8 Legends for design

8.1 Resolution and tolerance

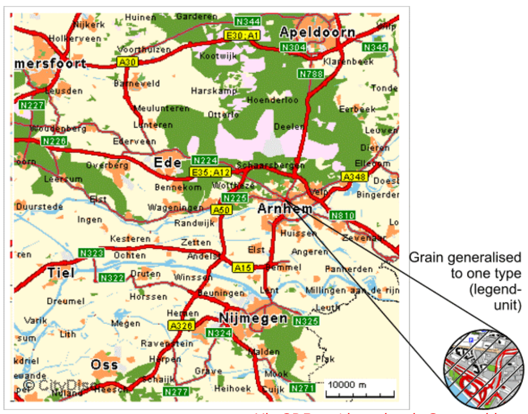
The legend is the vocabulary of design. A legend unit is a type and any legend is a result of (sometimes hidden) typology (for example living, working, recreating, travelling in CIAM's functional typology). According to Jong and Engel (2002) typology in design study is not the same as top-down categorizing in empirical research. A type is not a category, a model or a concept but the raw material for design. A type has to be designed to become a model, a design that can be realised. Types are chosen because of their potential for design. They seldom lack aspects of form. So, a design legend often can not be explained by words.

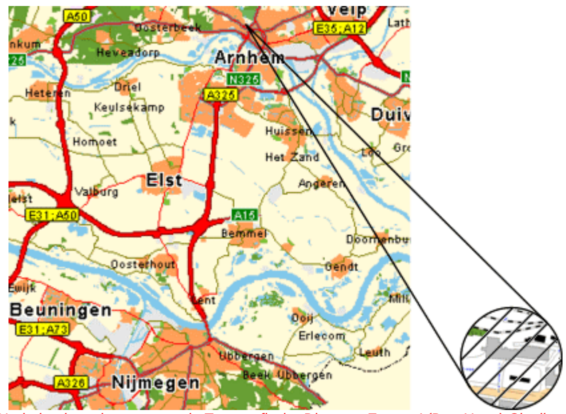
That is why design sometimes begins with a collage assembling reference images into a larger composition (collage, montage). In that case the reference images are the legend, sometimes even summarised and explained apart from the composition. The reference images should not be token litterally then, but interpreted as general types. In a later stage the composition becomes a realisable design and the legend transforms in homogeneous lines or surfaces indicated by form or colour. Their external form in the drawing is its smallest detail, its 'grain', supposed to be homogeneous inside. Compared with the measure of the composition as a whole ('frame') the grain determines the resolution of the drawing. The measure in reality of frame and grain could be expressed in their rough radius R={…1,3,10,30,100m….} and r={…1,3,10,30,100mm….}. So, a resolution r/R=0.1 may concern a sketch, r/R=0.01 a drawing, r/R=0.001 a very precise blue print.

Apart from the concept of *resolution* you have to consider the *tolerance* of a drawing. For example, if in an early stage of design you sketch a line indicating a road your intention is an approximate location, though it may be drawn in high resolution. Discussing the drawing with parties concerned a tolerance of 10m from the core of the line may be supposed. A drawing entails often different tolerances. The existing objects you want to keep in the design could be drawn with a small tolerance. Their exact location is determined. However, the designed lines start with a large tolerance and in the course of the design process their location is more and more precise; the tolerance decreases. If you draw the existing objects by narrow lines and the designed objects by thick lines your most important message comes to the fore best, while the objects everybody knows already shift to the background.

8.2 Scale-sensitivity

Your legend is scale sensitive. For example, using the CIAM typology of living, working, recreating and travelling for a regional sketch (R=30km and r=3km) tacitly supposes design decisions like dividing living, working and recreational areas concentrated within a radius of 3km. However, using it for a district sketch (R=1km, r=100m) hides other design suppositions[198]. So, frame and grain (scale) determine the meaning of your design vocabulary (legend).





Uit: CDRom 'de nationale Stratengids van Nederland met kaarten van de Topografische Dienst te Emmen' (Den Haag) Citydisc

Fig. 803 *The region Veluwe-Arnhem-Nijmegen 60x60km*
The radius of its grain is R=300m in reality; on scale 1:25 000 it is r=1.2cm

Fig. 804 *The sub-region Arnhem-Nijmegen 20x20km*
The radius of its grain is R=100m in reality: on scale 1:10 000 it is r=1cm

In Fig. 840 the radius of the smallest legend unit (grain) covers 1% of the radius of the whole map (300m) and a surface of approximately 30ha. So, it is not a rough sketch or precise blue print, but a drawing. Fig. 841 is a drawing as well, but with a smaller frame and grain. In both representations the legend distinguishes built-up area, forest, heathland, agriculture, water and highways. What kind of legends you would choose planning the area? There are infinitly more possibilities than the CIAM legend, topographical and density stereotypes. They all introduce hidden design decisions.
A legend in grain spots of the same surface makes the produced map countable as a surface programme. Such quantity and surface sensible spots can be grouped together into larger surfaces or subdivided into 10 smaller spots each, increasing resolution eventually into that of a photograph at last. However increasing resolution makes the map less accessible for analysis.

8.3 Unconventional true scale legend units

Steenbergen and Zeeuw (1995); Steenbergen and Reh (1996); Steenbergen (1999) and Reh discerned principles of landscape design as legend units (types) for the national planning agency of the rural area: urban nodes, rural estates and castles, plantations, landscape theatres and streamlands. In 2003 students tried to find them on a large 1:10 000 map of Fig. 840 (Fig. 843) and glued them as spots of two sizes (300m and 1000m) from Fig. 842.

Grain				Legend				
Radius real	surface real	radius on scale	diameter on scale	Red	Orange	Yellow	Green	Blue
m	ha	cm	cm	meaning				
300	30	1,2	2,4	urban node	rural estate	plantation	landscape theatre	streamland
1000	300	4,0	8,0					

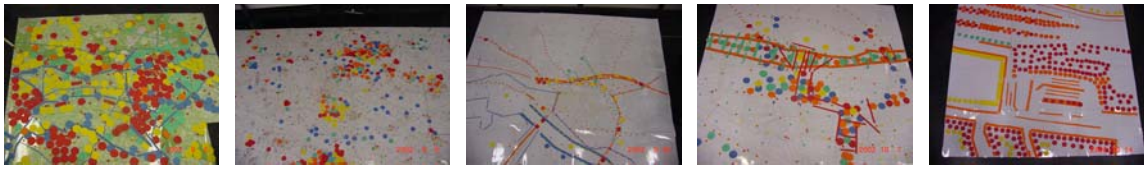
Fig. 805 *Legend-units landscaping r={300m,1000m} in a frame R=30km 1:25 000*

Existing urban nodes, rural estates and castles, plantations, landscape theatres and streamlands in the region of Fig. 840 were glued in grey shade first, planned ones in clear colour later.

Fig. 806 *Students making a map*

There are many existing rural estates and castles in that region. Vista's and other forms of accompanying landscapes were generalised in the glued spot. Plantations are colonised surfaces by which the programme is put on stage by intended or unintended grid like landscape architecture. They could be found not only in the rural, but also in the urban area, going beyond the stereotypic town-landscape dichotomy. Landscape theatres are recognisable natural, agricultural or urban systems of views and routes by which the physical, biological or cultural origin of the landscape could be experienced. Streamlands are locations where the dynamics of natural or urban life can be experienced.

On every level of scale (R={30km, 10km, 3km, 1km, 300m, 100m}) such maps were made with shifting unconventional legends (Fig. 844).



week 1 30km *Landscape* — week 2 10km *Town and traffic* — week 5 1km *Infrastructure* — week 6 300m *Physics and soil* — week 7 100m *Materialisation*

Fig. 807 *Exercises BkM1U 06 2002*

To indicate traffic in a frame R=10km (Fig. 841) spots of Fig. 845 were used.

Grain				Legend for a regular Monday				
Radius real	surface real	radius on scale	diameter on scale	Red: people average per hour using a station or motorway exit	Orange: people living at home	Yellow: people working	Green: people recreating	Blue: people caring or studying nature
m	ha	cm	cm					
100	3	1,0	2,0	100	1000	500	<100	<10
300	30	3,0	6,0	1000	10 000	5000	<1000	<100

Fig. 808 *Legend-units town and traffic r={100m, 300m} in a frame R=10km, 1:10 000*

Infrastructure was studied in a frame of R=1km, physics and soil in a frame of 300m.

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Fig. 809 *The town of Arnhem 6x6km.*
The radius of its grain meets R=30m in reality; r=1.2cm on scale 1:2 500

Fig. 810 *The railway station neighbourhood 600x600m of Arnhem*
The grain is R=3m in reality, 1,2cm on scale 1:250

Existing and planned infrastructure was studied in spots of investment according to Fig. 848.

Grain				Legend				
Radius real	surface real	radius on scale	diameter on scale	Red investment crossing	Orange investment trace	Yellow investment multiple land use	Green investment milieu	Blue investment waterworks
m	m^2	cm	cm	meaning				
10	300	1.0	2.0	€ 10 mln	€ 10 mln	€ 10 mln	€ 10 mln	€ 10 mln
30	3000	3.0	6.0	€ 100 mln	€ 100 mln	€ 100 mln	€ 100 mln	€ 100 mln

Fig. 811 *Legend-units infrastructure r={10m, 30m} in a frame R=1km, 1:1000*

Physics and soil was studied by problem and opportunity spotting according to Fig. 849.

Grain				Legend				
Radius real	surface real	radius on scale	diameter on scale	Red	Orange	Yellow	Green	Blue
m	m^2	cm	cm	meaning				
3	30	1.2	2,4					
first: problems				Safety	Noise	Light (sun/ artificial)	Ecotope	Wind
then: opportunities								
10	300	4.0	8,0					

Fig. 812 *Legend-units physics and soil R={3m, 10m} in a frame R=300m, 1:250*

Creative design starts with doubting its most self evident supposition: its vocabulary.

8.4 References on Legends for design

Jong, T. M. d. and H. Engel (2002) Typological research in: T. M. d. Jong and D. J. H. v. d. Voordt Ways to research and study urban, architectural and technical design (Delft) DUP

Steenbergen, C. and W. Reh (1996) Architecture landscape . The design experiment of the great european gardens and landscapes (Bussum) Thoth ISBN 9068681605.

Steenbergen, C. and P. d. Zeeuw (1995) Landschapsarchitectuur van de stad (Delft) TU-Delft BK Publicatiebureau.

Steenbergen, C. M. (1999) Architectuur en Landschap. De techniek van de rationele, formele en picturale enscenering. (Delft) DUP.

8.5 Composition analysis

Composition analysis is not only a research method for analysing the balance between repetition and diversity in existing urban architectural units, but also a design method to achieve this sort of balance and to explore its possibilities. In composition analysis, there appears to be an infinite number of possible types of balance. These extend artistic freedom
by challenging the possibilities to their limits. Within this are boundaries of survival value, future value, practical value, and experiential value. Composition analysis is a systematic form of establishing a legend in the research and design process. Establishing a legend is an unexpressed supposition in every structure- and function analysis.

The composition analysis discussed here has been developed for the image-quality plan of the Amsterdam district '*De Baarsjes*'. by Jong and Ravesloot (1995).The following pages are an literal quotation taken from this document.

8.5.1 Variation

The starting point is that image quality is an outcome of variation in surroundings. Too little variation (monotony) results in boredom, and too much variation (chaos) in overloading. For every individual, there are boundaries and optima of recognition by repetition and of surprise by change. This relationship says nothing about the importance of built-up surroundings, but rather about its potential to accommodate different sorts of meanings.

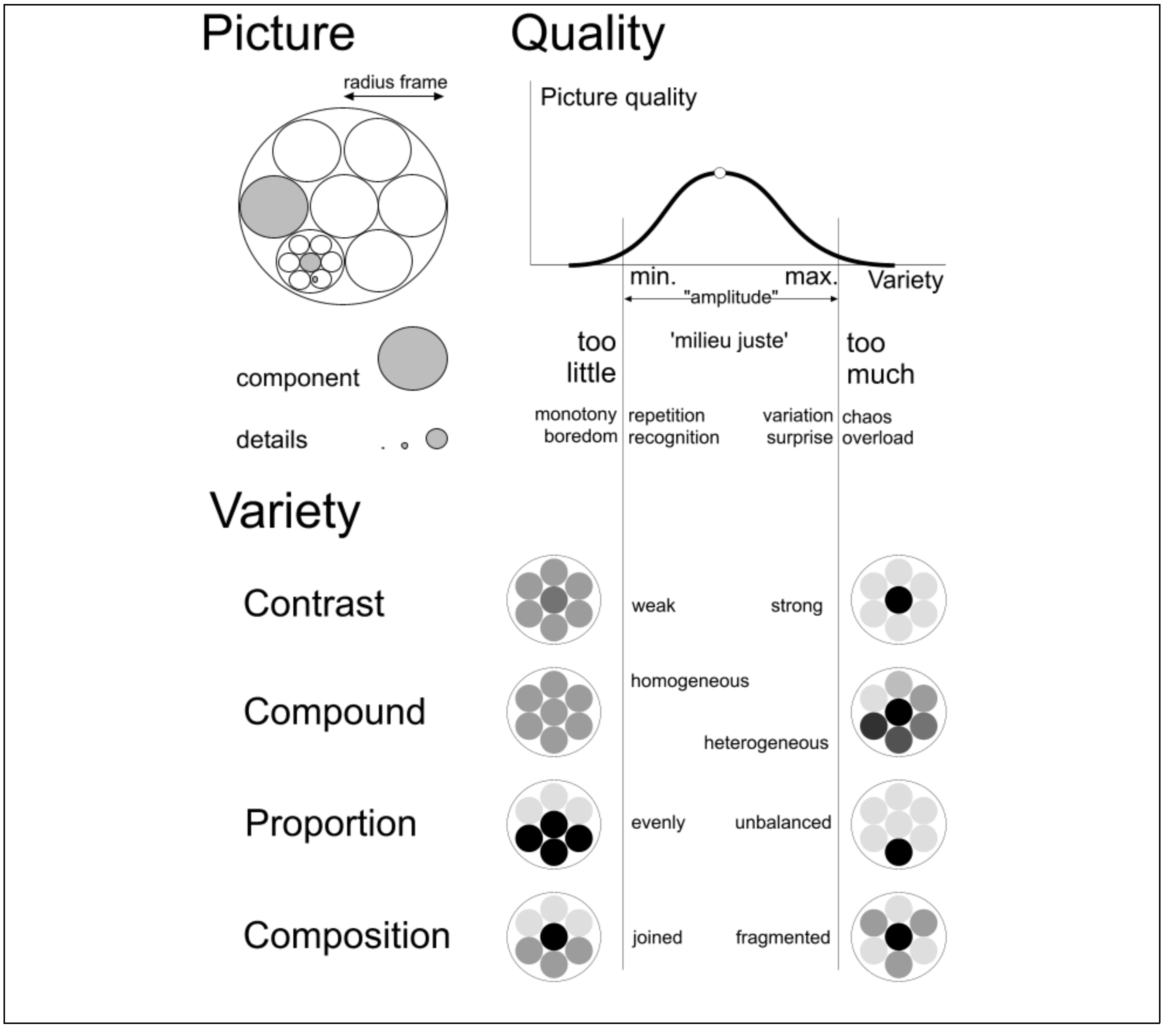


Fig. 813 *Composition-analysis*

That this simple relationship has not been utilised earlier, even though much psychological research has a bearing on it, can be ascribed to scale problems at the time of implementation. For this reason, we will consider images on different scale levels separately (district image, neighbourhood image, block image, etc.).

Within each image, we will make a scale differentiation between components and details. We consider parts larger than one tenth of the image as components that define the composition. We will call everything smaller than one tenth a ‘detail’, for the time being.

The components of an image can be more or less alike. If they are rather dissimilar, then the contrast is strong, otherwise it is weak. Between the most and the least similar components within an image, one can distinguish a smallest discernable and a largest discernable contrast. If all the components are similar (non-contrasting), then we call the composition homogenous, and if they differ, heterogeneous. One can observe a relationship between compositions of similar components, a relationship that can be either balanced or unbalanced. For the same contrast, the same composition and the same relationship, it is still possible to discern variation in composition. Similar components in a composition can be grouped in a more or less compact form.

Variation on one scale level (e.g. between the components) does not obstruct the occurrence of monotony on the other scale level (e.g. between the details within a component). In particular, it is the application of different principles on different scale levels that adds ‘tension’ to the image. One can now arrange the design strategies into scale levels in ‘accords’ between diversity (V) and repetition (R), for example:

ACCORDS	A	B
between buildings	Repetition	Diversity
between components:	Diversity	Repetition
between details:	Repetition	Diversity

Fig. 814 *Variation accords*

The ‘traditionally prepared’ architectonic accord A (Repetition at the building and detail levels, but Diversity on the levels in between, ‘RDR’) differs from the modern accord B (‘DRD’). After all, present architecture is mostly valued for the unique contour (D) of the building as a whole and for the originality (D) of the details, while between both these scale levels, repetition (R) is valued as ‘architectonic clarity’.

8.5.2 Scale levels

In Fig. 815, three periods of architectural style, and, for the sake of brevity, the three scale levels linked to them are shown. A *tholos* for Asklepios in Epidauros, with a radius of 10 metres; Palladio’s Villa Rotonda, with a radius of 30 metres; and Berlage’s Mercatorplein in the district De Baarsjes, with a radius of 100 metres. In each period, and on each scale, components and details can be seen which indicate to what extent one can talk about diversity or repetition. [6]

When we approach a façade, we first look at the composition of the different components and then at the details. By doing this, in each case, we have a different frame, depending on our distance away from that object. So, at a distance of 10 metres from our façade , when we turn our heads, the whole façade is within our vision (10-metre radius). Using a wide-angle lens, we can see our appartment (3-metre radius), and using a standard lens, a window or a door (1-metre radius).
To assimilate the total image of the street, we need to view it from a distance of about 30 metres. In each case, we position what we see within a larger frame. We see an image in a radius that is approximately the same as our distance away from that image. The more we extend that distance away from the image, the fewer details we see: the elements of façade are rougher than those of our house when we stand near to it. We only have an image of our block of houses thanks to the fact that we have walk around it at some stage. It is a conceptual image, but it is thereby no less important, because it helps us to find our way. This is also the case with our neighbourhood, district and urban images.

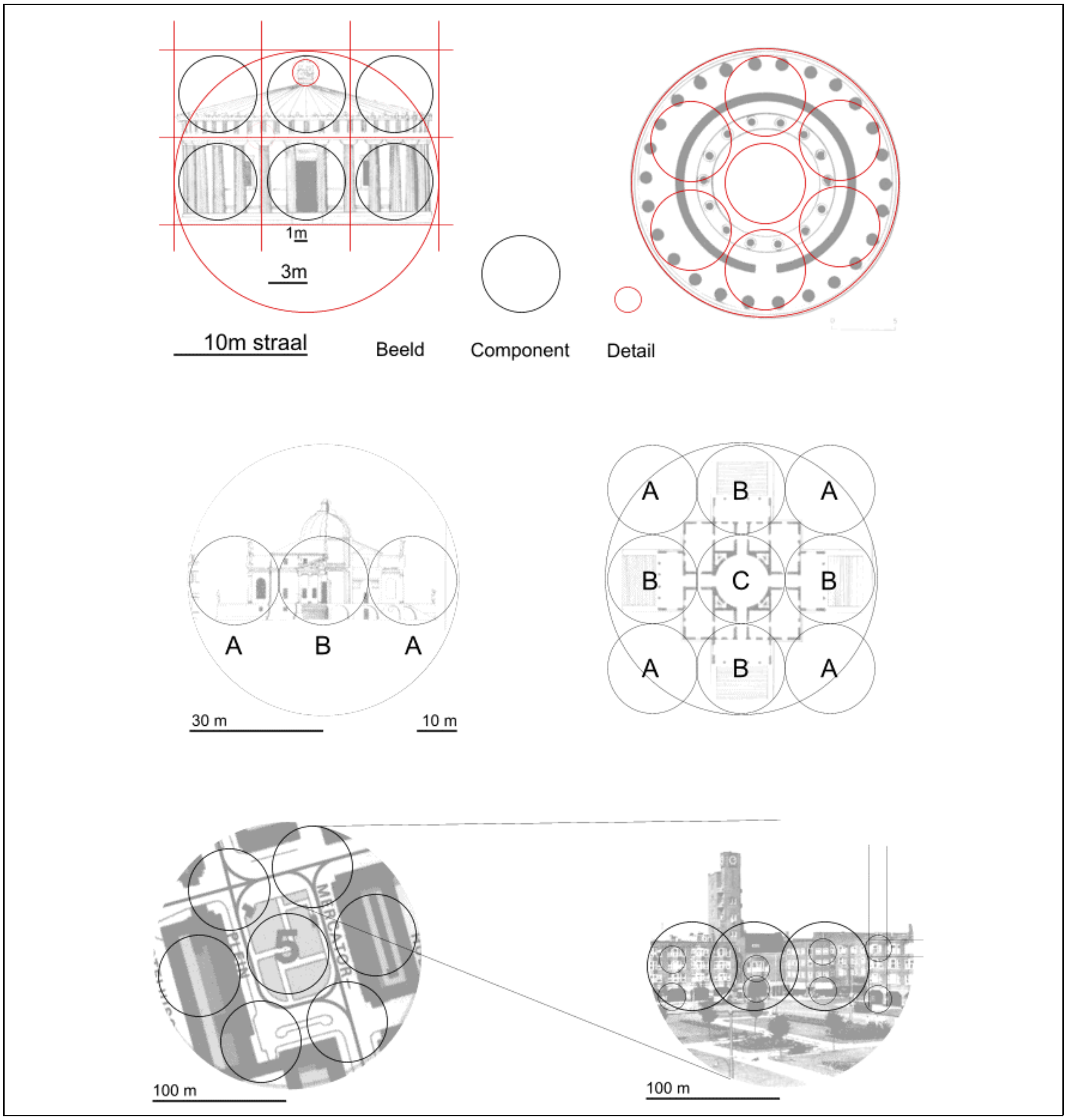


Fig. 815 *Components and details of images in a radius of 10, 30 and 100 metres*.

By chance, the *tholos* has a diameter of 20 metres and thus a radius of 10 metres. The components of a radius of about 3 metres appear in the image of the map as the central *cella*and the components of the *peristyllum.*

When one looks at them, they appear to be an entrance section and the flanking parts of the pillared gallery, and the roof section and foreground laid out in a similar way. The division of the components of the same order of size is, of course, free and is not linked to an orthogonal or hexagonal grid. The capitals, triglyphs and other ornaments are contained as details in a frame of 1m radius.

The components of the Villa Rotonda differ more. The middle section is dominant. The special (B) according to Tzonis, Lefaivre et al. (1989) is flanked by the common (A) , repeating components following the classical scheme ABA.[7] On the map, a large central section C appears, flanked by similar ABA schemes, in which, this time, the peripheral area can be included as the most common component. In the image of Mercatorplein, the area *is* the central component (30m in radius), flanked by an approximately equally large groups of house façades in the corners and along the lengthy sides. The details consist here of façade (10 m) window and entrance sections (3 m). The image of a block (of buildings) can also be described within a radius of 100 m.

For our analysis, we differentiate the following images by their details, components and frame (with radius expressed in metres):

	detail		component	frame	ACCORD
	<		>		BAARSJES
district image		100		1000	R
neighbourhood image		30		300	V
ensemble		10		100	R
street image		3		30	V
façade image		1		10	R
house image		0,3		3	V
finished image		0,1		1	R

Fig. 816 Variation accord for *De Baarsjes*

In *De Baarsjes* all the neighbourhoods within the district image look alike (R), but within each neighbourhood, the squares, and the block and street groups ('ensembles') vary greatly (V). Within each separate ensemble, the blocks and streets are again very similar (R), but within each block and street, the façades vary (V). Within the façades, appartments are repeated (R),[29] but within each house image, the finished image varies (V).

8.5.3 Focus

In the first instance, the variation in the district image is read against the variation among its components. As large units as possible are chosen as components within the image, wherein a maximal repetition of characteristic details can be found. It is as if one scans the image with a searchlight the size of a component, until one has caught the most repetitive part of the bundle. When, by doing this, one connects the definable diversity (between the components) and the repitition (within the components) so closely to the scale level of the district and its components, it becomes very important where one chooses to place (focus) the boundaries of the district components (and thus the boundaries of the formulated homogeneity).

To establish the remaining image-defining variations within each district component, a neighbourhood image can be formulated by looking for relatively homogeneous neighbourhood components that differ maximally among themselves at that level.

If, for example, a road lies between two district components, then this road accentuates the difference between the district components, or, alternatively, the similarity within a district component. In the one case, that can lead to the establishment of an asymmetric street profile, and, in the other case, to a symmetric one. For instance, in the case of De Baarsjes, the focus determines the symmetry of the Hoofdweg. When one reaches the Postjes neighbourhood, we can distinguish, for various reasons, two different district components on both sides of the Hoofdweg. For this reason, the walls of the streets on the opposite side do not need to be the same (<>). Once past the Postjesweg, a striking symmetry between the street walls becomes evident (><). This gives the impression that one is entering a homogeneous neighbourhood.

8.5.4 Morphological reconstruction

How, now, do we determine the focus? Following Van der Hoeven and Louwe's example, Hoeven and Louwe (1985) the urban area is 'morphologically reconstructed' (see the Fig. *817*) First, the area covered by the district is divided as equally as possible in the two main directions, using the most characteristic repetitive detail: a building block of 72 by 360 metres. In this way, the present district image has been reconstructed with an accuracy of approx. 100 metres. This conceptual design intervention is called 'dividing'. Globally speaking, the second intervention, 'segmenting', means connecting main roads and waterways to the surroundings and taking the consequences for the primary zoning. Thus, a more differentiated topological scheme arises that, in turn, is more closely aligned to present actuality.

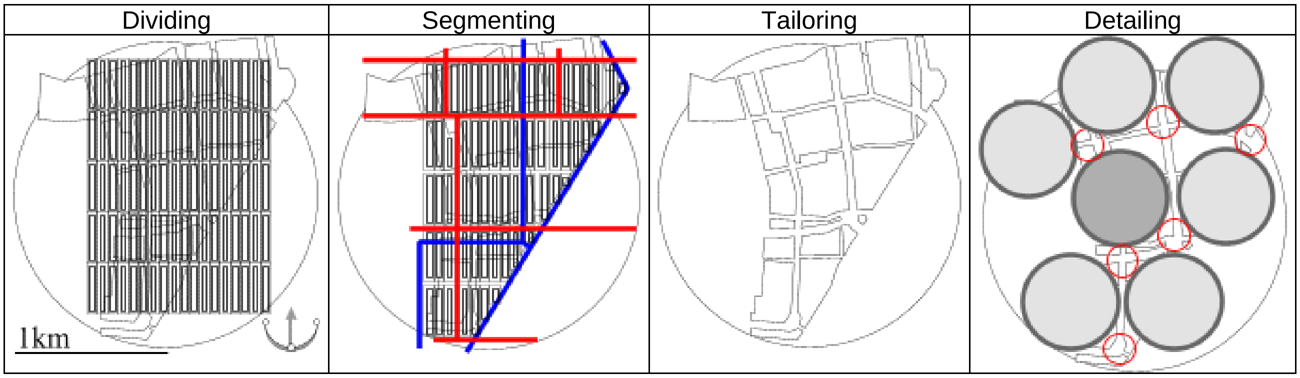
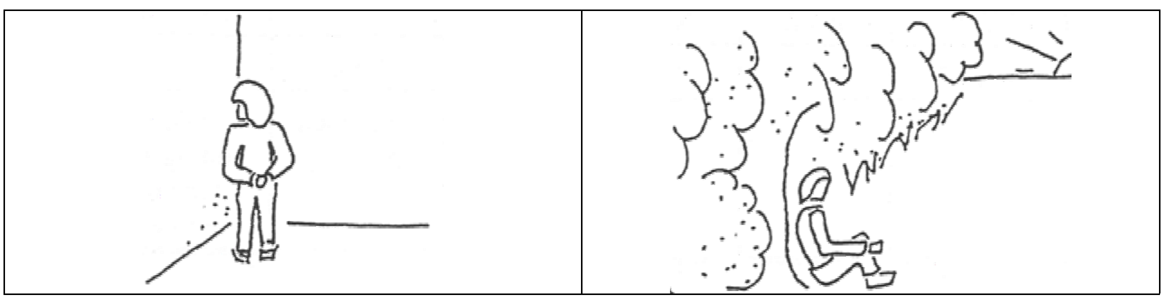


Fig. *817 Morphological reconstruction of the urban area De Baarsjes*

A third intervention cuts the otherwise homogeneous parts apart and 'adds' them to the existing topography. An analogy to the work of the tailor, the cutter, the couturier or dressmaker, this intervention is known as 'tailoring'. The next intervention, 'detailing', temporarily divides the area internally into components that are considered to be homogeneous, identified by characteristic internally repeating details. The connecting details can be found between the components, just where their differences culminate. These can be points or lines, which either represent the surrounding components or are in contrast to them.

8.5.5 Structure in terms of openness and closedness.

Structure (coherence) is the way in which grouped parts form a whole or the sum of divisions and connections. The concept forms a separate category between form and function, because the same structure can take on different forms and can have different functions, and *vice versa*. Coherence always arises between different parts; in the drawing, these are the legend units. One can refer to the coherence between one kind of legend unit as cohesion. The coherence between different kinds of legend units then has to be called adhesion.[8] Coherence can be stimulated by nearness in space and realised by separating or connecting infrastructure.



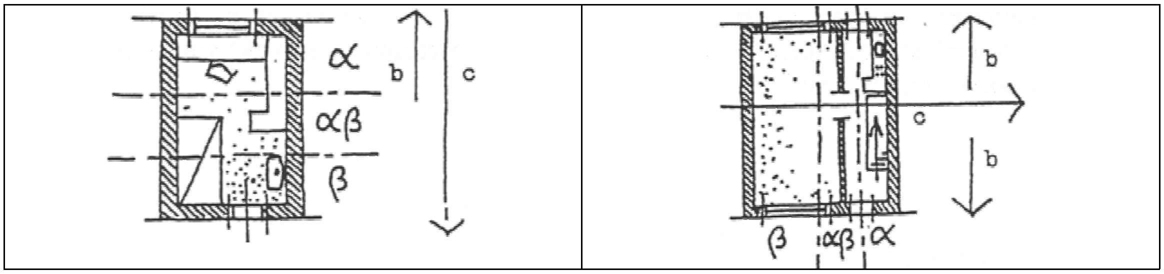
Jong (1978)

Fig. 818 *Polarities 3m*

Spatial elements such as a neighbourhood, a house, a chair, a cupbourd, a television set, a person are often polarised, on the one hand, towards an open 'front' where the connections are concentrated and the communication with other elements takes place, and, on the other hand, to a closed 'back' in which the 'functions characteristic of the system' are concentrated where they can operate sheltered from the outside world. One cannot reverse this polarity with impunity without jeapodising the function. For example, it is pointless placing a TV set, a cupboard or a chair with their fronts against a wall. One only puts a person in a corner (with their front against a wall) if one wants to 'gag' them (Fig. 818).

One can recognise polarity between openness and closedness on different levels of scale and can give them meaning as 'structure' in design and research. The polarities at different scale levels influence each other. The polarity of a wall of a small room (3m radius) or of a forest edge (100m radius), interfers with human polarity (1m radius) by causing hinderance or back-coverage.[199]

In the left hand Fig. 819, a study has an 'open' window-side and an 'walled-in' door-side. This sensoric polarity is realised within a radius of 3m. If one considers accessibility as 'the distance to the front door” (radius 10m), then on a greater scale and in a motorical sense, the door-side is the most ‘open’ side of the room and the window-side is the most ‘closed’. The polarities change meaning according to the scale and are directed antipodally (‘contrapolar’).

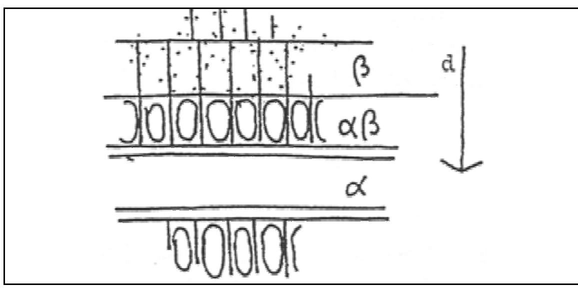


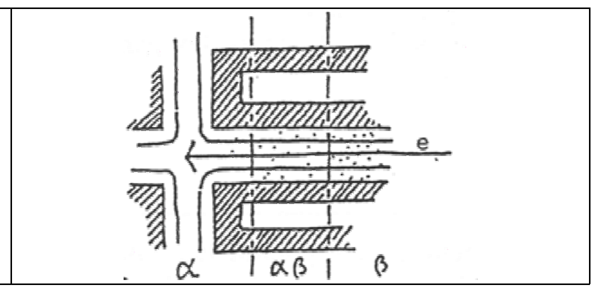
Jong (1978)

Fig. 819 *Polarities 10m*

The right-hand Fig. 819 is a sketch of a house with a through lounge in which the front door, back door, corridor, staircase, hall, cables, piping and wiring, in short the communication functions, are concentrated in the small aisle on one side, and the ‘system characteristic‘ living functions on the other side , in the large aisle. This is the motoric polarity (c) from the left-hand drawing that extends for a distance of 10m. The sensoric 3m polarity that divides the house on two sides into a window side and a walled-in zone is here perpendicular (‘orthopolar’).

The three standard hobbies of ‘creative’ architects: ‘the front door in the living room’, ‘the staircase in the living room’, or ‘the kitchen in the living room’ all breach the 10m motoric polarity, so that the objections to them (draught, smells, people walking through) have to be solved mechanically.





Jong (1978)

Fig. 820 *Polarity 30m*

Fig. 821 *Polarity 100m*

The house is polarised within a radius of 30m towards the open, communicative, public front and a more closed, protected ‘private’ back.

Its most ‘open’ side is where the street crosses with another street or enters a more important street or square; its middle is the most ‘closed’ part. This polarity can be spread over more than 100m. Within the radius of 300m, one can be polarised towards ‘neighbourhood centre’ and ‘neighbourhood green’; within a radius of 1000 metres towards ‘district centre’ and ‘district green’. In a similar manner, within a radius of 3 km, the town has an open ‘town centre’ and a more closed ‘periphery’. However, this is a motoric interpretation of ‘open’ and ‘closed’. A more sensoric interpretation talks about closed ‘inner city’ and open ‘outside areas’[200].

8.5.6 Functional differentiation

The built-up and unbuilt upon surroundings have different values, such as short-term experiencial value, medium-term practical (functional) value, long-term future value and extremely long-term survival value. By definition, this has to do with the value for people, including the value for plants and animals, in sofar as we, as people, recognise value in.[201]

For experiencial value ‘shape’ is enough; one doesn’t need much structure for this. For the other values, increasing amounts of structure are needed. These have to be designed in that way, because structure is the ‘condition’ for these values.

Functional values can be subdivided into economy, culture and administration. [9] These can be recognised in the medieval town (see the market square of Delft) as the following:

Social differentiation	Urban differentiation
administration (aristocracy)	castle, palace
culture (spirituality)	church, cloister
economic basis (citizens, serfs)	market, shops, dwellings, small traditional trade businesses

Fig. 822 *Trias urbanica in the Middle Ages*

Pierre George's definition George (1961can be called '*trias urbanica'*. By subdividing further, as a result of social differentiation, it is possible using Jakubowski's (1936) [10] and Parsons(1966 and 1977) systematique to imagine a '*trias politica'* from Montesquieu and Derathé (1973), a '*trias cultura'* and a '*trias economica'*.

Social differentiation	**Urban differentiation**
Politics	
legislative power	town hall
legal/administrative	law court/government services
executive power	police station, prison, barracks, military training ground
Culture	
religion/ ideology	churches, monuments, signs
art/science	museums, institutes, libraries
up-bringing/education	socio-cultural facilities, schools
Economy	
production	firms, banks, offices
exchange	distribution points, infrastructure
consumption	living, health service, recreation

Fig. 823 *Social and urban differentiation in modern times*

Functions can be concentrated or deconcentrated spatially, but apart from that, each function can also be centralised or decentralised in a hierarchical order.[202]
So, there are 4 possibilities of form related to function:

		FORM	
		concentration	deconcentration
FUNCTION	centralisation	Concentration of centralised functions	Deconcentration of centralised functions
	decentralisation	Concentration of decentralised functions	Deconcentration of decentralised functions

Fig. 824 *The difference between concentration and centralisation demonstrated*

In the concept of 'centre' a morphological and a functional meaning have to be discerned.

8.5.7 Intention

Intentions can range from tradition-oriented to opportunity-oriented. They are proportioned as are probability and possibility within what is desirable.[203]

A design is traditionally preceded by a programme of requirements, compiled according to the wishes of the commissioning body. In order to meet these requirements, the designer has to create the conditions in his proposals that will lead to the fulfilment of these requirements. In doing this, he himself sets additional requirements based on past experience and on his expectations regarding future use and perception.

The finished design will be used and perceived in a different way than the commissioning body and designer had envisaged. A design to be used in different ways and contexts we call ‘robust’ That quality often leads to a plea for flexibility, ‘leave possibilities open’. This means making fewer design efforts.
However, from that point of view, one can also defend an environmental diversity that offers freedom of choice and with which one not only makes allowance for the unsuspected, but also facilitates it. This means putting more effort into design.
A painting such as ‘the child with a tear’ that prescribes emotions in us, emotions that we have to feel every time we look at it, is no more art than sentimentality (kitch). A true piece of art enables one to feel different emotions every time we look at it.[204]

Nature has no wishes. Nevertheless, we try, as people, to make a programme of requirements for nature development.[23]. That is as paradoxical as the order ‘Be spontaneous’. We do that based on a primitive and often inaccurate picture of how plants, animals and human beings will use the environment that we design. We are repeatedly surprised by the way in which the surroundings that we have designed are put to use by nature.

We cannot make a programme of requirements for nature: each species has its own programme of requirements, about which we have little understanding and there are at least 1,500,000 species in addition to *homo sapiens*. All we can do is to create environmental diversity and wait to see what use nature will make of it. While ever one is unable to base the programme of requirements on prognoses, diversity remains a form of risk coverage for perceptive-, practical-, future- and survival values. This design intention seems to me to be important, not only for nature, but also for human beings, as long as we believe in their freedom of choice. Image quality can be related directly and in a design-oriented way to variation in surroundings.[205]

8.5.8 References to Composition analysis

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8.6 The scale level at which one separates and mixes

An important starting point for designing, forming policy on, and researching into legend units is the level at which one wants to mix them. I deal with the scale-segmented approach here. However, the terms employed in this are only used here to indicate the extent of an area and thus have no functional meaning other than 'potentials' for functions.

This approach is based on the discovery that 'scale falsification' can occur in most urban architectural argumentations when one derives the argumentation from another scale level than that on which the inference is implemented. For example, this has been the case with the division between living and working. The radius within which the hinderance was determined was much smaller than the radius within which living was separated from working. In addition, the scale-segmented approach renders designers' paradoxical concepts, such as 'bundled deconcentration', understandable and acceptable. The same applies to the separation and mixing of red, green, blue and black.

The concept of 'mixing', for example, of mixing built-up and vacant areas, is scale-dependent. What in a large radius is called mixing, can be segregation in a small radius. These conceptual confusions cannot arise any more in the legend proposed. Different principles for arranging can be recognised immediately on the map, according to scale.

The distribution of the urban area within a radius of 10 km has hardly any influence on the landscape around, if this is concentrated within a radius of 30 km. (zie **Fout! Verwijzingsbron niet gevonden.** (The two upper variants CC and CD). However, the distribution within a radius of 30 km breaks the landscape around into landscape parks. Under that condition, the distribution within a radius of 10 km again becomes important: the landscape parks are further divided into urban landscapes. Until 1983,[13] the national strategy was DC (Bundled Deconcentration). After thatRPD (1983), the policy was changed to CC (Compact City/Town), but, in practice, the strategy was CD and even DD.

Shape and size do not in themelves give an indication of the probable function, but rather of possible functions; of functions such as nature and recreation, for example.

Due to technical developments, some traditional urban functions (such as certain types of distribution) have become less dependent on the size of the built-up area around (the 'area capacity': the number of residents within a certain radius). Others (such as commuter traffic, public transport, urban nature and recreation) are still, or have become even more, dependent on that size. A table of potential functions could also be set up for each radius of the built-up area, even though it would have a more temporary character.

The internet is used a lot by estate agents. This is one of their messages:

'... project developments of houses, appartments and detached villas will also be situated at the water's edge. In Almere, houses have been built at the edge of the lake, with a mooring place for a boat, so that one gets the idea of being on holiday in one's own house, whatever the season. Rotterdam makes use of its water-rich environment and Amsterdam is planning a new development at a location still occupied by water. Nieuwegein has its river bungalows along the banks of the Lek and there are many other locations where one can live at the water's edge. Who would not want to live at the side of the largest expanse of water in the Netherlands, the North Sea, and watch the sun sink into the sea every cloudless evening?
But, of course, we cannot all live at the water's edge, so some people go and live on it. Houseboats and boat conversions decorate the sides of the water in all shapes and forms, irrespective of municipal and ministerial policies to discourage them. Hardly any new moorings become available, and permits are hardly ever issued for them any more. A boat conversion without a mooring permit is like a house without a building permit.
The remaining alternative is to live far away from the large areas of water and to buy a pleasure (!) yacht in which one spends as much of one's free time as possible. The yacht harbours on the Veluwemeer and the IJmeer, the Veersemeer and the Biesbosch, Nieuwkoop and Vinkeveen, Loosdrecht and the Sneekermeer offer these floating cabins, tired of tramping through the waterways all summer, places where they can hibernate through the winter en masse. Because another fact is that: it is nice on the water as long as it doesn't rain (too wet) and as long as it is not frozen over (too dry). But now let's return ... to the shore.
Because so many people are charmed by the restful effects and wide expanses of water, with the

many additional recreational possibilities close at hand, these locations are more expensive than other spots.
If living at the water's edge is restricted to the narrow ditch at the bottom of a back garden, then there are hardly any financial consequences. But if that narrow ditch becomes a stream, then the price of the plot is already higher. And should that stream broaden out into an often depicted slow-moving lowland river, flanked by summer and winter dykes, then the situation becomes very attractive for many people. Consequently, ... the more cubic metres of water that move along the banks of the waterway, the higher the square-metre price of the land becomes.

Maas van Vliet
Estate agent/ surveyor, Nieuwegein

Here, the economic function of the transition between buildings and water is defined. However, there are other functions and other transitions that must be valued and considered.

Apart from the colour combinations red and blue, one can distinguish on different scale levels the following margins between red, green, blue and black:

<table>
<tr><th>straal in m</th><th>RG</th><th>RB</th><th>RZ</th><th>GZ</th><th>BZ</th><th>GB</th></tr>
<tr><td>30 000</td><td>nationale spreiding?</td><td>bouwen in de duinen?</td><td rowspan="3">mainports</td><td rowspan="3">groene inpassing van snelwegen</td><td rowspan="2">Afsluitdijk</td><td>Nederland Waterland</td></tr>
<tr><td>10 000</td><td>Groene Hart?</td><td rowspan="5">Makelaarsdroom</td><td>Casco-concept</td></tr>
<tr><td>3 000</td><td>bufferzones?</td><td>Tjeukemeer</td><td>3 netwerken</td></tr>
<tr><td>1 000</td><td>stadsgroen?</td><td>geluidhinder</td><td rowspan="7">bermbeheer</td><td>havens</td><td rowspan="3">oever-recreatie</td></tr>
<tr><td>300</td><td>wijkgroen?</td><td rowspan="4">ontsluiting</td><td>boulevards</td></tr>
<tr><td>100</td><td>buurtgroen?</td><td rowspan="5">kaden</td></tr>
<tr><td>30</td><td>vlekgroen?</td><td rowspan="2">ontwatering</td><td rowspan="3">taluds</td></tr>
<tr><td>10</td><td>hof of tuin?</td></tr>
<tr><td>3</td><td rowspan="2">snippergroen</td><td rowspan="2">Venetië</td><td rowspan="2">rooilijnmarge</td></tr>
<tr><td>1</td><td>beschoeiing</td></tr>
</table>

Fig. 825 *Urban architectural agendas with respect to legend and scale*

Drawing creates boundaries. The decision as to where one draws a boundary, and why there, in particular, depends on the agenda.[206]

straal in m	RG	RB	RZ	GZ	BZ	GB
30 000						
10 000						
3 000						
1 000						
300						
100						
30						
10						
3						
1						

Fig. 826 *The level of scale on which separations are made*

8.6.1 Conditional considerations

Each cell in Fig. 826 has values and dilemmas that must be weighed up, not only economically, but also spatially, ecologically, technically, culturally and managerially. These considerations become simpler when one places those values in a conditional context (Fig. 827).

Fig. 827 *Urban operations arranged conditionally*

This figure shows, for example, that one cannot imagine management without culturally based collective concepts and shared presuppositions, but reversely, one can.
As a result, one cannot imagine culture without an economy that makes a decent existence possible, but reversely, one can. One cannot imagine economy without technical infrastructure: because, if the dykes break, the economy in the above-mentioned sense, does not exist any more. One cannot imagine technique without raw materials and raw materials cannot be imagined unless there is a time–space connection.

Fig. 828 gives an example of considerations using the above values, and summarized conditionally.

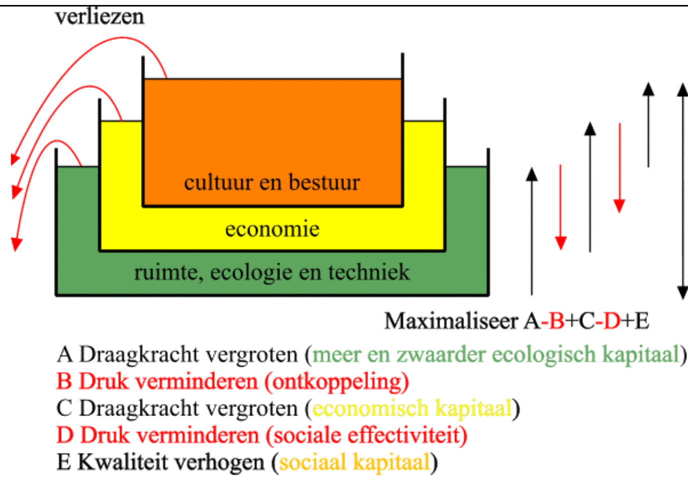
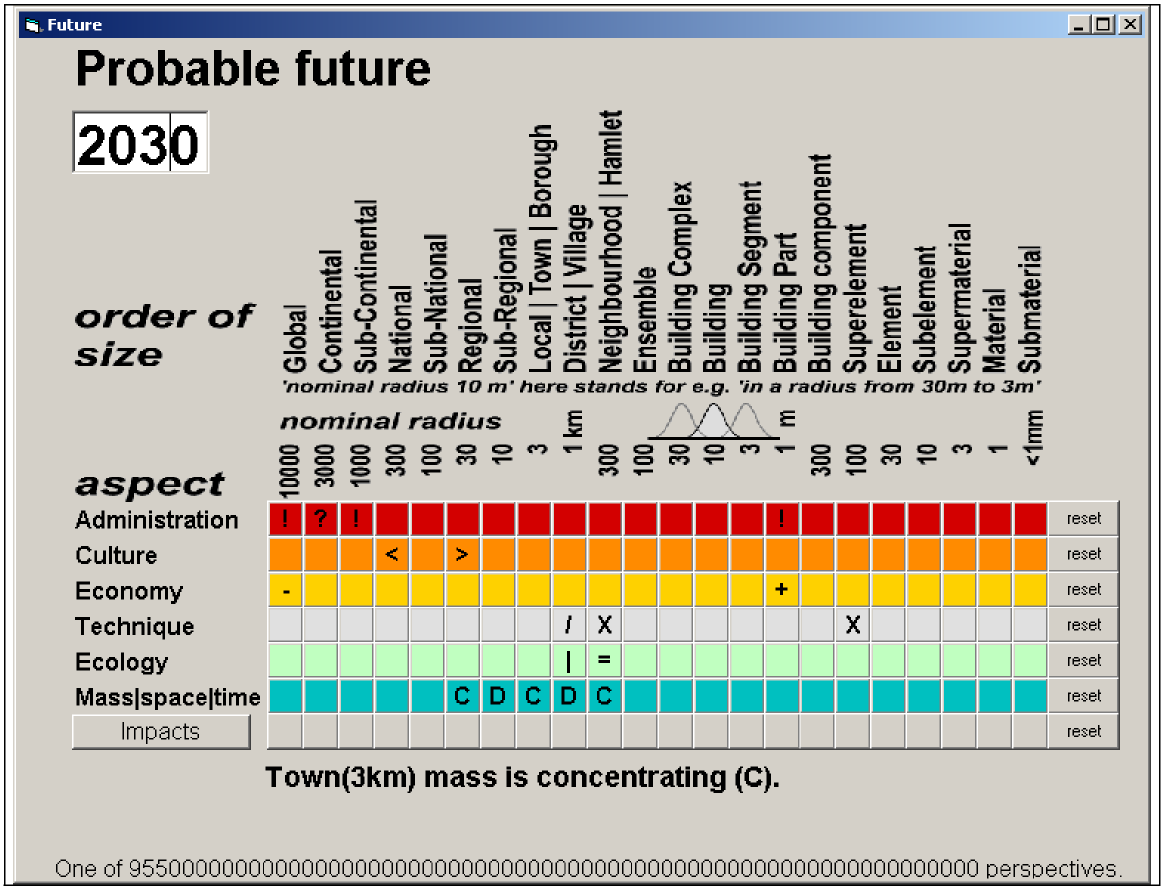


Fig. 828 *Conditional assessments*

8.6.2 The context and perspective of consideration

Anybody has an implicit idea about the probable future. It directs your decisions. When somebody else judges your design (evaluation), (s)he can reject your design from another idea about the future. So, it is important to make explicit your idea about the future for an honest judgement of your study. Try http://www.bk.tudelft.nl/urbanism/team, publications 2003, FutureImpact.exe (Fig. 829) to make your ideas about the future explicit in a design relevant way.



Jong (2003) http://www.bk.tudelft.nl/urbanism/team , publications 2003

Fig. 829 *Determining probable future*

The aspects ‘management’, ‘culture’ and so forth, are deliberately operationalised in an abstract way in extreme values (initiative(!) versus executing(?), traditional(<) versus innovative(>) and so forth), so that they mean something at each order of magnitude. Then they gain another working on each scale level, whereby their meaning shifts according to scale context.

Deciding among incomparable spatial, ecological, technical, economic, cultural and managerial values (evaluation) is dependent on the size of the project, the context within which the programme or intention is determined and the probable future in which the impacts of the intervention are anticipated within the term of a given planning horizon. In a second sheet of the computer programme you can fill in the frame(O) and grain(o) (size and resolution) of the object you have in mind. By doing so, the rest is context. What targeted (P) and non targeted (I) impacts you expect from the object you have in mind in that context? (Fig. 830).

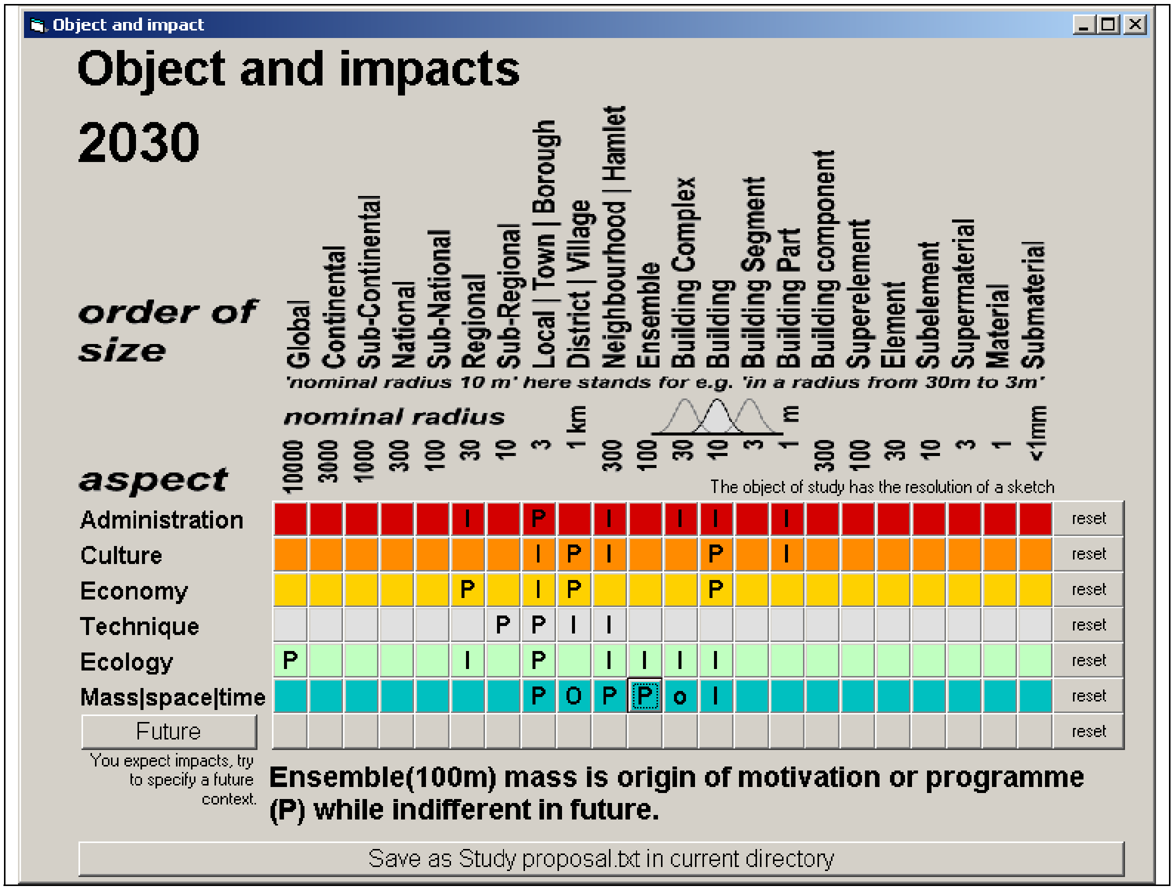


Fig. 830 *Determining object, local context and impacts*

Once you have made explicit *where* you expect the object to have its impacts (not even specifying them), you can ask the computer programme to make the framework of a priliminary study proposal by pushing the button below (Fig. 830).

The study proposal will look like this:

<Name> (26-8-2003) <Title> (Delft) Faculty of Architecture DUT

1 OBJECT OF STUDY AND ITS CONTEXT.

1.1 OBJECT OF STUDY

The object of study has the resolution of a sketch for 2030 on District(1km) scale with smallest details on Buildingcomplex(30m) level.

1.2 ASSUMPTIONS ABOUT THE FUTURE CONTEXT

Assumptions about the probable future context of the object of study until 2030 are:

- **management** will be initiating (!) on Global(10000km) not on Continental(3000km), on Subcontinental(1000km), on Buildingpart(1m) level;
- **culture** will be innovative (>) not on National(300km) on Regional(30km) level;
- **economy** will be growing (+) not on Global(10000km) on Buildingpart(1m) level;
- **technique** will be internally specializing subfunctions (/) on District(1km) not on Neighbourhood(300m) not on Superelement(100mm) level;

- **ecology** will be differentiating into heterogeneity (|) on District(1km) not on Neighbourhood(300m) level;
- **mass** will be concentrating (C) on Regional(30km) not on Subregional(10km), on Town(3km), not on District(1km), on Neighbourhood(300m) level;

assuming that probable future contexts will affect evaluation of the object.

1.3 MOTIVATION OR PROGRAMME

Setting desirable futures against this probable future context according to Jong and Priemus(2002) we get a problem field. Within that field the study object derives its motivation from expected:

- Town(3km) management;
- District(1km), Building(10m) culture;
- Regional(30km), District(1km), Building(10m) economy;
- Subregional(10km), Town(3km) technique;
- Global(10000km), Town(3km) ecology;
- concentrating (C) Town(3km), concentrating (C) Neighbourhood(300m), Ensemble(100m) mass;

partly resulting in a programme of requirements to change undesired developments.

1.4 NOT TARGETED EXPECTED IMPACTS

Unintended impacts are expected on:

- Regional(30km), Neighbourhood(300m), Buildingcomplex(30m), Building(10m), Buildingpart(1m) **management**;
- Town(3km), Neighbourhood(300m), Buildingpart(1m) culture;
- Town(3km) **economy**;
- District(1km), Neighbourhood(300m) **technique**;
- Regional(30km), Neighbourhood(300m), Ensemble(100m), Buildingcomplex(30m), Building(10m) **ecology**;
- Building(10m) **mass**;

summarised as well in the table below and elaborated in the next chapters.

1.5 SUMMARISED HIGHLIGHTS OF STUDY

Future 2030	Global(10000km)	Continental(3000km)	Subcontinental(1000km)	National(300km)	Subnational(100km)	Regional(30km)	Subregional(10km)	Town(3km)	District(1km)	Neighbourhood(300m)	Ensemble(100m)	Buildingcomplex(30m)	Building(10m)	Buildingsegment(3m)	Buildingpart(1m)	Buildingcomponent(300mm	Superelement(100mm)	Element(30mm)	Subelement(10mm)	Supermaterial(3mm)	Material(1mm)	Submaterial(<1mm)
management	!	?	!												!							
culture				<		>																
economy	-														+							
technique									/	x							x					
ecology									|	=												
mass						C	D	C	D	C												

Legend:
management = initiating (!) or executing or controlling initiatives (?)
culture = innovative (>) or traditional (<)
economy = growing (+) or declining (-)
technique = internally specializing subfunctions (/) or internally combining subfunctions (X)
ecology = differentiating into heterogeneity (|) or egalizing into homogeneity (=)
mass = concentrating (C) or dispersing (D)

Impacts 2030	Global(10000km)	Continental(3000km)	Subcontinental(1000km)	National(300km)	Subnational(100km)	Regional(30km)	Subregional(10km)	Town(3km)	District(1km)	Neighbourhood(300m)	Ensemble(100m)	Buildingcomplex(30m)	Building(10m)	Buildingsegment(3m)	Buildingpart(1m)	Buildingcomponent(300mm	Superelement(100mm)	Element(30mm)	Subelement(10mm)	Supermaterial(3mm)	Material(1mm)	Submaterial(<1mm)
management						I		P		I		I	I		I							
culture								I	P	I			P		I							
economy						P		I	P				P									
technique							P	P	I	I												
ecology	P					I		P		I	I	I	I									
mass								P	O	P	P	o	I									

Legend:
largest frame of study (O) and smallest grain of study (o)
probably affected without intention (I) or origin of motivation or programme (P)

2

ELABORATED MOTIVATION OR PROGRAMME OF REQUIREMENTS.
The object of study has the resolution of a sketch for 2030 on District(1km) scale with smallest details on Buildingcomplex(30m) level. With regard to my assumptions about the future context(1.2) I derive my motivation from:
Town(3km) management because .....

District(1km), Building(10m) culture because .....
Regional(30km), District(1km), Building(10m) economy because .....
Subregional(10km), Town(3km) technique because .....
Global(10000km), Town(3km) ecology because .....
Concentrating (C) Town(3km), concentrating (C) Neighbourhood(300m), Ensemble(100m) mass because .....

Earlier examples with similar motivation and context below fascinate me professionally.

	
Naam: Woning ensembles in Hong Kong Bron: Het ontwerp van de stadsplattegrond(pag. 52) Auteur: Jan Heeling e.a. Uitgever: SUN ISBN: 90 5875 026 4 Keywords: hoogbouw, dicht op elkaar, heel druk, veel mensen en allemaal zelfde vorm.	Naam: Luchtfoto Rotterdam-Pendrecht Bron: Het ontwerp van de stads-plattegrond (pag. 155) Auteur: Jan Heeling e.a. Uitgever: SUN ISBN: 90 5875 026 4 Keywords: druk, repetitie, ritmie, hoog en laagbouw

Bentvelsen (2003) http://www.bk.tudelft.nl/students/b1140337/internet/
Fig. 831 *Professionally fascinating images*

These images add the following designerly aspects to the motivation and programme of requirements of my study.
…….

3 ELABORATED DESCRIPTION OF OBJECT, LOCATION AND OTHER FUTURE CONTEXT FACTORS.
The object of study has the resolution of a sketch for 2030 on District(1km) scale with smallest details on Buildingcomplex(30m) level. The object will be located in ....

As a context I assume:

- management will be initiating (!) on Global(10000km) not on Continental(3000km), on Subcontinental(1000km), on Buildingpart(1m) level because: .....
- culture will be innovative (>) not on National(300km) on Regional(30km) level because: .....
- economy will be growing (+) not on Global(10000km) on Buildingpart(1m) level because: .....
- technique will be internally specializing subfunctions (/) on District(1km) not on Neighbourhood(300m) not on Superelement(100mm) level because: .....
- ecology will be differentiating into heterogeneity (|) on District(1km) not on Neighbourhood(300m) level because: .....
- mass will be concentrating (C) on Regional(30km) not on Subregional(10km), on Town(3km), not on District(1km), on Neighbourhood(300m) level because: .....

This chapter and the next ones will grow during the study.

4 POSSIBLE IMPACTS OF THE OBJECT AND ACTORS INVOLVED.

As announced in my introduction I expect the following impacts from my study:

- Regional(30km), Neighbourhood(300m), Buildingcomplex(30m), Building(10m), Buildingpart(1m) management because: .....
- Town(3km), Neighbourhood(300m), Buildingpart(1m) culture because: .....
- Town(3km) economy because: .....
- District(1km), Neighbourhood(300m) technique because: .....
- Regional(30km), Neighbourhood(300m), Ensemble(100m), Buildingcomplex(30m), Building(10m) ecology because: .....
- Building(10m) mass because: .....

So, actors involved in realisation of my study will be: .....
Their respective societal interests stem from:
.....

5 CONCLUSIONS

According to Jong and Voordt eds. (2002), page 28 - 31 this study proposal demonstrates:

A. Affinity with designing by ...
B. University latitude by ...
C. Concept formation and transferability by ...
D. Retrievability and Accumulating capacity by ...
E. Methodical accountability and Depth by ...
F. Ability to be criticised and to criticise by ...
G. Convergence and limitations by ...

It gives a contribution to the research of my studio ... by ...

Its has enough limitations to be realised in next timetable.

...

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KEY WORDS

In this index an expression like y(x), object(subject) means 'object y as a working (function, action, output, result, characteristic) of the subject x (independent variable actor, input, condition, cause)'.

planhorizon(2030)
management=initiating(Global(10000km)notContinental(3000km),Subcontinental(1000km),Buildingpart(1m))
culture=innovative(notNational(300km)Regional(30km))
economy=growing(notGlobal(10000km)Buildingpart(1m))
technique=specialising(District(1km)notNeighbourhood(300m)notSuperelement(100mm))
ecology=diversifying(District(1km)notNeighbourhood(300m))
mass=concentrating(Regional(30km)notSubregional(10km),Town(3km),notDistrict(1km),Neighbourhood(300m))
frameobject(District(1km))
grainobject(Buildingcomplex(30m))
impactmanagement(Regional(30km),Neighbourhood(300m),Buildingcomplex(30m),Building(10m),Buildingpart(1m))

impactculture(Town(3km),Neighbourhood(300m),Buildingpart(1m))
impacteconomy(Town(3km))
impacttechnique(District(1km),Neighbourhood(300m))
impactecology(Regional(30km),Neighbourhood(300m),Ensemble(100m),Buildingcomplex(30m),Building(10m))
impactmass(Building(10m))
programmemanagement(Town(3km))
programmeculture(District(1km),Building(10m))
programmeeconomy(Regional(30km),District(1km),Building(10m))
programmetechnique(Subregional(10km),Town(3km))
programmeecology(Global(10000km),Town(3km))
programmemass(Town(3km),Neighbourhood(300m),Ensemble(100m))
.....

8.6.3 Planning horizon and changing perspective

The perspective determines the manner in which one guesses effects, and this perspective changes in a rather unpredictable way, for example, at national level, as follows,:

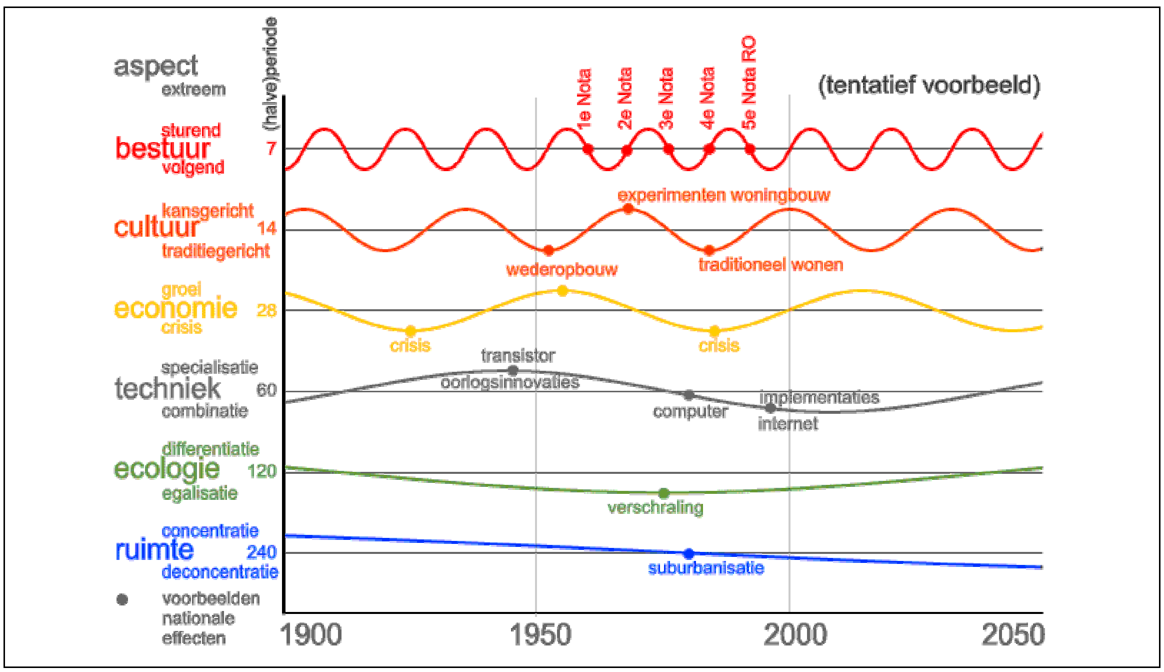


Fig. 832 *Changing perspective*

The predictability decreases with increasing periodicity (in an upward direction).

8.6.4 Geographical and historical variation in context.

Fig. 833 represent the same sorts of outside spaces in Venice, and are on the same scale as a ArchitectenCie's design for the harbour island in IJburg Amsterdam. The extent to which the geographical and historical context can determine the outcome is obvious from this. From these images, the potential of exposure of stone to water also becomes evident, and the significance of the margin between built-up and vacant areas.

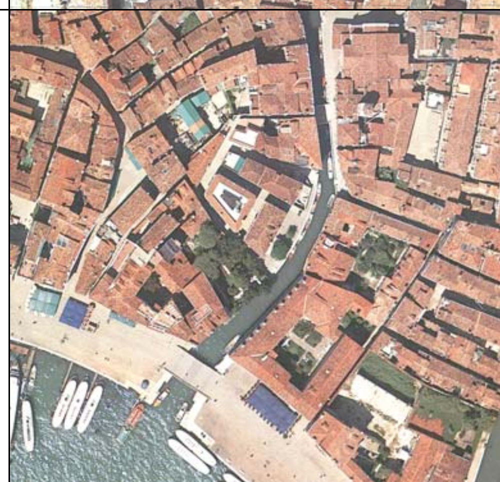
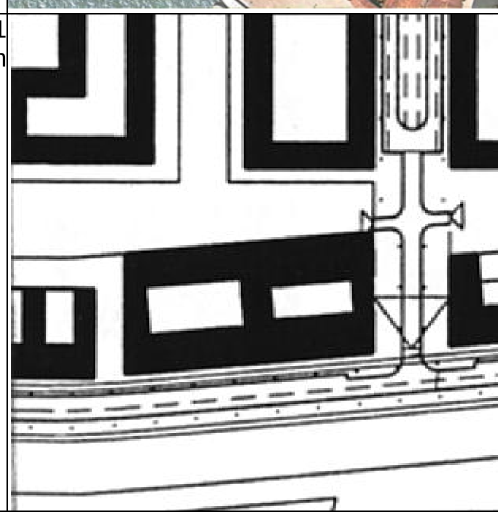
	Venice 1 x 2 km		Venice 200 x 200m radius 100m < canals every 100m < ⊥ streets every 30m < opened up internally by inner streets < occasionally with front to the water
Novelli (1989)			Venice 200 x 200m < interior < line of sight over the water < concave avenue
	IJburg 1 x 2 km		IJburg early design Harbour island 200 x 200m the same scale < interior < line of sight < more room to see < greater margin < convex avenue

Fig. 833 *Geographical variation of conceptions*

The above examples illustrate how important the margin is between built-up and vacant areas, and how much potential this margin has for a coherent urban image. Vertical segmentation on the façade surface gives motives for placing greenery, lighting, street furniture, pedestrian crossings and possibilities for interaction with adjoining water. In this way, public space is segmented by the façade in a manner that everyone understands. A number of examples are given below of this type of margin and the possibility for differentiating the outside space in relation to this with green and blue.

8.6.5 Relief between built-up and vacant areas

An urban architectural plan can be given shape starting from either the inside or the outside space.

At the buildings level, the first principle starting with the outside is geared towards large, detached constructions that are expressive on all sides. Within this, as many external functions as possible (parking, traffic, light, air, greenery) are internalised. This leads to a relatively large outside area and so to large façades. Walled-in feelings are compensated by windows overlooking vacant and empty spaces, courtyards or inner squares within 10 metres from each room.
Reasoned from inside outwards, a possible break in the building line is made in the form of ‘cold extensions’ such as platforms, balconies, galleries and oriels (‘external margin’ extensions) that leave the façade surface with a sudden jump in temperature (the skin) as undisturbed as possible. This is in turn, in itself, favourable for restricting the outside surface, although every extension also causes cold transition areas.

In contrast, the second principle in the same scale tends towards the externalisation of functions, towards buildings that are less independent within themselves and with internal breaks in the building line (building backwards into an ‘internal margin’). By doing this, the outside space gains more protected and covered external spaces such as inner corners, porches, arcades and walled-in balconies.

A systematic combination of both gives the façade a horizontal and/or vertical relief:

Horizontal relief	small space	large space	*vertical relief*	traffic space	lodging space
top floor	recessing	extending			
intermediate floors	extending	recessing	corner	recessing	extending
ground floor	recessing	extending	flank	extending	recessing

Fig. 834 *Horizontal and vertical relief*

Systematically building recesses, setting the building back in an internal margin in a horizontal relief is appropriate mainly for the ground floor, at the level of public use, and – because of exposure to the sun – on the top floor. Building outwards can easily take place where there is unused space, so on the intermediate floors. Put the opposite way: platforms, ramps and extensions on the ground floor, recessed floors and overhangs on the top floor or roof (Wright effect), lends itself more to special locations and to large outside spaces.These accentuate the contours of the building.

To achieve a vertical relief in the façade, one can choose to recess the corners and extend on the sides of the building (for example, at the entrances to the building), extending both over the floors, or one can choose for the reverse: fortress-like extensions at the corners and recesses in the sides of the ground plan. The latter is less suitable because of traffic considerations and lends itself to special situations such as car-free streets.
Where there is increasing non-systematic variation in recessing and extending, the sculptural effect increases at first, but then it decreases again because of fragmentation. By, introducing a pattern on the smallest scale (internal or external balconies), from a distance, the façade gains a structural effect.

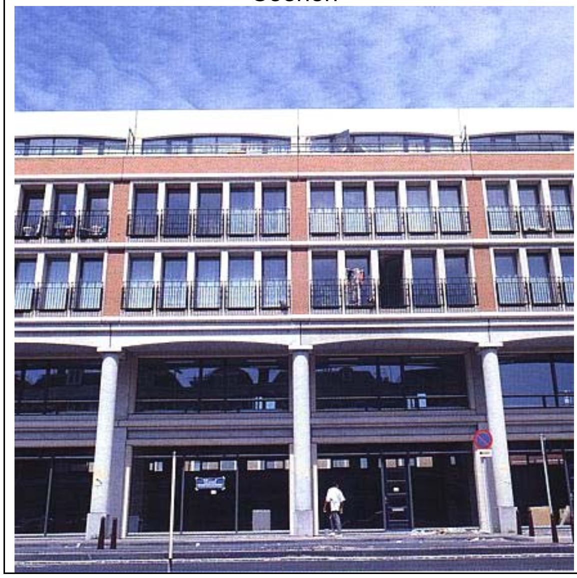
One can leave these choices entirely to the architect or, from the beginning, link it to the context in order to ‘add luster’ to a special location. By doing this, an urban architectural ensemble (street, square, building complex in a radius of approx. 100 m) becomes more recognisable as an entity, compared with other ensembles. After all, such choices have a greater effect if they are repeated between the buildings themselves. For example, recessed corners of blocks of buildings (see Cerda’s Barcelona) only create a broadening urban architectural image if the same principles are used in the next and/or opposite block, also if the symmetry in which this occurs is incomplete.

Old
Boven, Freijser et al. (1997)

15% horizontal extension
on the 1st floor

Wils
Boven, Freijser et al. (1997) page 65

30% horizontal recess on the first floor 1[e]
40% horizontal extension on the ground floor.

Coenen	Mecanoo
	

Boven, Freijser et al. (1997)

Fig. 835 *Examples of horizontal relief*

recessed corner	*extended flank*
Lourijsen 	Brandes 
De Bazel  Greiner 	Brandes 

	< Atelier PRO extension on the corner and flank		< Wils extension on the corner, recess in the flank

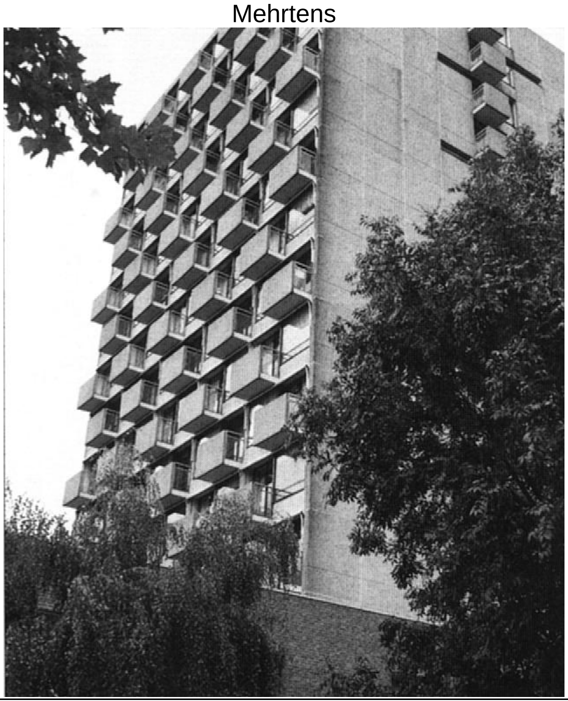
Boven, Freijser et al. (1997)

Fig. 836 *Examples of vertical relief*

Loerakker

Van Herk

Mehrtens



Benthem en Crouwel

Boven, Freijser et al. (1997)

Fig. 837 *Examples of combinations of horizontal and vertical relief*

8.6.6 Interaction with exterior spaces

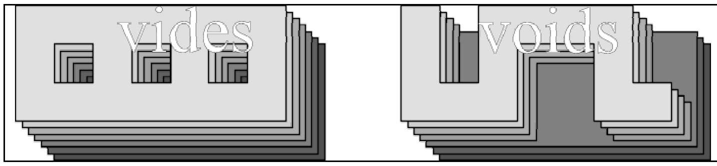
When one lets such choices depend more on the context at a higher scale level, that requires an urban architectural typology of location variants in a broader context. One can then look for the context on the district level (1km◎) up to the European level (3000km◎).
The larger the context in which the location variants of open spaces and especially open water occur, the more scarce and thus the more precious they are. That applies to the corners of an island such as the south-west corner of the Harbour Island (Haveneiland) in IJburg, but also for IJburg as the inner corner of the IJsselmeer, or for Amsterdam as a corner of Europe, where lines from south and east converge on sea- and airports. One can leave such location factors for what they are, but one can also exploit them urban architecturally, and cash in on their scarcity.

In an age in which residents bring ideas back home with them from holidays spent in all parts of the world, reminders of Venice or St. Petersburg can also play a role, but by careful interpretation, optimalisation, transformation and realisation, these must be adapted in such a way that they become rare in their own right. To what extent can the combinations that have come about in Venice, be used as a model for those in Amsterdam, and to what extent are they divorced from our time or place?

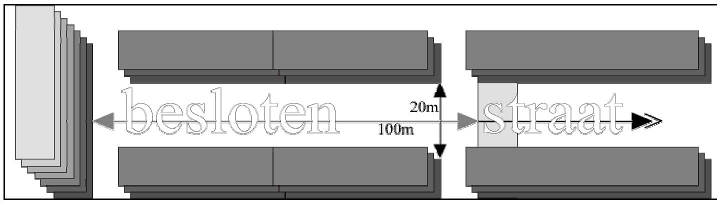
The effect of the outside space on the margin, and *vice versa*, is also connected here with climate (for example, with the amounts of sun and wind) and orientation (their direction), but, in particular, it is connected with the size of the open space along which the margins lie and the extent to which they are enclosed. Spaces that are totally, or for the most part, enclosed horizontally, such as empty spaces and voids (up to a breadth of 20m), courtyards and inner squares (20m or more in breadth) offer, in each case, another context for designing the margin. In the last two, it makes rather a lot of difference whether these are part of the through-traffic structure (outside courtyards and squares) or not (inner courtyards and squares).

Relief that has a rather small depth can, nevertheless, greatly influence the appearance of streets, as we know from experience in existing districts where plastic window-frames that have been moved to the façade surface interfere with the recognisability of the street.

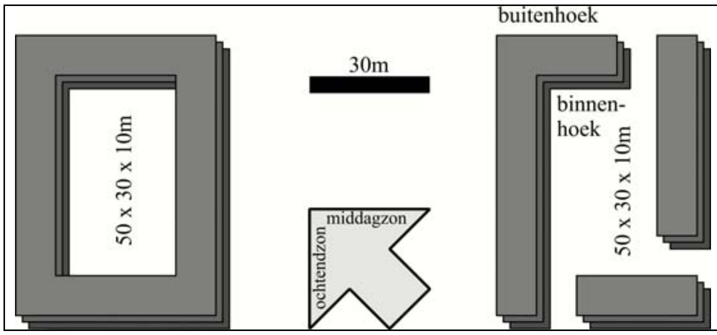
The frequency of the relief is related to the length and height of the façade. The minimal frequency is 0. A small frequency is once per façade (e.g.once vertically between two side streets or once horizontally between the lowest and highest floors). Each frequency larger than that gives a more unrestful image and, in special cases, may be accepted or even requested.



incorporated up to 30 metres in a building
empty spaces
voids

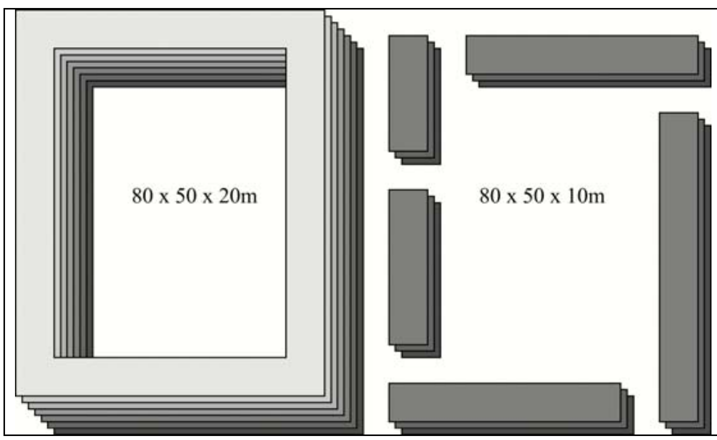


length smaller than 5 times the breadth: enclosed, otherwise through-going spaces: passages, streets, avenues



up to 30m in breadth

interior courtyards, small inner squares
exterior courtyards and small outer squares



meer dan 30m more than 30m

courtyards, inner squares
courtyards, outer squares

with less than 50% road surface: courtyard, otherwise a square

Fig. 838 *Outside spaces*

Squares

 market square for animals (Beestenmarkt) in Delft approx. 40 x 50m	 Main market square (Grote Markt), Haarlem	 Mercator Square (Mercatorplein), Amsterdam approx. 80 x 140m

MARGINS IN COURTYARDS AND STREETS

 Gouda Abken BV, approx. 20m	P.M. Schiedam by Van de Seyp and Van Dijk, approx. 10m

Recesses and extensions of different breadths.

 **EDE BRAUWERE**	 Rotterdam Crooswijk Malschaert
Small outside space with continual horizontal relief; large outside space with vertical relief every 80m.	

Fig. 839 *Squares and margins*

8.6.7 An academic example of working out façade relief in accordance with urban architectural rules.

The rules given here only apply to building lines (alignments) and façades. A distinction is made between ground-floor façades (BG), intermediary floors (TV) and the floor directly under the roof (DV).

1. The building lines are the outside boundary of the façade surface, unless it is established in the following rules that at a particular depth, over a certain area, and at a certain frequency, it is permitted to extend and/or recess a building with respect to the building line.
2. The particular characteristic of the planning area within a town is ‘powerful and urban’. This leads to the general rule that deviations from the building line should strengthen the vertical character of the buildings and, with a view to this, must extend above each other over a number of floors.
3. Acceptability and the desirability of having differences between the façade surface and the building line is established by four fixed characteristics of the urban architectural plan. These are:

   a. the position of the building with respect to water;
   b. the position of the building within the urban district;
   c. the position of the façade with respect to the public space that borders it;
   d. the position of the façade with respect to the sun.

Each of these characteristics leads to a series of different public spaces. Each series is divided into a series of types (rules 5-8). For each of the four characteristics in each series a general rule is given (rules 8-12).

5. Water in the planning area is divided into four types on the basis of breadth, as follows:

W1 >100m	: external water
W2 50-100m	: internal water
W3 25-50m	: waterways
W4 <25m	: canals

6. The planning area is divided on the basis of centrality in three types of urban area, as follows:

IJ1	centre, up to 300m from the southernmost point of the harbour
IJ2	central area, 300-1000m around the centre
IJ3	periphery, urban areas around the central area

7. Public space in the planning area is divided into ten types, grouped into streets (S), squares (P) and courtyards (H), as follows:

S1	1>10 b, where b is 24–48m: main street
S2	1>10b, where b is 12–24m: street
S3	1> 5b, where b is 4–12m : lane
S4	1> 5b, where b is <4m : passage
P1	built-up on one side, remaining sides W or S
P2	built-up on two sides, remaining sides W or S
P3	built-up on three sides, remaining sides W or S
P4	built-up on all four sides.
H3	built-up on three sides, remaining side W
H4	built-up on all four sides.

8. The façades are divided according to their position in relation to the sun’s orbit (Z), by the hours of the day, as follows:

Z1	0–6 hrs	: night façade (N–E)
Z2	6–12 hrs	: morning façade (S–E)
Z3	12–18 hrs	: afternoon façade (S–W)
Z4	18–24 hrs	: evening façade (N–W)

9. Because of traffic, the corners between S1 and S2 are recessed from the corner to 3m. All the other corners are built along the building line to at least 5m from the corner. The rules below only apply then to the remaining surface of the façade.

10. The general rule for recessed building surfaces with respect to the building line in connection with their location with respect to the sun's orbit is that the less exposure to the sun, the smaller the percentage of the façade surface that is allowed to deviate from the alignment of the building. For Z1, the desired deviation from the remaining façade surfaces according to rule 10 is 20%, for Z2 this is 40%, for Z3 60%, and for Z4 80%.

11. The general rule for the depth of the recess with respect to the alignment of the building in connection with location by water and public space is that from at least 1% of the bordering public space in the south-west of the planning area (*luw*) to at least 5% of it in the north-east of the planning area (*ruw*) are recessed inside the building alignment.

12. The general rule for the frequency of recessing with respect to the building alignment is that the nearer one comes to the centre, the 'liveliness' of the façade increases. In the connection with the above sentence, the frequency with which recessing occurs amounts to a maximum of 3 times for each 100m of building alignment on the north-west side to at least 9 times for each 100m of building alignment on the south-east side.

8.6.8 References to The level of scale

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8.7 Legends for design

8.7.1 Resolution and tolerance

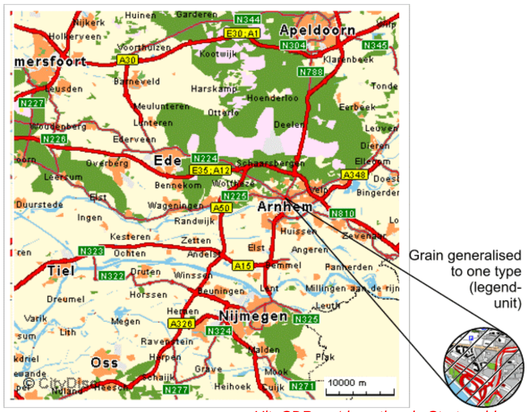
The legend is the vocabulary of design. A legend unit is a type and any legend is a result of (sometimes hidden) typology (for example living, working, recreating, travelling in CIAM's functional typology). According to Jong and Engel (2002) typology in design study is not the same as top-down categorizing in empirical research. A type is not a category, a model or a concept but the raw material for design. A type has to be designed to become a model, a design that can be realised. Types are chosen because of their potential for design. They seldom lack aspects of form. So, a design legend often can not be explained by words.

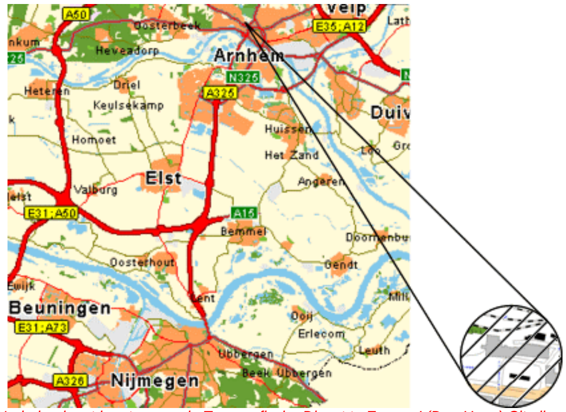
That is why design sometimes begins with a collage assembling reference images into a larger composition (collage, montage). In that case the reference images are the legend, sometimes even summarised and explained apart from the composition. The reference images should not be token litterally then, but interpreted as general types. In a later stage the composition becomes a realisable design and the legend transforms in homogeneous lines or surfaces indicated by form or colour. Their external form in the drawing is its smallest detail, its 'grain', supposed to be homogeneous inside. Compared with the measure of the composition as a whole ('frame') the grain determines the resolution of the drawing. The measure in reality of frame and grain could be expressed in their rough radius R={…1,3,10,30,100m….} and r={…1,3,10,30,100mm….}. So, a resolution r/R=0.1 may concern a sketch, r/R=0.01 a drawing, r/R=0.001 a very precise blue print.

Apart from the concept of *resolution* you have to consider the *tolerance* of a drawing. For example, if in an early stage of design you sketch a line indicating a road your intention is an approximate location, though it may be drawn in high resolution. Discussing the drawing with parties concerned a tolerance of 10m from the core of the line may be supposed. A drawing entails often different tolerances. The existing objects you want to keep in the design could be drawn with a small tolerance. Their exact location is determined. However, the designed lines start with a large tolerance and in the course of the design process their location is more and more precise; the tolerance decreases. If you draw the existing objects by narrow lines and the designed objects by thick lines your most important message comes to the fore best, while the objects everybody knows already shift to the background.

8.7.2 Scale-sensitivity

Your legend is scale sensitive. For example, using the CIAM typology of living, working, recreating and travelling for a regional sketch (R=30km and r=3km) tacitly supposes design decisions like dividing living, working and recreational areas concentrated within a radius of 3km. However, using it for a district sketch (R=1km, r=100m) hides other design suppositions[207]. So, frame and grain (scale) determine the meaning of your design vocabulary (legend).





Uit: CDRom 'de nationale Stratengids van Nederland met kaarten van de Topografische Dienst te Emmen' (Den Haag) Citydisc

Fig. 840 *The region Veluwe-Arnhem-Nijmegen 60x60km*
The radius of its grain is R=300m in reality; on scale 1:25 000 it is r=1.2cm

Fig. 841 *The sub-region Arnhem-Nijmegen 20x20km*
The radius of its grain is R=100m in reality: on scale 1:10 000 it is r=1cm

In Fig. 840 the radius of the smallest legend unit (grain) covers 1% of the radius of the whole map (300m) and a surface of approximately 30ha. So, it is not a rough sketch or precise blue print, but a drawing. Fig. 841 is a drawing as well, but with a smaller frame and grain. In both representations the legend distinguishes built-up area, forest, heathland, agriculture, water and highways. What kind of legends you would choose planning the area? There are infinitly more possibilities than the CIAM legend, topographical and density stereotypes. They all introduce hidden design decisions.
A legend in grain spots of the same surface makes the produced map countable as a surface programme. Such quantity and surface sensible spots can be grouped together into larger surfaces or subdivided into 10 smaller spots each, increasing resolution eventually into that of a photograph at last. However increasing resolution makes the map less accessible for analysis.

8.7.3 Unconventional true scale legend units

Steenbergen and Zeeuw (1995); Steenbergen and Reh (1996); Steenbergen (1999) and Reh discerned principles of landscape design as legend units (types) for the national planning agency of the rural area: urban nodes, rural estates and castles, plantations, landscape theatres and streamlands. In 2003 students tried to find them on a large 1:10 000 map of Fig. 840 (Fig. 843) and glued them as spots of two sizes (300m and 1000m) from Fig. 842.

Grain				Legend				
Radius real	surface real	radius on scale	diameter on scale	Red	Orange	Yellow	Green	Blue
m	ha	cm	cm	meaning				
300	30	1,2	2,4	urban node	rural estate	plantation	landscape theatre	streamland
1000	300	4,0	8,0					

Fig. 842 *Legend-units landscaping r={300m,1000m} in a frame R=30km 1:25 000*

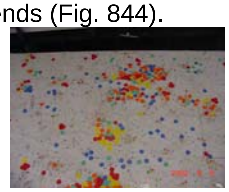
Existing urban nodes, rural estates and castles, plantations, landscape theatres and streamlands in the region of Fig. 840 were glued in grey shade first, planned ones in clear colour later.

Fig. 843 *Students making a map*

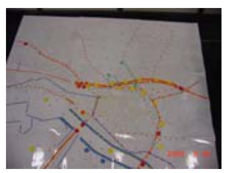
There are many existing r u r a l e s t a t e s and c a s t l e s i n t h a t r e g i o n. V i s t a ' s and other forms of accompanying landscapes were generalised in the glued spot. P l a n t a t i o n s are colonised surfaces by which the programme is put on stage by intended or unintended grid like landscape architecture. They could be found not only in the rural, but also in the urban area, going beyond the stereotypic town-landscape dichotomy. L a n d s c a p e t h e a t r e s are recognisable natural, agricultural or urban systems of views and routes by which the physical, biological or cultural origin of the landscape could be experienced. S t r e a m l a n d s are locations where the dynamics of natural or urban life can be experienced.

On every level of scale (R={30km, 10km, 3km, 1km, 300m, 100m}) such maps were made with shifting unconventional legends (Fig. 844).

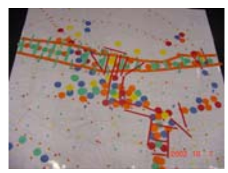
week 1 30km Landscape



week 2 10km Town and traffic



week 5 1km Infrastructure



week 6 300m Physics and soil

week 7 100m Materialisation

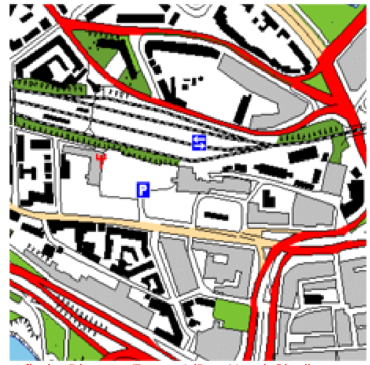
Fig. 844 *Exercises BkM1U 06 2002*

To indicate traffic in a frame R=10km (Fig. 841) spots of Fig. 845 were used.

Grain				Legend for a regular Monday				
Radius real	surface real	radius on scale	diameter on scale	Red: people average per hour using a station or motorway exit	Orange: people living at home	Yellow: people working	Green: people recreating	Blue: people caring or studying nature
m	ha	cm	cm					
100	3	1,0	2,0	100	1000	500	<100	<10
300	30	3,0	6,0	1000	10 000	5000	<1000	<100

Fig. 845 *Legend-units town and traffic r={100m, 300m} in a frame R=10km, 1:10 000*

Infrastructure was studied in a frame of R=1km, physics and soil in a frame of 300m.



Uit: CDRom 'de nationale Stratengids van Nederland met kaarten van de Topografische Dienst te Emmen' (Den Haag) Citydisc

Fig. 846 *The town of Arnhem 6x6km. The radius of its grain meets R=30m in reality; r=1.2cm on scale 1:2 500*

Fig. 847 *The railway station neighbourhood 600x600m of Arnhem The grain is R=3m in reality, 1,2cm on scale 1:250*

Existing and planned infrastructure was studied in spots of investment according to Fig. 848.

Grain				Legend				
Radius real	surface real	radius on scale	diameter on scale	Red investment crossing	Orange investment trace	Yellow investment multiple land use	Green investment milieu	Blue investment waterworks
m	m^2	cm	cm	meaning				
10	300	1.0	2.0	€ 10 mln	€ 10 mln	€ 10 mln	€ 10 mln	€ 10 mln
30	3000	3.0	6.0	€ 100 mln	€ 100 mln	€ 100 mln	€ 100 mln	€ 100 mln

Fig. 848 *Legend-units infrastructure r={10m, 30m} in a frame R=1km, 1:1000*

Physics and soil was studied by problem and opportunity spotting according to Fig. 849.

Grain				Legend				
Radius real	surface real	radius on scale	diameter on scale	Red	Orange	Yellow	Green	Blue
m	m^2	cm	cm	meaning				
3	30	1.2	2,4					
first: problems				Safety	Noise	Light (sun/ artificial)	Ecotope	Wind
then: opportunities								
10	300	4.0	8,0					

Fig. 849 *Legend-units physics and soil R={3m, 10m} in a frame R=300m, 1:250*

Creative design starts with doubting its most self evident supposition: its vocabulary.

8.7.4 References on Legends for design

Jong, T. M. d. and H. Engel (2002) Typological research in: T. M. d. Jong and D. J. H. v. d. Voordt <u>Ways to research and study urban, architectural and technical design</u> (Delft) DUP

Steenbergen, C. and W. Reh (1996) Architecture landscape . The design experiment of the great european gardens and landscapes (Bussum) Thoth ISBN 9068681605.
Steenbergen, C. and P. d. Zeeuw (1995) Landschapsarchitectuur van de stad (Delft) TU-Delft BK Publicatiebureau.
Steenbergen, C. M. (1999) Architectuur en Landschap. De techniek van de rationele, formele en picturale enscenering. (Delft) DUP.

8.8 Boundaries of imagination

Creativity means leaving out at least one self evident tacit supposition. We found a systematic way to examine *hidden presuppositions* in science and technology. We provisionally call it '*conditional analysis*' and use it in ecology, design, education and in making computer programs. It has more to do with possibilities than with probabilities or necessities[a]. It gives some insight in the boundaries of imagination and thus design.

It is based on the simple comparison[b] of two concepts A and B, putting the question 'could you imagine A without B?' and the reverse question. Temporarily we take in consideration only the pairs of concepts that make possible a different answer on both questions.
As soon as we can imagine A without B but B not without A we call A a (semantic) condition for B. As soon as we find a concept C that we cannot imagine without B but B without C we can, we have semantically a '*conditional range*' of concepts ABC out of which the hypothesis emerges that we cannot imagine C without A, but in the reverse we can. Though introspective, these comparisons turned out to give consensus based on a possibility of falsification[c].

Let us for instance conditionally compare the ecological concepts *Abiotic*, *Biotic* and *Cultural* phenomena (A, B and C). I cannot imagine cultural phenomena without biotic (because culture presupposes at any time living people and functioning brains), but biotic phenomena without cultural I can (for instance plants[d]). I cannot imagine biotic phenomena without abiotic phenomena, but abiotic phenomena without biotic I can (for instance light, air, water, soil). So the hypotheses to be controlled are: 'I cannot imagine cultural phenomena without abiotic phenomena, but abiotic phenomena without cultural I can.'. If we confirm that hypotheses we can draw a conditional scheme like this:

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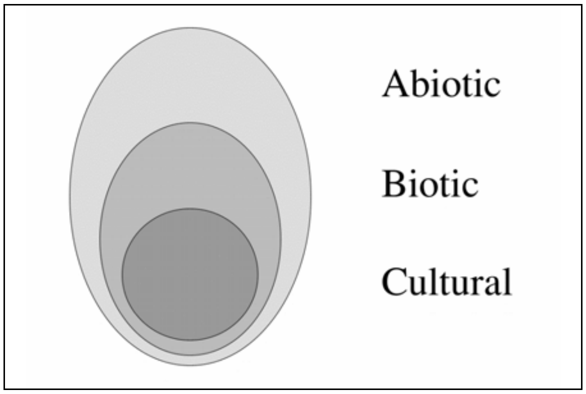
[a] Some presuppositions of normal logic lack that seem to stagnate the development of drawing theory, design theory and ecological theory. Though we, Jong, T. M. d. (2002) Verbal models in: T. M. d. Jong and D. J. H. v. d. Voordt Ways to research and study architectural, urban and technical design (Delft) Faculteit Bouwkunde TUD did not examine it thouroughly, semantic conditions may be tacitly presupposed in normal logic. To formulate the function of a logical operator 'o', you first need to test the truth-value of 'PoQ' in four conditions (if P is true and Q is true, if P is true and Q is false, if P is false and Q is true, if P is false and Q is false). That conditional if..than.. test cannot be performed by the conditional operators ($\Rightarrow$, $\Leftarrow$ and $\Leftrightarrow$) to be defined by the truth-table itself. What kind of conditional comparisons are they than if they are tacitly supposed in formulating these well-known conditionals? Conditional analysis may also shed some light on the hidden propositions in the terminology 'true' and 'false' and the hidden propositions concerning restrictions on space and time in logical reasoning. For instance, the expression 'It rains and it rains not' is true on world-scale, but forbidden in formal logic as a contradiction. So the hidden supposition of formal logic must be that only local events could be logically expressed. A drawing containing different locations cannot be logic in this way.

[b] The expression 'comparison' is used here in an unusually broader sense than in formal logic or mathematics, but until now seemed to be correctly understood without explanation.

[c] Including the comparisons needed for the hypothesis, we needed 6 comparisons to make a conditional sequence of three concepts. The fourth one will need another 6 comparisons, the fifth another 8. We compared appoximately 200 crucial concepts in science and technology like 'set', 'pattern', 'structure', 'function' and the like (note 6). That required 39800 comparisons and resulted in a samantically conditional sequence of these concepts with one single condition at the beginning.

[d] This already says something about my preconception about culture: 'a plant has no culture'. Though the concept of culture is not yet defined by this operation, it is in any case 'placed' and the boundaries of many possible definitions are set.



Jong (1972)

Fig. 850 *The ABC model*

It seems to be a *Venn diagram* out of set-theory. But it is not, because set-theory presupposes more than the concept of presupposition itself. It presupposes for example the concept of 'element' and any equality of the elements (according to the criterion of the set). Jong (1992) supposes less.

A *semantic Venn diagram* does not yet need these and perhaps other presuppositions. The drawn borders are no inward formulated borders of sets and elements, but outward boundaries of eventually vague and continuous conception.

The *ABC model* represents phenomena outside culture, but is itself a concept and thus culture.

This raises the philosophical question whether there is any difference between '*preconception*' (*presupposition*, *assumption*) and '*precondition*' (*prerequisite*) at all. The environmental crisis taught us however that there appeared preconditions for life we did not preconceive beforehand. We consider '*environment*' in an ecological sense as the set of conditions for life, known or yet unknown.

8.8.1 Anthropocentric and ecocentric thinking

Let us now try to draw two very different ecological presuppositions that have a direct influence on the way people design a landscape or townscape: 'Man is part of nature' and 'Nature is only a human concept' *ecocentrism* and *anthropocentrism*).

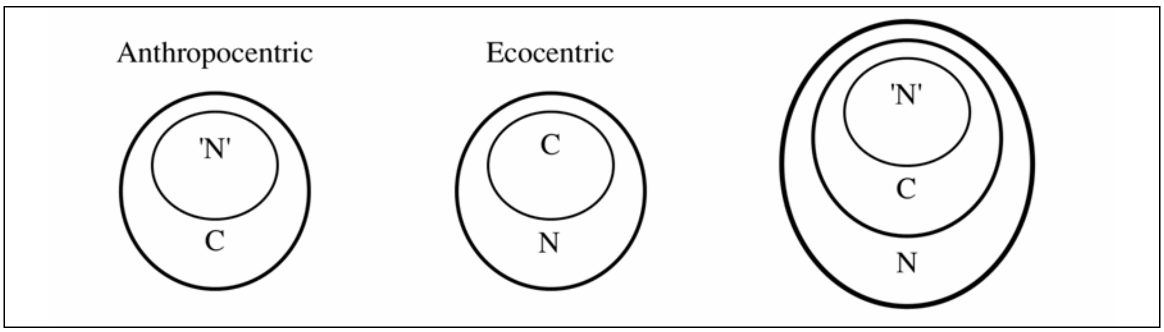


Fig. 851 *Presuppositions about the relation between culture and nature*

Both suppositions contain a paradox. The anthropocentric way of thinking would imply that physics and biology ('N') cannot find anything new from experiment or observation that is not already included in the existing set of concepts (C) or its combinations[a] (idealistic position). Wittgenstein (1919, 1959; Wittgenstein (1963; Wittgenstein and Hermans (1986) said: 'The boundaries of our world are the boundaries of our language.', and: ‘About which you cannot speak you have to be silent.’ It was a reason to suspect him of mysticism.
The ecocentric view however would imply that we cannot communicate such observations. To take these observations serious, we have to regard them as a not yet cultural part of the natural world N (materialistic position).

Let us now consider culture (C) as an intermediate between the picture ('N') and the portrayed in the natural world (N). Wittgenstein supposes that the picture and and the portrayed have their 'logical form' in common. Formal logic however cannot cope with expressions like exclamations, questions, proposals (like designs) and orders: they have no logical form. That is what occupied the later *Wittgenstein (1953)*. In my opinion these linguistic expressions are the very solution to the paradox of ecocentric thinking. Questions are the definition of an emptiness at the boundaries of knowledge, proposals and designs are excursions in an unknown, but nevertheless imaginable and perhaps possible future world.

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a. Synthetic judgements a priori of Kant, I. (1976) Kritik der reinen Vernunft (Frankfurt am Main) Suhrkamp Verlag. .

This brings me to a specification of culture, creativity, science and art. *Culture* is the set of preconceptions in communication. Suppose we had to explicate all presuppositions of our communication before we could start with it, in that case we would seldom have time to communicate[a]. Fortunately we don't have to explicate every time all these preconceptions, we simply take them for granted and call them culture. That is easy, but it also keeps 'self-evident' concepts out of discussion. *Creativity* just starts with disclaiming these apparently self-evident preconceptions, *science* starts with doubting them.
Art is a ripple at the outside boundary of culture denying conventional and adding unconventional presuppositions by poièsis[b]. We need art or technique to make new concepts outside conventional language. Science on itself does not provide that.

8.8.2 Possible futures

Probable ecological, economical and cultural *futures* are gloomy from a viewpoint of inevitable environmental developments. But are the probable futures the only ones that we have to take in consideration? *Empirical research* is limited to the probable futures. Design, or technical research is limited to the broader set of possible ones.
I cannot imagine the probable without the possible. The reverse I can.
What is probable must be by definition possible.

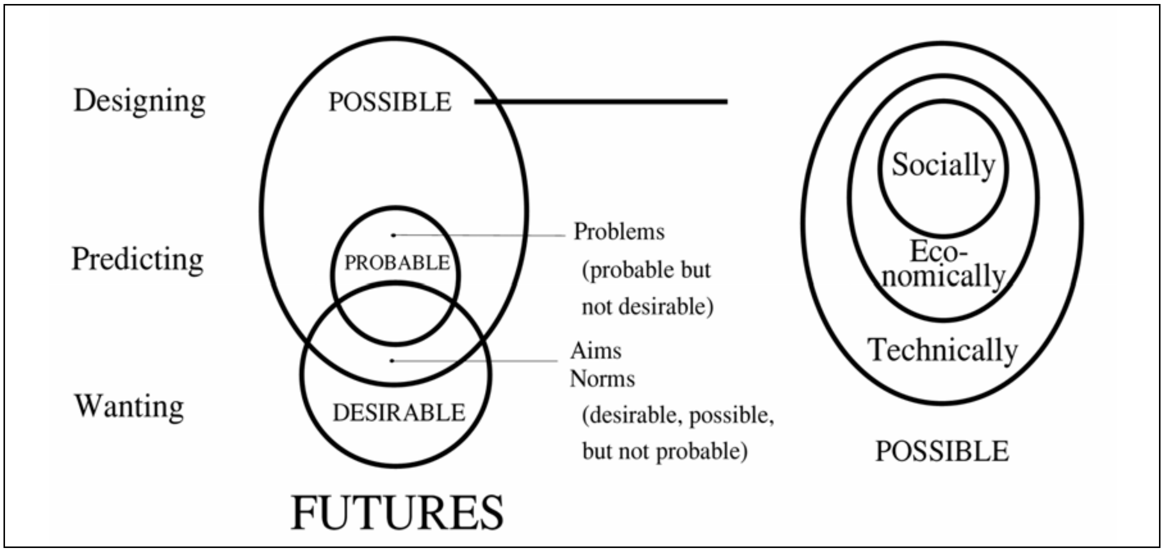


Fig. 852 The modality of the possible

Predicting probable futures requires causal thinking on an empirical basis. We cannot predict possible futures as far as they are not probable: we have to design them. They are invisible for probability-calculations. They are fundamentally ab-normal, outside the 95%-area of probability. Designs cannot be calculated or predicted. If so, they would no longer be designs. Design produces possibilities, conditions, freedom of choice, difference.

Every line a designer draws is a precondition for further drawing, but not a cause for the rest of the design process. In the same way the performance of the resulting building, the behaviour of its inhabitants, is not caused or even necessarily aimed by the designer, but only made possible in a universum of possibilities opened by the design. Every line a computerprogrammer writes is a condition for the rest of the program, but not the cause of its performance. On the other hand one single missing line can 'ceteris paribus' be called the 'cause' of its break-down. In the same way global life has no single cause, but many conditions of which lacking one on a single place and moment can

a. 'Suppose we are human, suppose we use a language, suppose we understand the same things using the same words, suppose this building does not pour down, suppose you don't kill me for the things I say etceteras etcetera . . . than we could have a conference, shall we have a conference?'
b. ποιησισ, manufacture, construction

indeed cause the death of an individual. Special conditions of sunlight, moist and minerals do not cause special life-forms (let alone that they can be aimed by norms of sunlight, moist and minerals per location), they only make different life-forms possible. The relation conditional <> causal has its analogies in the dualities possible <> probable, designing <> predicting, means-directed <> aim-directed, and probably ecocentric <> antropocentric.
What kind of thinking do we need for design study?

8.8.3 Causal and conditional thinking

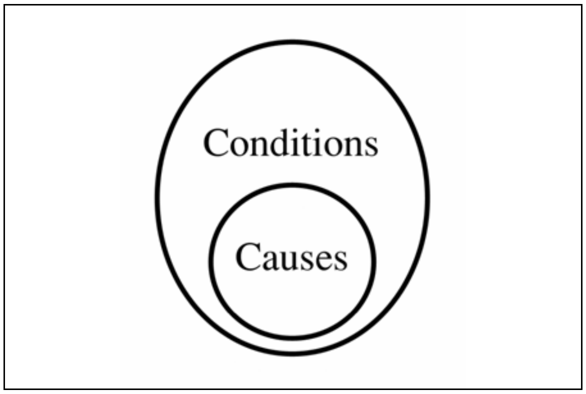


Fig. 853 *Causes under conditions*

I cannot imagine causes without conditions, the reverse I can. We have to make a step back from *causal thinking* about probabilities into the broader area of *conditional thinking* about possibilities.
Every cause is a condition for anything to happen, but not every *condition* is also a *cause*. The foundation of a house may be a precondition but not a cause of its existence. Causal thinking is conditional thinking, but conditional thinking is not always causal.
Suppose we read in the paper: 'The crash of the cars was caused because one of the drivers lost control of his wheel.' That sounds plausible until an extraterrestrial descends, saying: 'Nonsense, the collision was caused by two objects approaching eachother with great speed.'

If he is right, the paper is wrong, because if the cars would not have been approaching eachother and one of the drivers would have lost control there would have been no collision. So it is only a cause under the tacit precondition of approaching cars. Every causal conclusion is based on innumerable tacit conditions called '*ceteris paribus* presuppositions'.

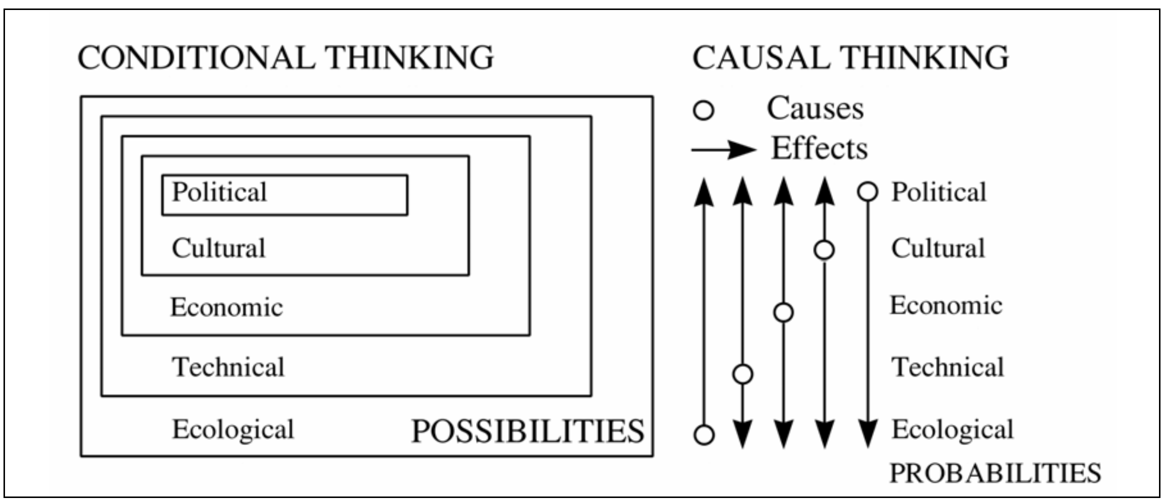


Fig. 854 *Conditional thinking as a ceteris paribus environment of causal thinking*

I cannot imagine *social possibilities* without any *economical conditions*. The reverse I can.
I cannot imagine *economical possibilities* without *technical conditions*. The reverse I can.
This gives a semantic conditional sequence of possibilities. In stable technical conditions economical initiatives can cause technical or social change. But when the dikes burst the technical 'ceteris paribus' for economical determinism are lacking.
The ceteris-paribus presuppositions of causal explanations also change on different levels in time. That means changing causal explanantion. They also can be changed by design forcing shifting explanation about the effects. Innovative design implies removing some preconditions and making new ones. Design makes *ceteris **non** paribus*.

Innovative design implicates always removing suppressed conditions and making new ones. Loose from that conditions change in different wave-lengths:

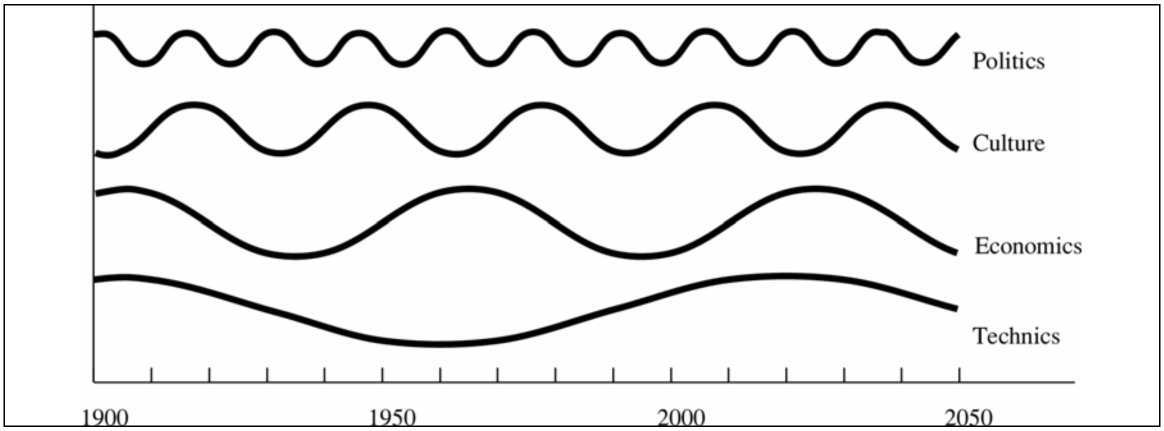


Fig. 855 *Changing conditions for causal thinking.*

Now we can point out a week component in causal thinking. The ceteris-paribus presuppositions of causal explanations change on different levels and can be changed by design ... by us.

Professor Helmar Krupp (1996), former director of the Fraunhofer Institut in Karlsruhe studied physics, pilosophy and sociology. He came to the conclusion that the individual no longer can influence the evolution of society. Society behaves as a system with its own dynamics. Individuals have to submit to this dynamics. In the conference 'The mind of technology', Delft, 27 november 1996, De Jong tried to comfort him by emphasising design. The limitations of research could be broken by design. Probable ecological, economical and cultural futures are gloomy from a viewpoint of inevitable Schumpeter dynamics or Fukuyama-expectations. But are the probable futures the only ones that we have to take in consideration? Empirical research is limited to the probable futures, design, innovation or technical research to the possible ones. And that creates hope.

8.8.4 Design making difference

I cannot imagine a *representation* or *drawing* without indicated differences, an (eventually tacitly presupposed) vocabulary or *legend* (key to symbols). The legend is the vocabulary of the drawing. Only by drawing differences one can make *forms* and only by making different forms one can make *structures*. *Function* presupposes a structure within which the function operates.

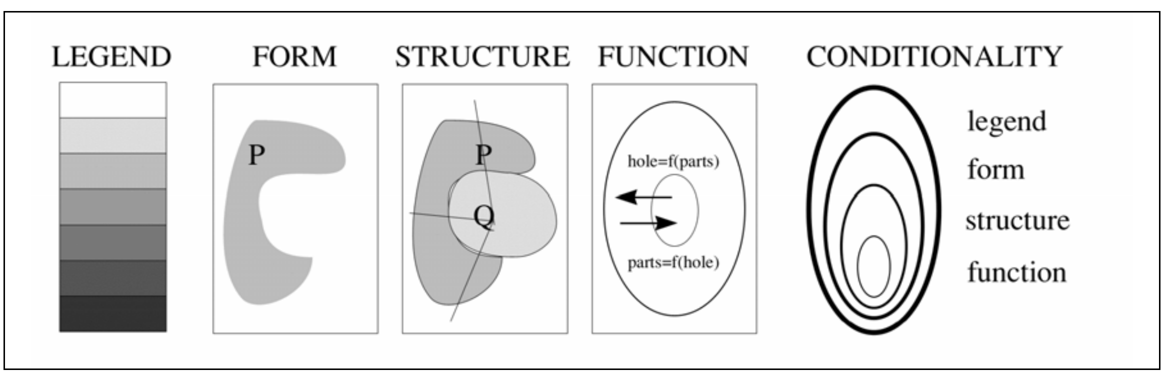


Fig. 856 *The legend and its relation to form, structure and function*

Nevertheless, within one set of forms (for example a box of blocks) you can imagine different ways of connecting them (structures) and within different structures you can imagine different functions. In the reverse the same function often chooses different structures and the same structure is often built in different forms or materials. So where the design process lays the initiative is free. It can be either a causal, *aim-directed* (purposive) process starting with the function (*funcionalist* position) or a conditional, *means-directed* process (*formalist* or *structuralist* position).

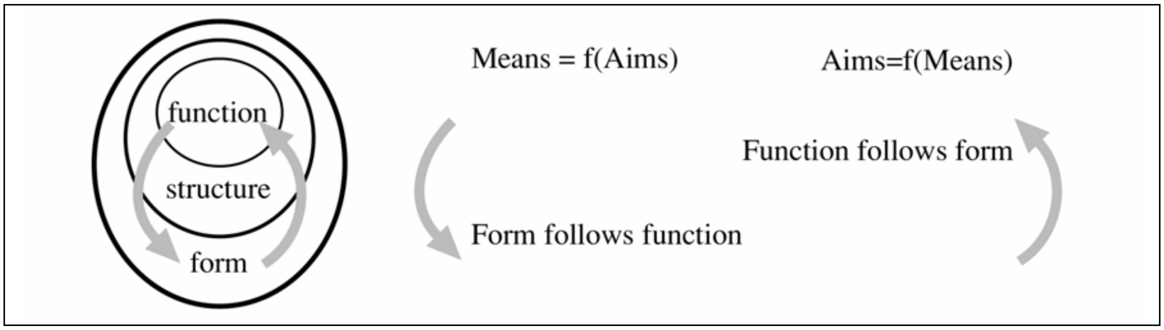


Fig. 857 *Function, form, aims and means*

When the number of *aims* is smaller than the number of *means* you better can use aims as *independent variable* with the means as *dependent variable*. In architecture and certainly urban planning the number of means is smaller than the number of aims. In that case you better can variate the means to see what gives the greatest amount of possibilities for future generations.

8.8.5 Environment, the set of conditions for life

Environment in the technical and ecological sense of Hendriks (1993) is the set of conditions for life. In this definition 'conditions' can be interpreted as ecological, technical, economical, cultural or administrative preconditions. These substitutions result in 5 different usual concepts of 'environment': the administrative environment, the cultural environment etc. The concept 'life' can be substituted in the same sense as 'social life, cultural life, life of men, animals, plants etc, multiplicating the meanings of the concept of 'environment'.

Building is a prerequisite for human and other life. Building and *urbanization* has ecologically more positive effects on the environment than negative. In contrast with other productive branches it produces more 'environment' than it costs. It produces an environment for humans without which they would not survive at the same rate. But it also could produce a better environment for a variety of plants and animals than many places outside the built-up area.

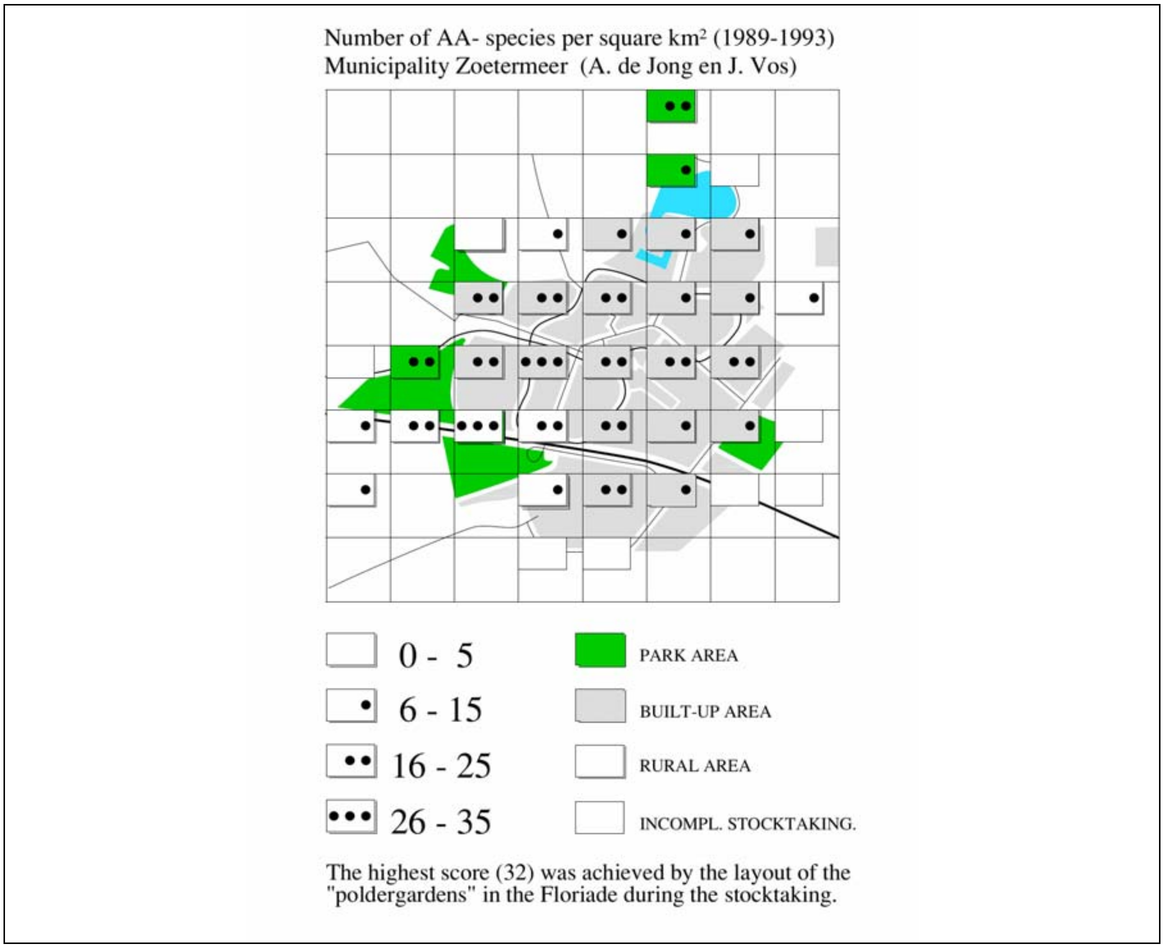


Fig. 858 *Biodiversity in Zoetermeer*

Vos (1993) and Denters, Ruesink et al. (1994) reported that for instance in the Dutch cities Zoetermeer and Amsterdam, you can find 1/3 and 1/2 of the total amount of botanical species in the Netherlands. Within the city of Zoetermeer one square kilometre counts even 350 wild self breeding species outside the gardens. That is 7 times more species than an agricultural square kilometre in the direct surroundings and as much as a square km in the natural environment of natural reserves as the Dutch dunes. Of course we cannot say that the value of an urban ecosystem equals that of the dunes, but we signal a potential that we could improve. To improve the contribution of urban design to the solution of the ecological crisis we have to emphasize more the production of positive effects and its research than the reduction of the smaller negative effects.

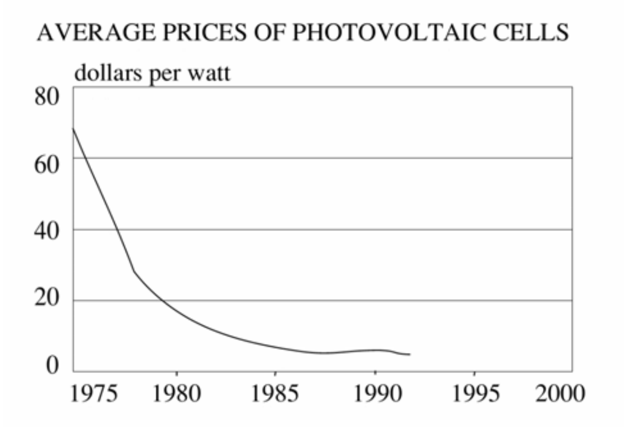


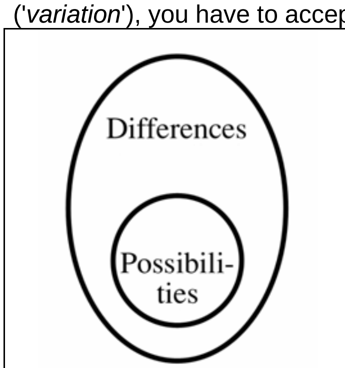
Fig. 859 *The development of photovoltaic cells.*

Let me give another example of environmentally decisive design. The development of *photovoltaic cells* can destroy many gloomy prophecies. The photovoltaic cell deminished a factor 14 in price since 1975; another factor 8 and it outruns the economical efficiency of fossil fuels. The only problem is a cheaper way of slicing sand. The last two centuries technical problems like that never waited longer than 10 years for their solution.

Let's destroy **all** gloomy prophecies by design.

8.8.6 The concept of difference

The very beginning of any range of semantic conditions seems to be '*difference*'. Any concept presupposes 'difference'. Difference on itself cannot be defined because the concept of '*definition*' already presupposes making difference with the rest. But also the concepts of 'making', 'with', 'the', and 'rest' presuppose 'difference'. So in the sentence concerned, 'difference' was already at least five times presupposed! Even the concept of *equality* (as necessarily presupposed in the concepts of 'gathering' and 'counting' and therefore in set-theory and mathematics) presupposes difference. As soon as you accept that there are 'different differences', for instance more or less difference ('*variation*'), you have to accept that equality is a special case of difference.



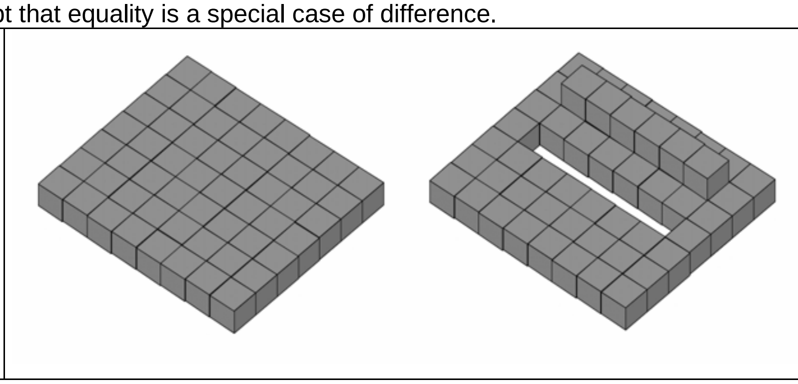


Fig. 860 *Anything differs*

Fig. 861 *Difference makes possible*

According to Fig. 861 there should be a more specific relation between difference and possibility than the conditional one in Fig. 860. However, I did not yet find a more convincing consideration than a picture like Fig. 861.
Yet this question is essential for designers. If after all their profession as producers of possibilities has a specific relation with differentiation, than it has a difficulty with the accepted scientific practice of generalization.

Ashby (1960) and *Leeuwen (1971)* noticed that given a difference you always can imagine more difference, but not always less. The least kind of difference we call equality. Nevertheless, there must be a difference of place or moment left to establish that equality, otherwise the comparison has no sense. So we can draw an important conclusion: equality is a special kind of difference and not the opposite of it.

Many scientists feel uncomfortable with that conclusion because their profession is based on equations that conceive regularities in sets of n>1 'comparable' facts. Designers on the contrary do not, because their profession is based on originality in every single n=1 case. Without that originality their design would not be a design, but a prediction. The very concept '*concept*' presupposes any equality in the observations conceived in the concept, but the concept '*conception*' presupposes something different from earlier observations. Conceptualization always needs a reduction of diversity.

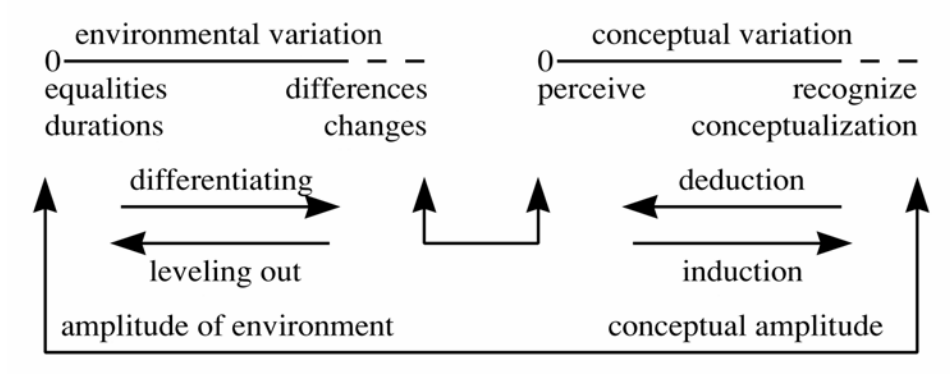


Fig. 862 *Perceiving differences, recognising equaities*

Vision, hearing, smelling, touching all need differences or changes in the environment. As soon as there is some repetition within these perceptions, we 'recognize' it, which is the basis of cognition and conceptualization. (Re)cognition however is only based on similarity, it **reduces** the differences that still can be perceived. So conceptualization changes sometimes chaos in surprize, sometimes surprize in recognition, sometimes recognition in boredom.

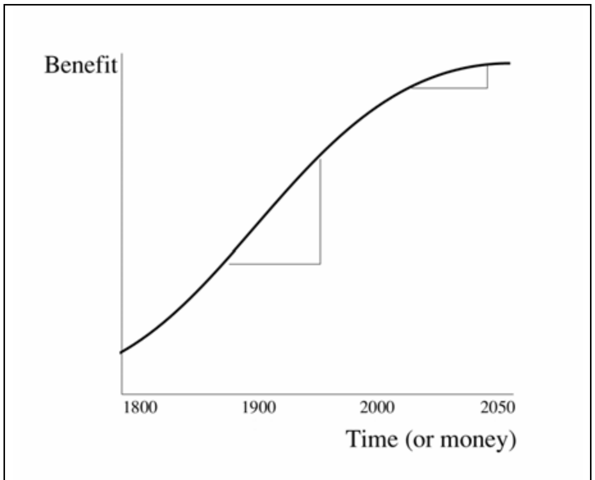


Fig. 863 *Deminishing returns of monocausal (or paucicausal) research*

Causal thinking is a special way of reducing diversity. It reduces similarities in repeating sequences of phenomena to the more general concepts of cause-effect relationships. Causal explanation has the more value the more reduction of different cases is possible by abstraction.

Alas, nowadays there are not so much phenomena left that can be explained monocausally. They largely have been explained earlier. What is left are context sensitive effects that can be caused by many different 'causes' or causes that can bring about many different effects, dependent on small differences in the environment where the 'cause' is introduced. Striking a match can cause little damage here, and big damage there. So monocausal (or 'paucicausal') research shows deminishing returns, especially on environmental (context sensitive) issues.

Means and aims can only be chosen on the basis of a supposed causal relationship between both. Otherwise thinking about means and aims is senseless. The same means applied here have other effects as applied there. Apart from that they are also scale-dependent and therefore subject of misconceptions.

8.8.7 The importance of diversity in ecology: tolerance and possibility

The curve of *ecological tolerance* relates the chance of survival of a species or ecosystem to any environmental variable, for instance the presence of water. In that special case survival runs between drying out and drowning.

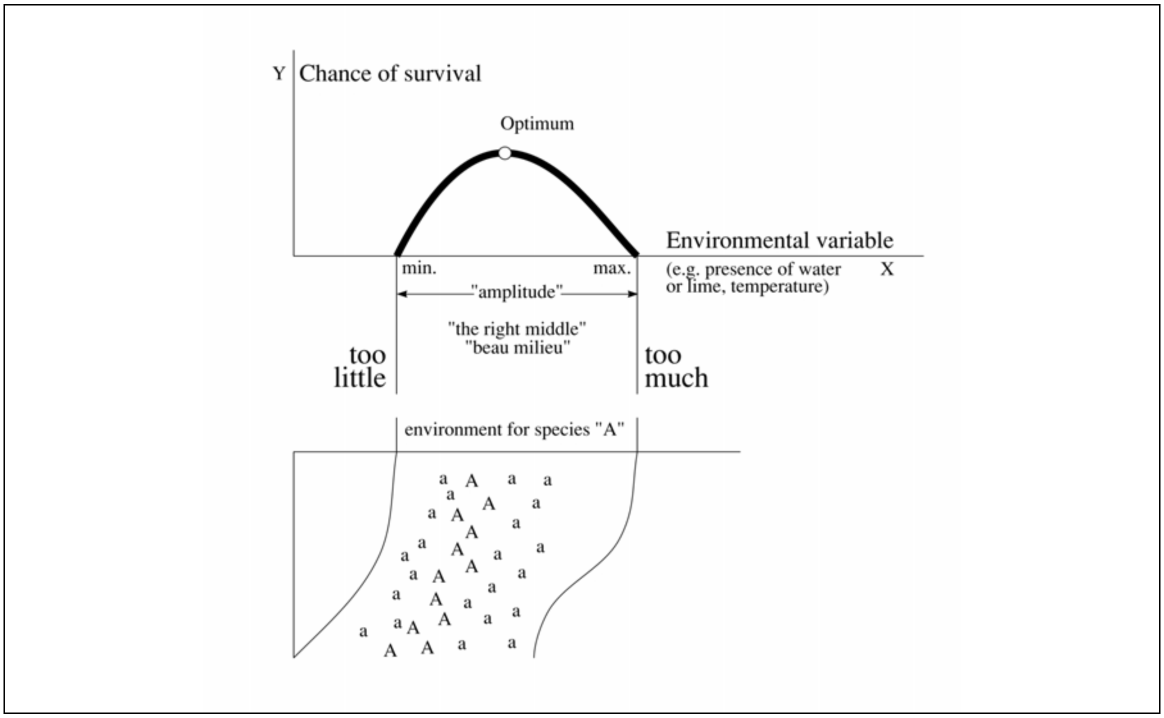


Fig. 864 *Ecological tolerance in theory and reality.*

Imagine the bottem picture as a slope from high and dry to low and wet. Species A will survive best in its optimum. Therefore we see florishing specimens on the optimum line of moisture (A). Higher or lower there are marginally growing specimens (a). The marginal specimens however are important for survival of the species as a whole.
Suppose for instance long-lasting showers: the lower, too wet standing marginal specimens die, the florishing specimens become marginal, but the high and dry standing specimens start to florish! Long-lasting dry weather results in the same in a reversed sense. Leveling the surface and water-supply for agricultural purposes in favour of one useful species means loss of other species and increased risk for the remaining species.

Variety is a risc-cover for life. This is not only true for the variety in the abiotic conditions, but also for the variety of ecosystems, species and of genetic possibilities within each species. Life survived many disasters thanks to biodiversity. In the diversity of life there was always a species to survive or within a species a specimen that survived. Survival of the fittest presupposes diversity from which can be chosen in changed circumstances. Deminishing biodiversity means undermining the resistance against catastrophes. From the 1.5 million species we know, this century we lost approximately 50000. So, we not only introduce ecological disasters, but also undermine the resistance of life against these disasters.

Biodiversity in mankind is a crucial value in our quality of life. As we are here we are all different and the very last comfort you can give a depressed person is 'But you are unique'. Diversity is also a precondition for trade and communication. If production and consumption would be the same everywhere, there would be no economical life. If we would have all the same perceptions and ideas, there would be no communication. It is an important misconception to believe that communication only helps bridgeing differences. Communication also produces diversity by compensating eachother and coordinating behaviour by specialization.

World commission environment and development (1990) (Committee Brundtland) summarizes the environmental challenge by stating sustainability as leaving next generations at least as much possibilities as we found ourselves. But what are possibilities? 'Possibilities' is not the same as economical supply. If our parents would have left us the same supplies as they found in their childhood, we would be far from satisfied. 'Possibilities' has to do with freedom of choice and thus variety. Our converging Schumpeter-economy described by Krupp (1996) and Fukuyama (1992)-culture leaves no choice. In our search for the alternative we find everywhere in the world the same hotels, the same dinners, the same language. This century, the last 'primitive' cultures are lost and with them an experience of life that no western language can express.

The extremest consequence of this levelling out would be a world without economy and even communication. If there are no longer any differences in production factors, exchanging goods and services would no longer be necessary. If total world wide distribution of knowledge and consensus would be the result of our communication age, there would no longer be anything worthwile to communicate. These thought experiments show clearly that 'difference' is also a hidden presupposition in communication and economy.

8.8.8 Diversity and quality

Quality can be measured in terms of possibilities of use, experience and expectation for future generations. The way design can sustain a sustainable development in the sense of Brundtland is to produce more choices for man, animal and plant. If there were one best solution for all problems of architecture and urban planning, it would be the worst in the sense of choices for future generations! This paradox pleads more for diversity than for uniform solutions. Moreover, if there was an uniform solution, the designer would have no task.
Quality is always a function of variation. Quality of possible experience moves between diversity and uniformity, surprise and recognition. One step too far into both sides brings us in the area of boredom or confusion.

This is a simple conception, already recognized by Birkhoff (1933) and Bense (1954) see also Koutamanis (2002), but why dit it not succeed, why is quality always posed as an unsolvable question?

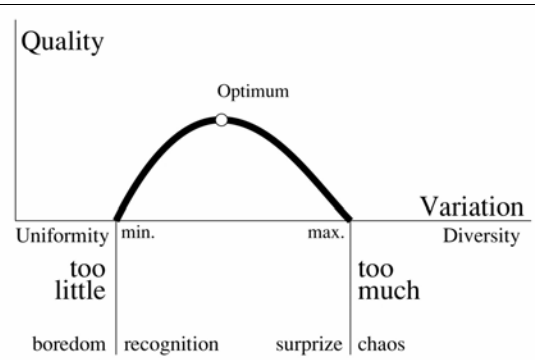


Fig. 865 *Quality = f(Variation)*

Any discussion on variety and thus variables can fall prey to confuson of scale. That means that even logic and science as forms of communication are prey to the scale paradox. The paradox of *Achilles and the turtle* is a beautiful example of the scale-paradox in time. The turtle says: 'Achilles cannot outrun me when I get a headstart, because when he is where I was at the moment he started I'm already further, when he reaches that point I am again further and so on!'. This conclusion is only incorrect by changing the time-scale during the reasoning. Something similar is found by Russell on set-theory. Russell (1919) bans sets containing themselves and reflexive judgements as 'I am a liar'.

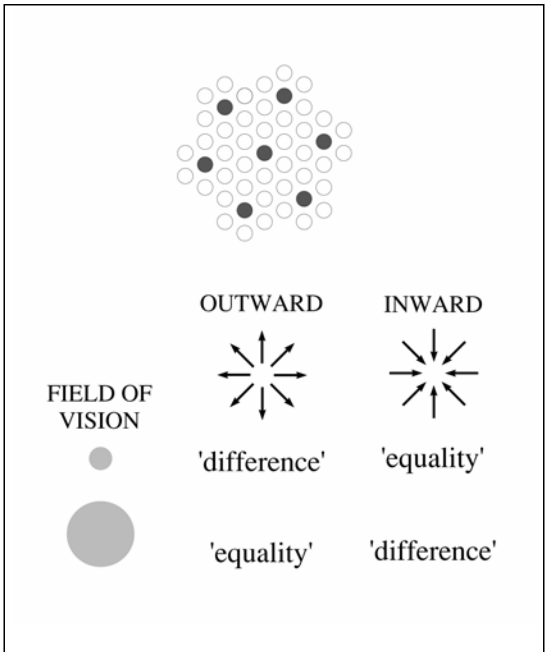


Fig. 866 *The scale paradox*

The *scale paradox* means an important scientific ban on applying conclusions drawn on one level of scale to another without any concern. The picture shows the possibility of changing conclusions on a change of schale by a factor 3. There are 7 decimals between a grain of sand and the earth. That gives approximately 15 possibilities of turning conclusions. Between a molecule and a grain of sand applies the same. This ban is violated so many times, that this should be an important criterion on the validity of scientific judgements.

The scale-paradox is not limited on concepts of diversity. An important example of turning conceptions into their opposite by scale is the duality of aim and means. For the government subsidizing a municipality the subsidy is a means, for the municipality it is an aim. So the conception of means changes in a conception of aim by crossing levels of scale. The turning of '*Zweckbegriff*' into '*Systemrationalität*' by Luhmann (1973) may be a turning conception of the same character.
In growing organizations *integration* on the level of the organization as a whole means often *desintegration* of the subsystems and perhaps a new form of integration in the sub-sub-systems. This process is often called '*differentiation*'!

8.8.9 Conclusion

The computer sustains the design process and spatial design sustains or even enlarges our freedom of choice. Enlarging the diversity of inside and outside space offers after all new possibilities and thus new freedom of choice. Concerning the possibilities of future generations of world population since Bruntland, we call the maintenance of that freedom '*sustainable development*'. Environmental planning takes into account the simultaneously appearing loss of possibilities and freedom of choice for future generations.

The building process however has in this sense more positive than negative ecological effects. The best way design can sustain a sustainable development in the sense of Brundtland, is to produce more choices (possibilities) for man, animal and plant. If there were one scientificly tested best solution for all causally formulated problems of architecture and urban plaming, it would be the worst in the sense of choices for future generations. This paradox rises when we consider science only as a method of optimizing probable effects. I would like to state that technical science has more to do with possibilities than with probabilities.

Computerprogramming not only sustains design and freedom of choice, it also forces us to make clear hidden presuppositions and that is the traditional task of art and science.
In that perspective the task of technical science is to make clear the preconditions (or presuppositions) of technical performance, the task of technical ecology that of life performance.
The presuppositions about the design process, as they are differently hidden in a designers' mind and in design sustaining computer programs, have something in common with the preconditions of technical and biological performance. If our theory can cope with both, it will concern a more essential thing about design, building and ecology.

The *possibility* (the set of conditions) of an event is something different from a cause (and subsequently the probability) of an event. Every cause is a condition for something to happen, but not every condition is also a cause. The design of a house does not cause the behaviour of a household. It only makes more ways of behaviour possible than there would have been possible without a house. It allows freedom of choice, offers conditions. In the same way the design of a *computerprogamme* is no good when it forces the user into a specific way of thinking, it should give the opportunity for different ways of thinking. Ecology is the science of conditions, prerequisites for different life-forms. Global life by its enormeous differentiation is not monocausal and thus not predictable or 'aimable'.

Death of individuals on the other hand, is predictable by pointing out any essential condition for life lacking. Man as a part of life is essentially not predictable as long as we believe in freedom of choice.

In ecology, technology, design and computerprogramming conditional thinking is as important as the operational, aim-directed, causal thinking we are used to. The methodology of causal and probability thinking is largely developed. But what methodology do we need when we do not only ask questions about the cause or aim of a phenomenon, but about the conditions under which a phenomenon could possibly appear, its possibility?

8.8.10 References to Boundaries of imagination

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