #1, the courtyard houses", Edition Blondal, Hellerup, 2004, p.35.

KINGO HOUSING, HELSINGØR,1953, JØRN UTZON

Here is a typical plan of a Kingo house (14,84x14,64= 217,25 m^2) a view of the patio.

Now, I would like to show you some examples of different types of introverted (or courtyard) houses and the way they distribute the inside and outside space. This is 'The Ryde' in Hatfield New Town, which is next to Welwyn Garden City, the 2nd Garden City (following Letchworth Garden City) in England, founded by Ebenezer Howard in 1920 and one of the first New Towns. Instead of the intended 12 standard houses the architects (Peter Phippen, Peter Randall and David Parks) used the available plot to realize 28 introverted houses, a tennis court, a communal nursery with a guest apartment and 6 extra garages and storage spaces.

DISTRIBUTION OF PRIVATE INSIDE/OUTSIDE SPACE

M. Prip-Buus, "Jørn Utzon Logbook #1, the courtyard houses", Edition Blondal, Hellerup, 2004, p.91.

KINGO HOUSING, HELSINGØR,1953, JØRN UTZON

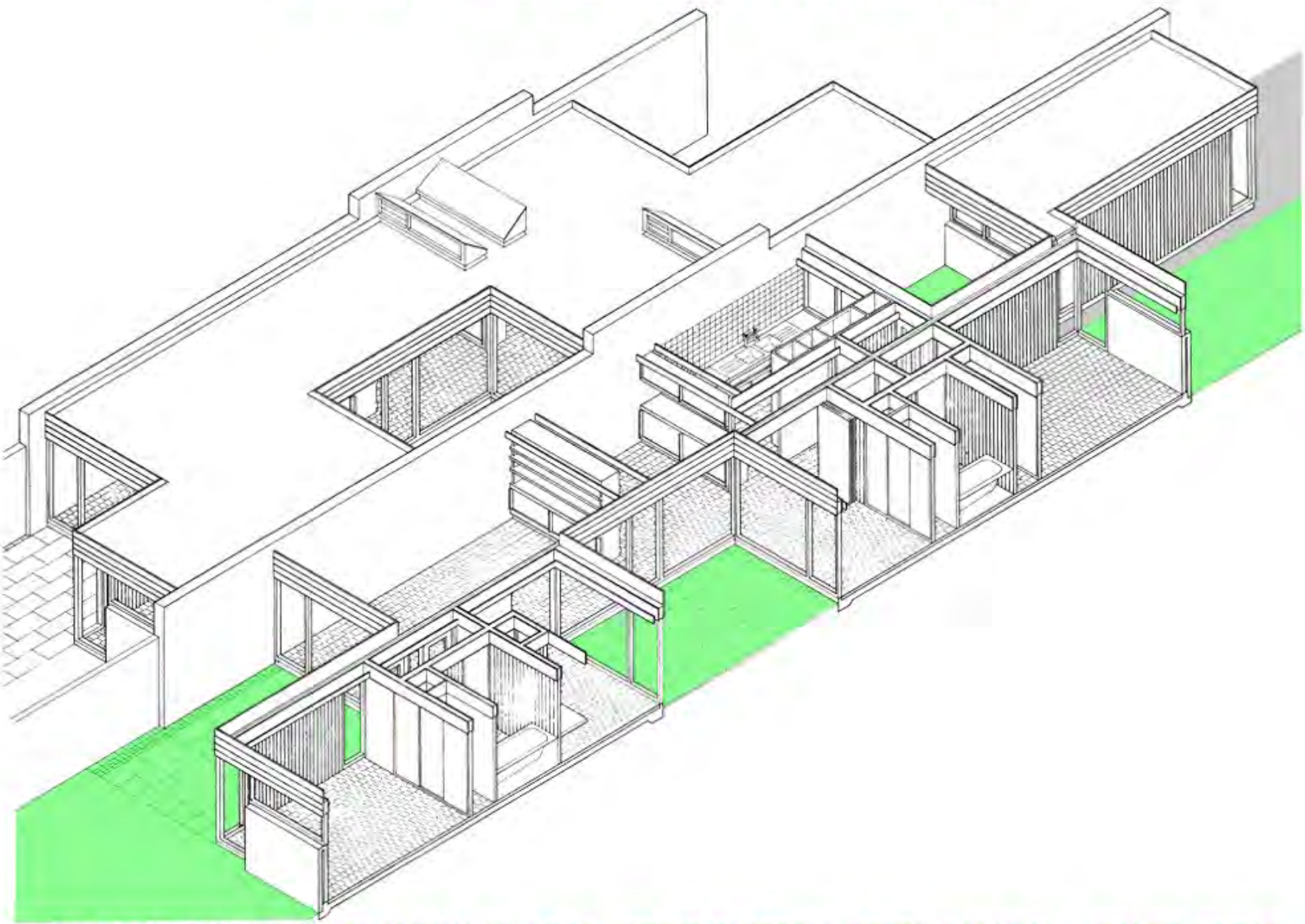
DENSITY AND DISTRIBUTION OF INSIDE/OUTSIDE SPACE

THE RYDE, HATFIELD NEW TOWN, 1963, PETER PHIPPEN, PETER RANDALL, DAVID PARKS

The typology and structure of these houses is very simple: (party) walls are set apart at ± 6,8m. (center to center) to form slots with a wooden post-and-lintel structure in between, not only to reduce the span, but also to split the plan in two zones. One, the slightly wider zone, is for living, dining and kitchen, and the other is for sleeping and bathing.

It is a deep-plan typology, as used before by among others Serge Chermayeff, but in fact its a very old typology. One can also find it in traditional Japanese architecture like, for instance, in the 'machiya', the townhouses of Kyoto, or in ancient Egypt. Within this typology, the patio in the middle and the patios in the front and the back provide the deep-

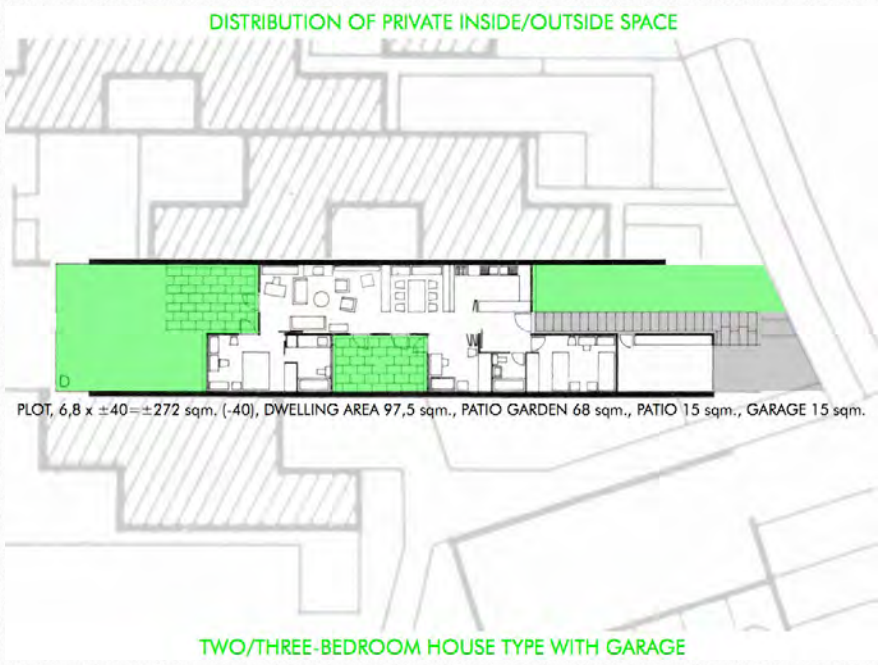
DISTRIBUTION OF PRIVATE INSIDE/OUTSIDE SPACE

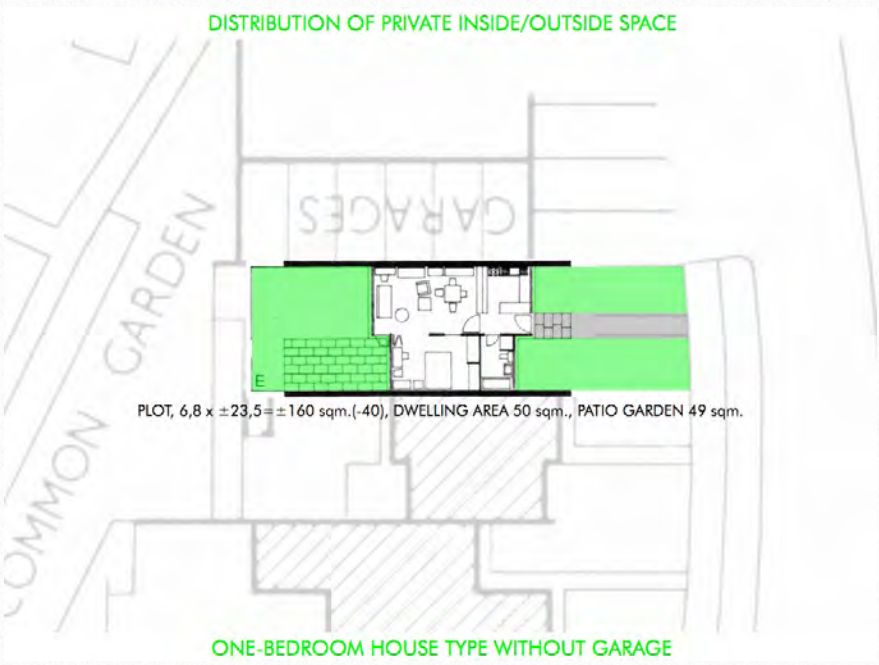


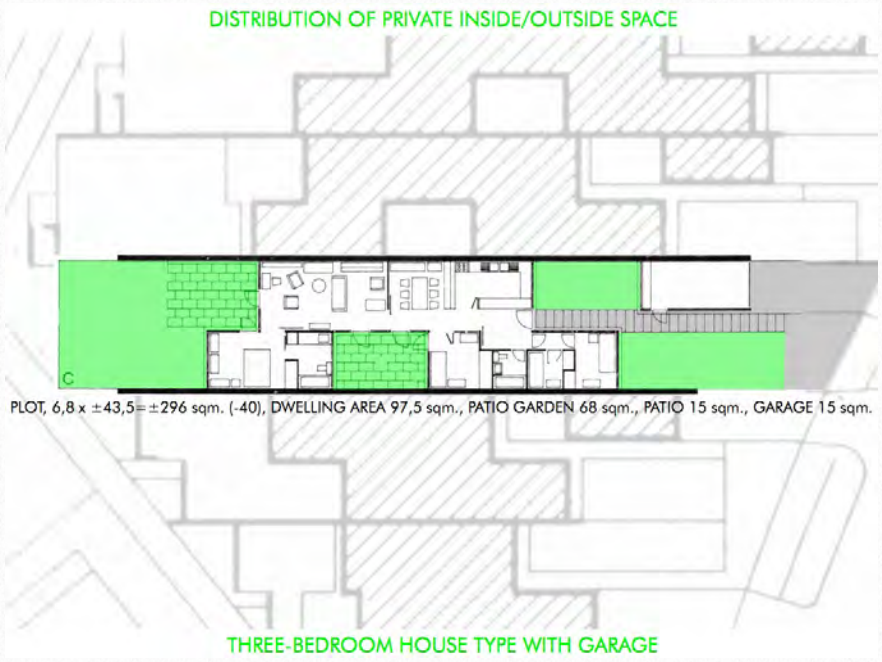
THE RYDE, HATFIELD NEW TOWN, 1963, PETER PHIPPEN, PETER RANDALL, DAVID PARKS

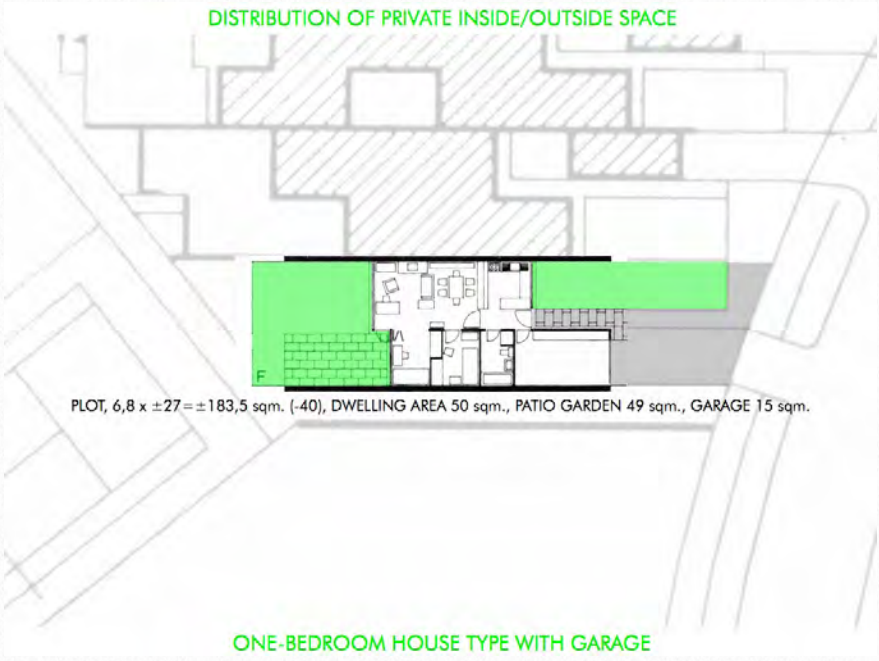
plan with the necessary light while additional roof lights are used to provide extra light and ventilation to specific rooms like the kitchen and the bathroom.

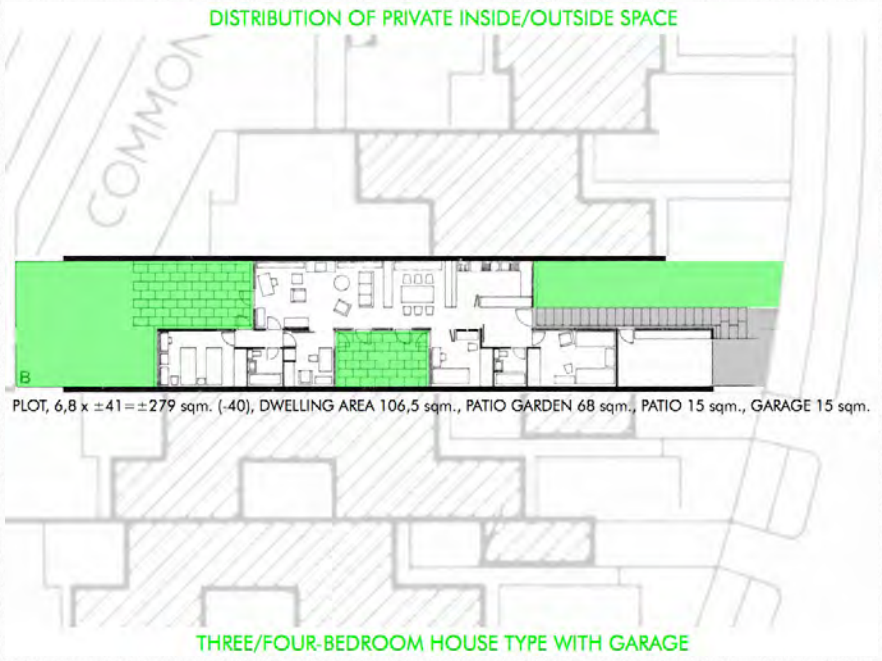
Although this wasn't the case with this house, within this sequence one could also imagine it as a house that can grow over time.

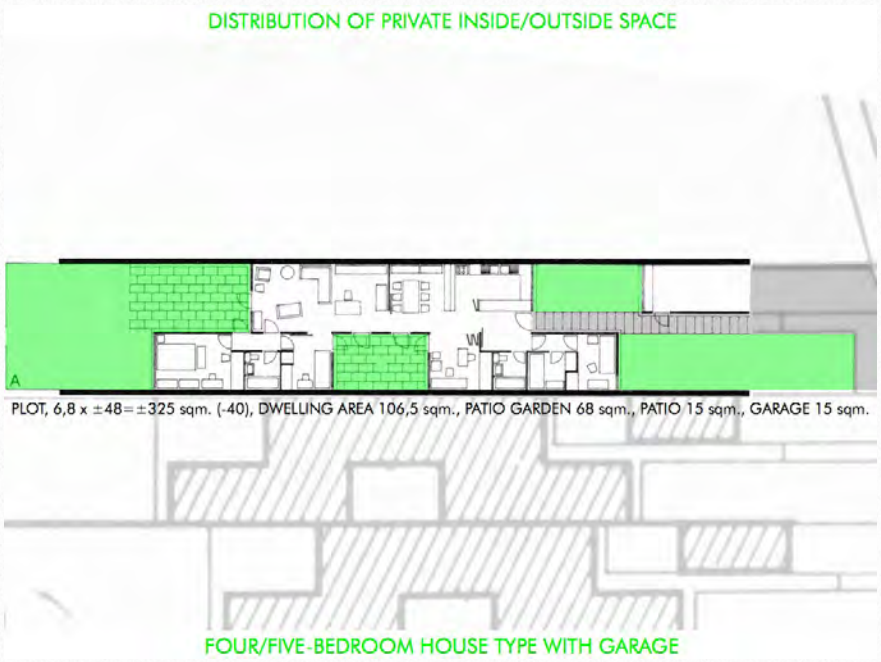












A 20 foot building line (red dotted line) was required so the houses had to be set back from the street for about 6 meters.

If now we correct the average plot sizes with ± 6.8x6m = 40 m^2, we get a density of 43 dwellings/hectare (average Germany Netherlands 33), meaning at 2,2

DENSITY AND DISTRIBUTION OF PUBLIC/PRIVATE OUTSIDE SPACE

10 Four-bedroom:	106,5 x 10 = 1065 sqm.	Av. Plot: 285 x 10 =	2850 sqm.
10 Three-bedroom:	97,5 x 10 = 975 sqm.	Av. Plot: 235 x 10 =	2350 sqm.
5 Two-bedroom:	74,0 x 5 = 370 sqm.	Av. Plot: 185 x 5 =	925 sqm.
3 One-bedroom:	50,0 x 3 = 150 sqm.	Av. Plot: 135 x 3 =	405 sqm.
TOTAL DWELLING AREA	2560 sqm.	TOTAL PLOT AREA	6530 sqm.

Av. PLOT, 6530/28=233 sqm. (306) = 43 DWELLINGS/HECTARE (33) = (x2,2) 95 INHABITANTS/HECTARE (72)

dwellers per dwelling unit 95 inhabitants per hectare (av. 72). Average dwelling area is, 2560/28 = 91,5 m^2.

Also of interest is the kind of changes the inhabitants made over time. One in particular is that some put over the central patio a glass roof that can be opened, thus turning it into a winter garden (which not only has functional but also climatic benefits in winter time).

PRP Architects, "Place & Home, The search for better housing, Black dog Publishing, London, 2007, p.21..

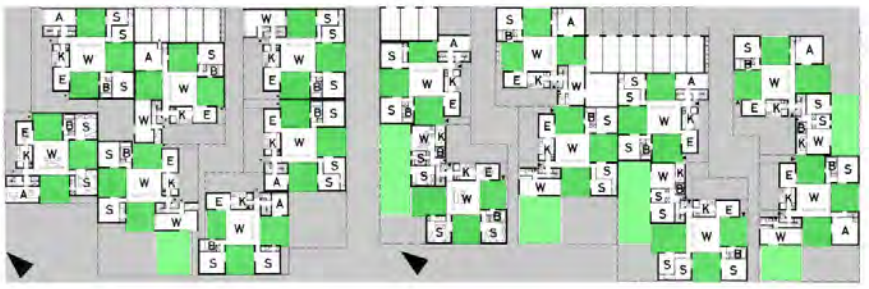
DENSITY AND DISTRIBUTION OF PUBLIC/PRIVATE SPACE

WOHNBEBAUUNG 'NEUE STADT', KÖLN,1961-64, OSWALD MATHIAS UNGERS

The next example is a relatively unknown typology for an introverted house, developed by Oswald Mathias Ungers, at about the same time as Phippen, Randall and Parks developed 'The Ryde'. It was for the housing project 'Neue Stadt' (New Town) in Cologne, in 1961-64. The typology went through several design stages, but was never built.

It's a set of 3 clusters of courtyard houses, each placed around a kind of communal square.
The garages, parking places and garbage-can depots are concentrated at the side of the public street.
It's actually one basic type, but with slight changes and sometimes a sort of separate extension for lodgers like grandparents or servants.

DENSITY AND DISTRIBUTION OF PUBLIC/PRIVATE OUTSIDE SPACE



From: O. Hoffmann, C. Repentin, "Neue urbane Wohnformen", Ulstein, Berlin, 1965, p.91.

WOHNBEBAUUNG 'NEUE STADT', KÖLN,1961-64, OSWALD MATHIAS UNGERS

Here an example of the basic type with just a variation in bedroom layout. Characteristic and also very intriguing is the central living room, or better said, the living pavilion that has a free view into three courtyards or patios.
The front side contains on one side the entry hall with wardrobe, toilet, study and a staircase that leads up to a guest room and on the other side are the kitchen and the dining room that opens to the living pavilion. At the other end of

DISTRIBUTION OF PRIVATE INSIDE/OUTSIDE SPACE

PLOT, 16 x 16 =256 sqm., DWELLING AREA ±188 sqm., EACH PATIO ±25 sqm.

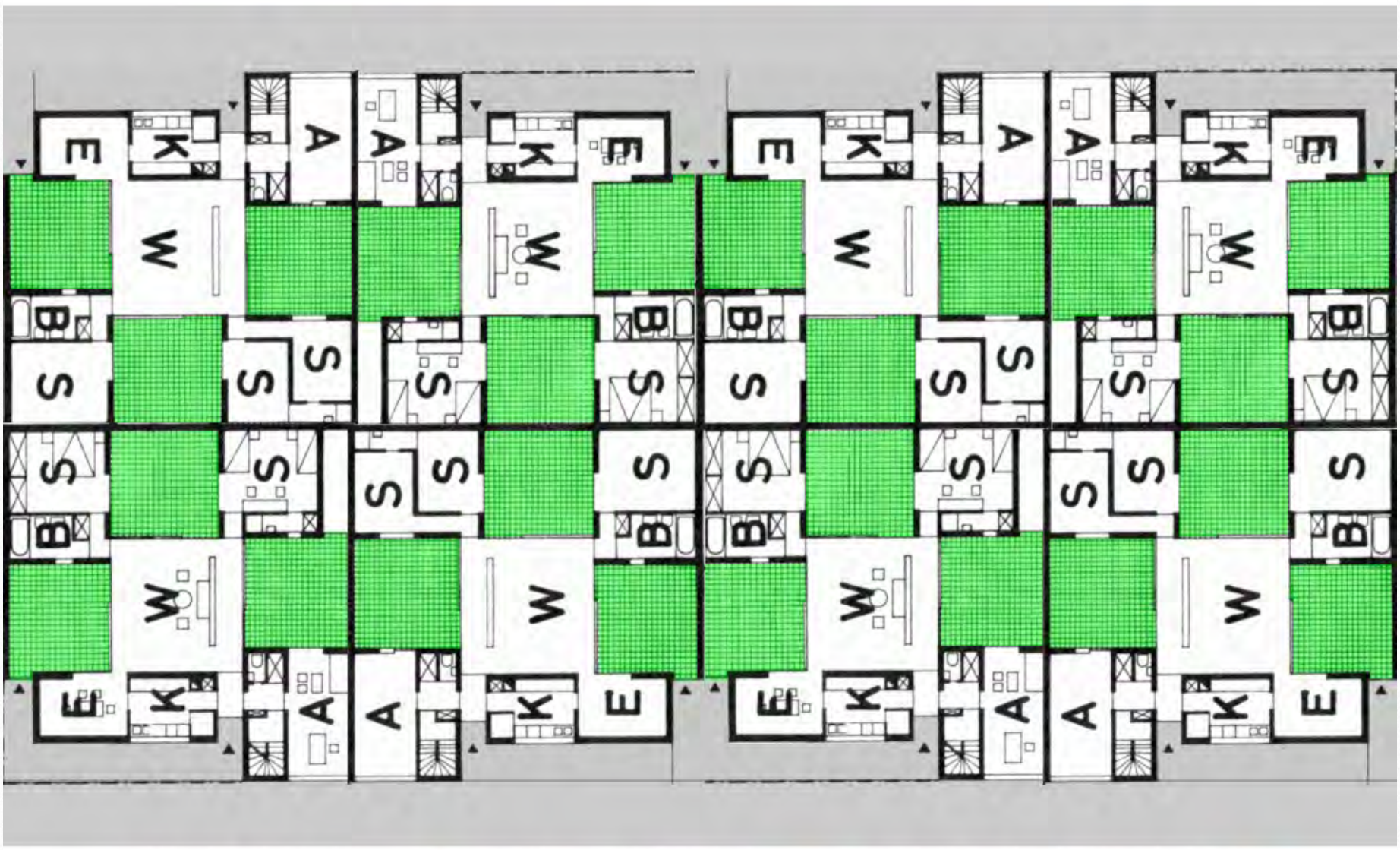
From: O. Hoffmann, C. Repentin, "Neue urbane Wohnformen", Ulstein, Berlin, 1965, p.91.

WOHNBEBAUUNG 'NEUE STADT', KÖLN,1961-64, OSWALD MATHIAS UNGERS

the living pavilion we find the bedrooms and bathrooms.
The plot is 16 by 16, so 256 m^2, the total dwelling area is about 188 m^2 and each patio is about 25 m^2.

An optimal density can be achieved by clustering these units next to each other and back to back, thus resulting in a density of 39 dwellings per hectare.
Also imagine the plasticity of the street facade, the lower part of the dining room (E) and Kitchen (K), the double height of the study (A) with guest room above and the middle height of the living pavilion (W).

DENSITY AND DISTRIBUTION OF PRIVATE INSIDE/OUTSIDE SPACE



PLOT, 16 x 16 =256 sqm. (306) = 39 DWELLINGS/HECTARE (33)= (x2,2) 86 INHABITANTS/HECTARE (72)

WOHNBEBAUUNG 'NEUE STADT', KÖLN,1961-64, OSWALD MATHIAS UNGERS

DENSITY AND DISTRIBUTION OF PUBLIC/PRIVATE OUTSIDE SPACE

CAPUCIJNENHOF, MAASTRICHT, 1992-97, WIM VAN DEN BERGH

The last example I would like to show you is again one of my own designs. It's in the heart of Maastricht and located in the interior courtyard of an urban block, which in former times housed a monastery.

The courtyard is defined by a set of buildings that surround it, a former chapel and 6 large chestnut trees. My task as an architect was to convert the surrounding buildings of this former monastery into dwellings, while preserving

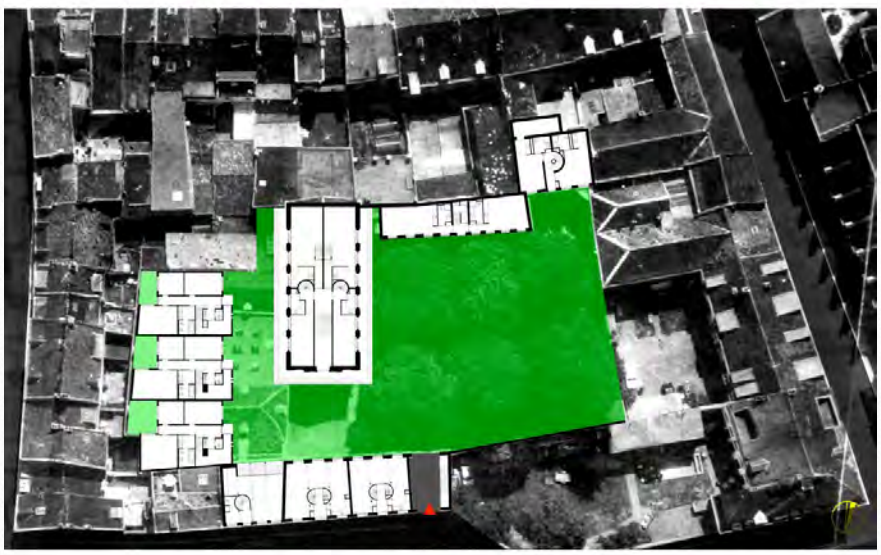
DENSITY AND DISTRIBUTION OF PUBLIC/PRIVATE OUTSIDE SPACE

CAPUCIJNENHOF, MAASTRICHT, 1992-97, WIM VAN DEN BERGH

the quality of the main courtyard with the trees. One enters this courtyard via an under-passage on the north side of the urban block.

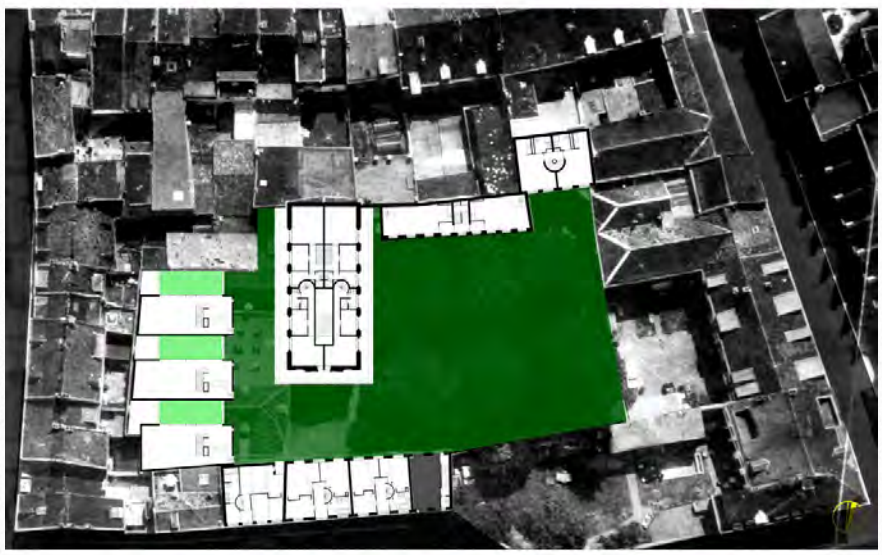
The 3 patio houses I want to show you are on the left, but the patios at ground floor level, you see here in green, are mainly just providing light and air to the bedrooms located on the ground floor. The actual patios are on the second floor, where the living quarters of these houses are located.

DENSITY AND DISTRIBUTION OF PUBLIC/PRIVATE OUTSIDE SPACE

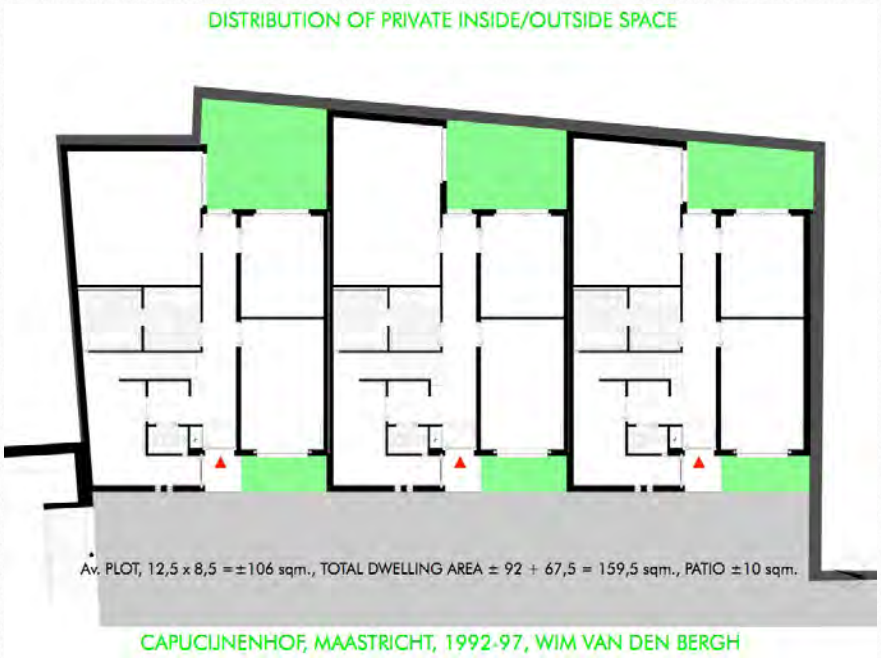


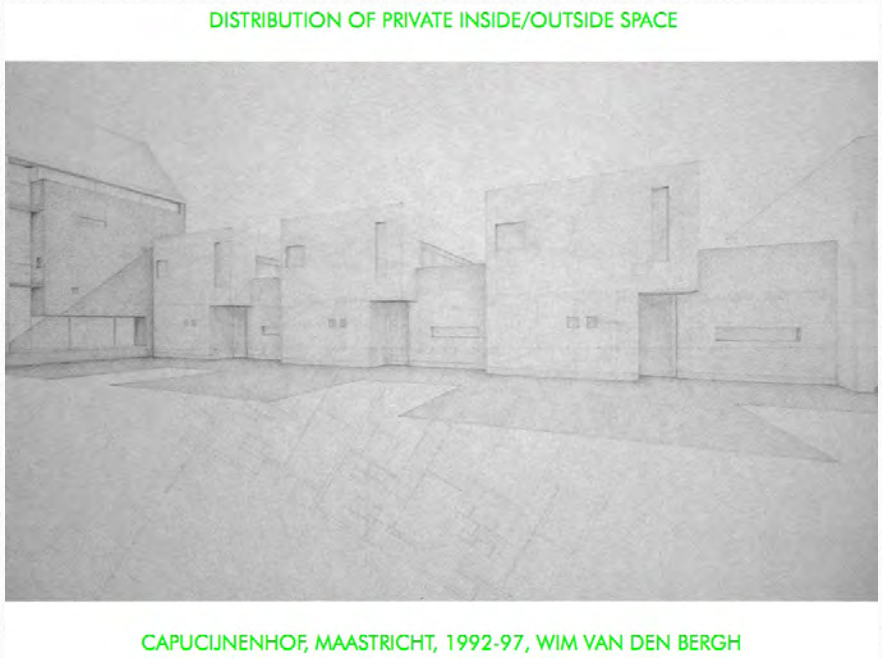
CAPUCIJNENHOF, MAASTRICHT, 1992-97, WIM VAN DEN BERGH

DENSITY AND DISTRIBUTION OF PUBLIC/PRIVATE OUTSIDE SPACE

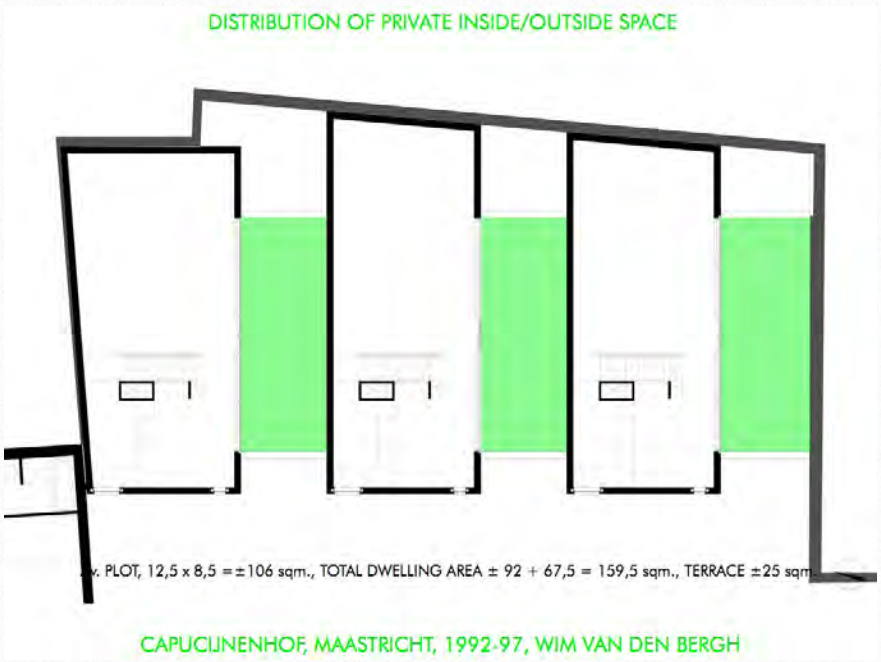


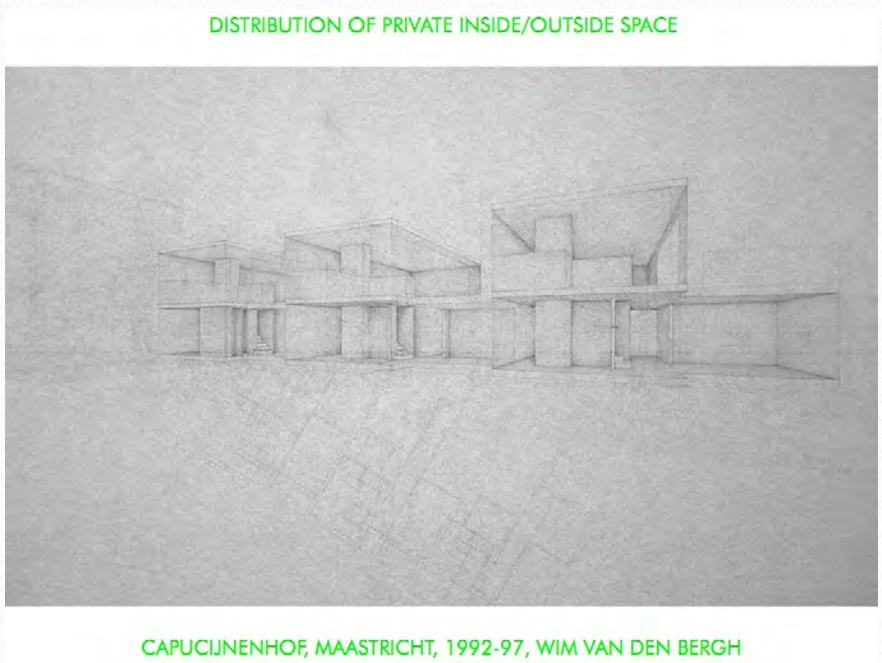
CAPUCIJNENHOF, MAASTRICHT, 1992-97, WIM VAN DEN BERGH





A closer look shows you the typology: main entry (red arrow) and (left) the entry to the storage/utility space for bicycles, washing machine, boiler etc.
Then behind the main entrance are two (bed) rooms to the right and the bathroom and master bedroom to the left, plus the wardrobe, toilet and the staircase that leads up to the living room, kitchen and dining room. And don't forget the raised patio, or terrace, of about 25 m^2, which not only is the private outside space but also provides the light for the living quarters. The glass facade towards the patio faces south and has a retractable awning that can cover the patio completely from sun and rain.
The average plot for this type would be 12,5x8,5 = 106 m^2, resulting in 94 dwellings per hectare, 207 inhabitants per hectare, or in short, almost triple the number of the Dutch/German average.





DENSITY AND DISTRIBUTION OF PUBLIC/PRIVATE SPACE

PLOT, 12,5 x 8,5 =106 sqm. (306) = 94 DWELLINGS/HECTARE (33)= (x2,2) 207 INHABITANTS/HECTARE (72)

CAPUCIJNENHOF, MAASTRICHT, 1992-97, WIM VAN DEN BERGH

If we were to sum it up we could say, by means of the urban examples of the Kingo houses and its surroundings, that:
- The density of introverted houses is comparable to stacked dwellings
- In introverted houses the private outside space is really private
- With introverted houses there is in fact no ‘left over’ outside space
- The unambiguous distribution of public and private outside spaces also allows for the integration of clearly defined communal spaces
- Introverted houses with their own private outside spaces, thus allow for full integration of public, communal and infrastructural outside spaces, thus saving valuable space and territory.

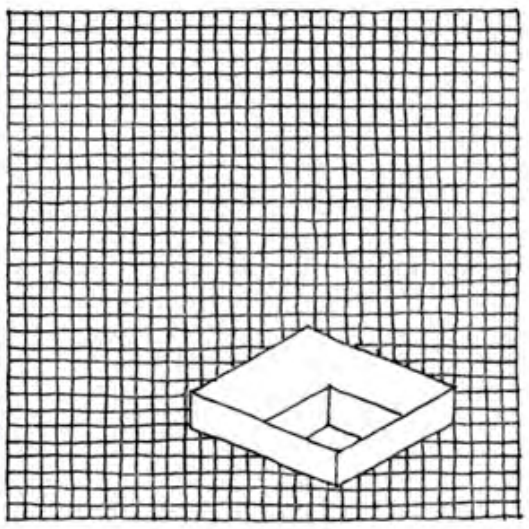
DENSITY AND DISTRIBUTION OF PUBLIC/PRIVATE OUTSIDE SPACE

USE OF 1 HECTARE NET DWELLING AREA

If we were to sum up the advantages of the introverted house in terms of a sustainable dwelling environment, we could say its characteristics are:
- High-density, thus a good economic scale for the necessary services
- Low-rise, thus has a pleasant spatial scale for dwelling, walking, cycling
- Clear distribution of public, communal and private outside space
- No ‘loss’ of ‘green’ space if integrated with the infrastructure
- Relatively independent in terms of solar position, since it is low-rise
- High degree of privacy and individuality also in the outside space

THE INTROVERTED HOUSE

SUSTAINABLE DWELLING ENVIRONMENT



- High-density, thus good economic scale for the necessary services
- Low-rise, thus pleasant spatial scale for dwelling, walking, cycling
- Clear distribution of public, communal and private outside space
- No 'loss' of 'green' space if integrated with the infrastructure
- Relatively independent in terms of solar position, since its low-rise
- High degree of privacy and individuality also in the outside space
- Good inside-outside relationship of all rooms (view, light, air)
- High degree of comfort (security, in/outside climate, maintenance)
- High degree of functionality (large part of the house on one floor)
- High degree of flexibility (dwelling career, demographic changes)

SUSTAINABLE BUILDING TYPOLOGY

- Introversion allows the enclosing facades of the house to be optimized
- Introversion also allows for a high degree of horizontal clustering (party walls)
- Thus resulting in both economic and energetic benefits
- The roof surface of the house offers a high potential for harvesting sunlight and rainwater
- The integration of all these benefits easily results in opting for energy^{+}houses
- The roof terraces further offer a possible enlargement of the garden and its greenery
- Technically and structurally these houses, since low-rise, are rather simple and easy to build
- Pre-fabrication and do-it-your-self are viable options (flexibility, economy)
- Depending on the typology and its plot dimensions, the ground costs and the infrastructure can be optimized

- Good inside-outside relationship of all rooms (view, light, air)
- High degree of comfort (security, in/outside climate, maintenance)
- High degree of functionality (large part of the house on one floor)
- High degree of flexibility (habitation career, demographic changes)

We may further summarize the advantages of the introverted house up in terms of a sustainable building typology as follows:
- Introversion allows the enclosing facade surface to be optimized
- Introversion also allows for a high degree of horizontal clustering (party walls)
- Thus resulting in both economic and energetic benefits
- The large roof surfaces offer a high potential for harvesting sunlight and rainwater
- The integration of all these potential benefits results easily in opting for energy+ houses
- The roof terraces offer a further enlargement of the garden and its greenery
- Technically and structurally these houses, since low-rise, are rather simple and easy to build
- Pre-fabrication and do-it-your-self are viable options (flexibility, economy)
- Depending on the typology and its plot dimensions, the ground costs and the infrastructure can be further optimized.

But next to all these 'material' benefits let’s not forget the highly important phenomenological aspect of the courtyard that links our dwelling to the idea of a rebuild paradise, as expressed in Johannes Spalt's 'Philosophy of the Courtyard':

“Set in the midst of the universe,
man needs a place of peace, of seclusion,
as part of the greater, hostile, amorphous world outside,
a space which, all the same receives its share of
day and night,
sun and moon,
heat and cold and rain.
This space,
which is subservient to the passage of the days and years
and the rules that order existence,
is
the ‘courtyard’“

INTROVERTED EXTROVERSION