

VISIONS OF BELLE VAN ZUYLEN

13.1 INTRODUCTION

This is a story about an early feminist eighteenth-century intellectual, a proposal for a mighty skyscraper on the edge of a mid-size Dutch city, a chief government architect who was trying to find arguments to save the unspoilt views of the Green Heart of Holland and a group of researchers in the Netherlands Institute for Spatial Research. Historical references, unashamedly conspicuous architecture, present-day ideas on landscape conservation and planning policy are the main ingredients of the story. Why was the view of Utrecht in 2007 more widely discussed than Vermeer's View of Delft from 1660, and why were so many officials and politicians interested in the results of a highly technical GIS-based study by an institute many of them until then had hardly heard of?

As this chapter will make clear, even a largely academic study can have some tangible impact on a political decision-making process. In this particular case of the proposed (and controversial) Belle van Zuylen skyscraper, several seemingly unrelated facts and opinions came together. A succession of events worked in favour of the study that is the subject of this chapter: first, a proposal for an outsized building by the developer, then the rapid acceptance by a city eager to give its image a boost, followed by critical comments by the Chief Government Architect, who was backed up by his freshly installed cabinet minister. Suddenly, the skyscraper plan became something of a national issue, especially because the Green Heart of Holland, one of

the most precious icons of the Dutch planning system, had come into play. In this situation, a study into the tower's visual effects was more than welcome for the policy makers involved in the decision process.

13.2 THE LADY, THE TOWER AND THE ARCHITECT

Belle van Zuylen (1740-1805), née Isabella van Tuyll van Serooskerken (see figure 1), was born on a country estate near the city of Utrecht, in a family of landed gentry. She studied mathematics and several languages, travelled extensively throughout Europe, kept up correspondences with many scientists and writers in different countries, among them great French minds like Rousseau and Voltaire, and wrote a number of books and plays. By all means, she can be considered a typical 'woman of letters', especially in her days when generally recognised female intellectuals were a rare species ¹. Her unconventional ways became apparent when, after a broken-up marriage and a succession of male lovers, she indulged in a relationship with her French soul mate Madame de Staël. As a remarkable and unique person, Belle van Zuylen became a cult figure in and around Utrecht. In 1993, her life was the subject of a Dutch costume drama movie ².

Our nineteenth-century heroine Belle entered the twenty-first with a bang. In 2005, the city council of Utrecht approved a proposal for new high-rise buildings. The positive spirit of this decision was remarkable, because until then the city of Utrecht opposed any building taller than the historical bell tower of the *Dom* (the erstwhile cathedral tower), with its 110 metres a landmark in its own right that dominates not just the medieval downtown area but also most of the modern city itself. The proposal suggested the development of a strategic site on the A2

motorway and an important railway line, half-way between the old city and a large new suburban extension to the west, known as Leidsche Rijn. Central in this development, a tower of "unlimited height" could be erected to become the new landmark for the city of Utrecht. During further planning and design in 2007/8, the name 'Belle van Zuylen Tower' was adopted for the project, thereby honouring one of Utrecht's greatest names in the history of the city. In 2008,



Figure 1
Portrait of Belle van Zuylen (1740-1805)

a draft design was presented by developer Burginvest and architect Pi de Bruijn ³. By that time, Belle's tower had shot up to a staggering height of 262 metres (860 feet), almost 2.5 times the height of the Dom bell tower (perhaps as relief to concerned citizens, it should be said that the distance between both towers would have been at least 4.5 kilometres).

The idea of building a tower of such a commanding height was met with a lot of scepticism and outright criticism. Apart from practical questions about the construction and marketability of the tower, many were worried by the potential impact of such a landmark on the surrounding landscape. Although situated in the middle of an urban area, Belle's silhouette would reach much farther into rural areas, especially into the Green Heart of Holland (*Groene Hart*). Designated more than 50 years ago, the Green Heart is probably the internationally best-known icon of Dutch spatial planning ⁴. It covers an area of roughly 80 by 60 kilometres across, situated between the four largest cities in the country: clockwise from the north Amsterdam, Utrecht, Rotterdam and The Hague. From a landscape point of view, the Green Heart is made up of wet meadowland, parcelled out into long and narrow strips of land and interspersed by lakes and rationally designed reclamation landscapes. Most of the Green Heart is wide-open, allowing long-distance views in all directions. High-rise urban areas like Central Rotterdam and the Amsterdam Arena stadium district are clearly visible from distances in the range of 10-15 kilometres. In 2004, the Green Heart was designated as a National Landscape in the National Memorandum on Spatial Planning, giving a certain level of governmental protection to the area (VROM, 2004).

This is where a rather unique official comes in. Since the early nineteenth century, the Dutch government employs a remarkable advisor known as the Chief Government Architect (*Rijksbouwmeester*). The 'national architect' heads an independent office that makes designs for important buildings but which also expresses opinions on matters of town and country planning. In the spring of 2007, the cabinet minister of Housing, Planning and the Environment (Ministry of VROM) asked the Chief Government Architect on his opinion on the positive and negative effects of tall structures in general, and the acceptability of the proposed Belle van Zuylen tower in particular. As the design of the tower went ahead at considerable speed, and the City of Utrecht seemed sympathetic toward the whole idea, the minister wanted advise in the shortest possible term.

In September 2007, Chief Government Architect, Mels Crouwel, advised strongly against the Belle van Zuylen tower, mainly on visibility grounds ⁵. On the same day, the cabinet minister for housing and planning, Ms Jacqueline Cramer, according to her spokesman, agreed in principle with Mr. Crouwel. The minister made it clear that she endorsed the national architect's viewpoint that a tower of this height might be all right in other locations but certainly not here on the edge of the Green Heart. Mr. Crouwel's opinion was to a certain extent based on a study

by three researchers in the Netherlands Institute for Spatial Research (from 2008 part of the Netherlands Environmental Assessment Agency). Shortly before the architect and his minister expressed their opinion, the Hague-based Institute issued a study by the name of The Visibility of the Belle van Zuylen Tower (*De Zichtbaarheid van de Belle van Zuylen-toren*) (Lörzing, et al. 2007), which presented a method to measure the visual impact of such a disproportionate object on the horizon.

13.3 METHODS FOR MEASURING THE IMPACT OF A HIGH-RISE

In the spring of 2007, with crucial decisions about the go-ahead for the tower to be made within a year, none of the parties involved in the Belle van Zuylen project so far had developed a convincing method to depict the visual impact of the tower. Of course, architects and developers generously provided artist's impressions (see figure 2), but these gave only limited and selective perspectives of the tower's surroundings, focusing on the view from nearby highways.

Figure 2
Artist's impression of the Belle van Zuylen tower [source: Architecten Cie Amsterdam]



In discussions with the national architect's office, as researchers for the government (the Institute for Spatial Research was independent but funded by the Ministry of Planning) we decided that it was high time to start a quick and object-specific study into the visual effects of Belle van Zuylen's tower.

Without any doubt, the ultimate method to experience the visual effects of a planned building is erecting a life-size model on scale 1 to 1. This has actually been done in a few cases, like the proposed reconstruction of the Berlin *Stadtschloss* (the Kaiser's City Palace that was razed to the ground by the GDR regime) and the *Valkhof*, a Medieval defence tower in the Dutch city of Nijmegen, which was to be rebuilt after an absence of several centuries. In Switzerland, the real-size outlines of new buildings have to be simulated with the use of pylons or building cranes. In the case of Belle van Zuylen Tower, however, this approach would be virtually impossible; building a 262 metre high-rise construction would require almost the same technological prowess as building the real tower, at an almost comparable price. Other methods, like hanging air balloons or zeppelins in place right above the proposed building site, may be less expensive but seem equally unrealistic.

We decided to use the available experience with GIS within the Institute. To make GIS applicable for the kind of study we had in mind, we needed to make a few technical choices. The most important one was the introduction of the *Viewshed* method as a tool to construct realistic sightlines between the Belle tower and its surroundings, thereby defining the tower's range of visibility. For a complete picture, we needed answers to the following questions:

- At which (maximum) distance will the Belle van Zuylen tower theoretically be visible, taking the curvature of the earth into account?
- In which locations and to which extent will the visibility be restricted by objects that stand in the way between the observer and the tower?
- To which extent will the visibility of the tower be influenced (or better: reduced) by the weather conditions?
- And finally, which role will the shape of the tower (esp. its height-width ratio) play in its impact on the horizon?

To put the effects of the Belle van Zuylen tower in perspective, we also decided to make comparative studies for a number of well-known existing high-rises, towers and pylons in or in the direct vicinity of the Green Heart of Holland.

First, we calculated the theoretical maximum visibility of the Belle van Zuylen tower. This maximum range is a hypothetical circle on the earth's surface. Under ideal circumstances, the tower can be seen on and everywhere within the circle, taking the earth's curvature into account. Outside the circle, the tower will never be visible, at least not from a viewpoint on ground level.

For the 262-metre Belle tower, maximum visibility turned out to be no less than 62 kilometres (38.5 miles). This would mean that, in theory anyway, Belle could be seen from all of the Green Heart and all the big cities in the Western part of the country; its visibility range would extend well into the North Sea and miss the German border by a few kilometres.

These effects may seem rather alarming, but in the real world the citizens of The Hague, the crew on a North Sea coaster and the German border police won't need to worry. Belle's impact on their environment will be non-existent. For a more realistic picture, we must take into account the effects of physical barriers within the theoretical visibility circle. Viewshed analysis is capable of including in its calculations data about hills, built-up areas, woodlands and other types of objects that can potentially obstruct the view of an observer. To create a digital landscape model (DLM), a three-dimensional landscape for use by Viewshed, we used the ground level heights from the *Actueel Hoogtebestand Nederland* (a modern digital elevation model of the Netherlands), and combined them with data from the digital topographic maps of the Dutch Topographical Service of the Land Registry (*Topografische Dienst Kadaster*) (esp. built-up areas, linear vegetation and woodlands) and more specific data on road noise barriers etc.

Making this data usable for viewshed analysis, we made a few assumptions, like uniform heights for low-rise and high-rise built-up areas (7 and 30 metres, respectively) and for tree lines, woods and forests (15 metres). The effects of visibility barriers on perception are substantial and complicated. Let's suppose, for instance, that an observer stands at a distance of 30 kilometres from a 262 metre tall tower, and in between is a 6 metre high building. As the observer moves toward the tower, he will pass a 950metre-long zone in which the tower disappears from sight. In case the obstacle would be 18 metres high, the zone of invisibility would be over 3 kilometres long. These examples are far from hypothetical; the supposedly 'open areas' of western Netherlands (like the Green Heart) are full of similar sight barriers, so that the overall perception of a tower like Belle van Zuylen will be vastly reduced. Feeding all this data and interpretations into viewshed analysis, we were able to give a fairly accurate approximation of Belle's impact on the countryside around the city of Utrecht.

So far, the visual impact of the Belle van Zuylen high-rise was calculated for ideal weather conditions. As any visitor to the Netherlands will testify, these conditions are extremely rare in reality. Fog, rain, haze and darkness often diminish the sight of tall and voluminous objects on the horizon, sometimes even at short distances. To put things into perspective, we collected data about the weather in this part of the Netherlands; the Royal Netherlands Meteorological Institute (KMNI) was happy to oblige. They were able to provide detailed data for a twenty-year period. Based on the weather bureau's material, we could calculate the average chance for the Belle tower to be visible from various distances under the prevailing weather conditions.

13.4 THE VISIBILITY OF BELLE FROM THE COUNTRYSIDE

The first conclusion that can be drawn from the results was that there would be very few places from where the Belle van Zuylen tower could be seen without any obstruction from the theoretical maximum distance of 62 kilometres, see figure 3. In fact, such a place existed only in a sector of the former *Zuyderzee*, a vast open lake in the heart of the country. To a yacht skipper, plying the waters of Lake Marken, it could be a spectacular sight, but he would be one of the very few lucky ones to ever see Belle from such a distance. More likely, people in large parts of the Green Heart would be able so see the tower from distances up to 25 kilometres. But their view would be fragmented and interrupted by numerous sight barriers. Only in the largest open areas (and the Green Heart is famous for its flat and open meadowland between the towns, woodlands and linear settlements), unobstructed views could be admired (or cursed, according to the preferences of the beholder).

Figure 3
Visibility of the Belle van Zuylen tower based on earth's curvature and topography; the circles indicate sight limitations by the weather at 5, 10, 20 and 30 kilometres



From the major cities around the Green Heart, and even in large parts of the city of Utrecht itself, the tower would be virtually invisible. The same would go for the hilly and densely wooded areas to the northeast and east of Utrecht, known to the Dutch as *Utrechtse Heuvelrug* (Utrecht Hill Range). From here, Belle would be visible only in extremely exceptional cases, like the runway of a former air force base which, by a rather eerie coincidence, points directly at the high-rise tower as if making it a prime target for pilots training. For those in search of the best views of Belle at the horizon, the meadows to the southwest of Utrecht (*Lopikerwaard*) and the lakes to the north of the city would be the best choice.

All in all, the visibility of the Belle van Zuylen tower from the open landscapes around Utrecht would be substantial, but less comprehensive than the theoretical maximum of 62 kilometres seemed to suggest. Actually, the most impressive views of Belle could be expected from some of the major motorways that run toward Utrecht. As the city of Utrecht more or less is the geographical heart of the Netherlands, motorways from seven directions come together on the Utrecht Ring. No less than five of these roads would offer compelling views of the tower from distances up to 25-30 kilometres. Motorists travelling down the A2 motorway from Amsterdam would certainly be impressed the moment they caught the first sight of Belle, which would actually be immediately at Amsterdam's outskirts.

The influence of the weather, as it could be derived from the weather bureau's data, turned out to play a substantial role in the tower's visibility. When superposed on the aforementioned results, the actual visibility over time (expressed in percentages of total visibility) proved to be greatly diminished. The results are shown in figure 3, where changing colours in four circles around the Belle van Zuylen tower suggest changes in visibility percentage.

- The first circle, at 5 kilometres, has a visibility chance of 77.6%.
- On the second, at 10 kilometres, the visibility chance is 56.7%.
- For circle three, at 20 kilometres, the visibility chance is 30.8%.
- Finally, the visibility chance on the outer circle (at 30 kilometres) is a mere 9.4%.

These results make clear that at distances of over 20 kilometres, the actual chance to see a tall construction the size of Belle's tower is at most only 30% of the time. These findings should be combined with the Viewshed data, which show that at distances of 20 kilometres and more (which coincides with the third circle in figure 3), even the ideal visibility based on the topography of the area is fairly limited. To put it in simple terms: at distances of more than 20 kilometres the Belle high-rise will be visible from a limited number of places, and the visibility from these places will be greatly limited by the weather. On the other hand, within a circle of 10 kilometres (the second circle in figure 3) Belle's theoretical visibility from the open countryside will be near total, while the chance to see the tower under various weather conditions will vary from 55% to 100 %.

To put the effects of the Belle van Zuylen tower in perspective, we decided to make comparative studies for a number of well-known existing high-rises, towers and pylons in or in the direct vicinity of the Green Heart of Holland. These objects were deliberately picked with maximum diversity in mind, featuring:

- A Rotterdam office tower (then, with its 151 metres, the tallest building in the country);
- Good old *Dom* (cathedral) bell tower, Utrecht's proud landmark from the Middle Ages (112 metres);
- A radio relay mast in the middle of the Green Heart (125 metres);
- A characteristic water tower in the Green Heart (because of its shape colloquially referred to as 'the Pencil', 58 metres);
- The tallest construction by far in the Netherlands, Gerbrandy Communications Tower on the edge of the Green Heart close to a Utrecht suburb (375 metres).

The distance of maximum visibility for these tall objects is shown in figure 4. As can be seen, Belle's visibility range of 62.3 kilometres is second to that of the Gerbrandy tower (at 73.3 kilometres).

All these tall constructions and buildings turned out to have at least one thing in common with Belle van Zuylen's tower: their theoretical maximum visibility is greatly reduced by a wide range of sight barriers that pop up all over the countryside. The maximum visual range of the

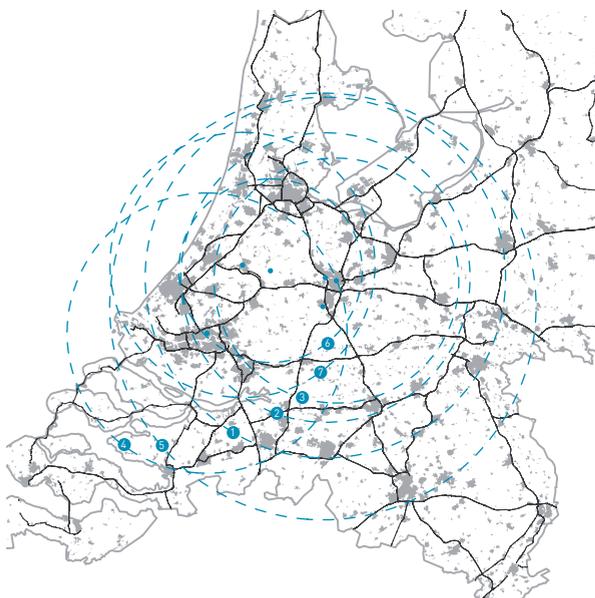


Figure 4
Maximum visibility range for the Belle van Zuylen tower and 7 reference objects

- 1 Belle van Zuylen 262 m (62,3 km)
- 2 Belle van Zuylen 162 m (50,0 km)
- 3 Domtoren 112 m
- 4 Delftse Poort 151 m
- 5 Gerbrandytoren 375 m
- 6 Watertoren Meije 58 m
- 7 Straalverbindingstoren Alphen a/d Rijn 135 m

tallest object, the Gerbrandy tower, was calculated at 73 kilometres, but in reality this giant construction (dressed up as an illuminated Christmas tree every December) is seen mostly from the eastern and southern parts of the Green Heart at distances up to 30 kilometres, the most spectacular view being from a nearby motorway bridge across the Lek river south of Utrecht. Rather to our surprise, the largest area of unobstructed visibility can be found for the Rotterdam office tower; but here, these views are not from the Green Heart (where the tower certainly has some impact, but over no more than some 15 kilometres) but from the vast open arable fields to the south of Rotterdam, where the sight lines of over 25 kilometres are no exception. As a self-chosen experiment, we also introduced a more modest Belle van Zuylen tower of 162 metres (exactly 100 metres lower than the original). Much to our surprise, trimming back Belle's tower to just over 60% of its intended height wouldn't make a proportionate difference: 'Belle's little sister' would still be visible from a substantial part of the Green Heart. At 50 kilometres, its maximum visibility (see figure 4) turned out to be only gradually smaller than Belle's 62.3 kilometres.

So far, the distance between the observer and the object on the horizon was our only criterion. From the beginning, however, we felt that there had to be another important factor related with the actual presence of the object. With the visibility measurements of Belle and other towers available, we had a great example at our disposal. Just imagine the effects on the horizon, caused by a solid building like the Belle van Zuylen tower on the one hand, and an ultra-thin construction like the (much taller) Gerbrandy tower on the other. Even without any further study it will be clear that the Gerbrandy tower will practically disappear from sight against the sky on an average day, while the Belle tower will be a landmark in its own right, especially after dark when lit windows will make it a shining beacon on the horizon.

To provide ourselves with a more elaborate theory on the horizon effects of different structures, we developed a method based on the term 'horizon impact percentage' (see figure 5). We calculated this percentage by:

- defining the 'facade surface' of the object;
- introducing a measure for the 'viewer's horizon', expressed in the commonly accepted 60 degrees vision angle and a 'horizon height' for which we took the height of the tallest object in our comparative study: the Gerbrandy tower's 375 metres.

The results of these calculations are striking⁶. Mainly because of its considerable silhouette, the Belle van Zuylen tower will have a much higher horizon impact percentage than any of the other towers that were part of the study. At a uniform percentage of 0.1% for all towers, 'Belle' will be seen at a distance of 30 kilometres, while the much taller Gerbrandy tower would only be visible from 6 kilometres (see figure 6 for the circles of 0.1% horizon impact). The only other tower with a serious presence on the horizon is the Rotterdam office tower, which is easy to

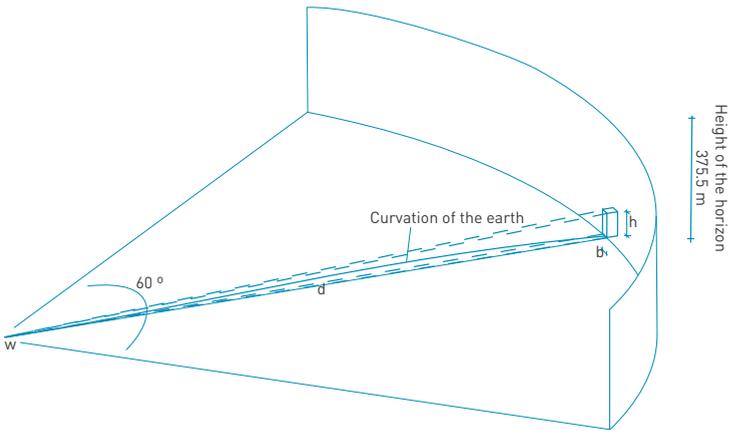


Figure 5
Model of the horizon impact percentage measurement method



Figure 6
Comparison of the visibility of the Belle van Zuylen tower and reference objects at a horizon impact of 0.1%

understand given its rather plump, broad design. Compared to the other towers, 'Belle' will certainly make a great impression against the skies over Holland.

13.5 BELLE'S SUDDEN DEMISE

According to informal comments by the Chief Government Architect's office, our Institute's visibility study greatly helped the to form the Architect's opinion about the acceptability of Belle's tower. But even if the minister herself had expressed her doubts about such a huge tower at the edges of the Green Heart, civil servants in The Hague had to admit that the ministry didn't have the power to stop the Belle project altogether. In the City of Utrecht, prospects still looked rosy for the development of what was marketed as the city's future landmark. Before the minister's statement, in June 2007, the city's executives decided that they endorsed the results of a feasibility study, expressing the expectation that the tower would become a major tourist and business attraction for Utrecht. It seemed only a matter of time for the city to give its formal go-ahead.

But things began to change, albeit slowly. On October 10th of 2007, the City of Utrecht held a referendum as part of the appointment procedure of a new mayor (in the Dutch system, mayors are not elected but appointed by the government; in a few recent cases, however, the electorate has been consulted before the final decision). The winning candidate, social democrat MP Aleid Wolfsen, presented himself as an outspoken critic of the tower project. The fact that Mr. Wolfsen won the referendum and was subsequently appointed mayor of Utrecht didn't change the situation overnight. The city still seemed supportive of the project, but waited for the outcome of the developer's search for investors. However, in the city council, most parties (and most councillors) were in favour of the Belle van Zuylen, although some parties held a 'yes, but' or 'yes, provided that' view.

In 2008, a citizens' initiative to organise a consultative referendum on the tower project gathered a few hundred signatures, but a large majority in the city council rejected the idea. The only result of the referendum initiative was that an ever-larger number of citizens began to discuss the project. In these discussions, the outcome of our Institute's study into the long-distance visibility of Belle van Zuylen tower began to play a tangible role; supporters and opponents found a basis for their arguments in our study⁷. A smooth and rapid approval of the plans by the city council began to look increasingly unlikely. Within two years, the worldwide credit crunch did what ministerial doubts, council debates and citizens' protests could not achieve: on the 22nd of January, 2010, the City of Utrecht and Burginvest development stated in a joint declaration that preparatory work on the Belle van Zuylen tower project was to be discontinued due to economical difficulties. The dream of developers and city fathers, to erect the tallest tower in the country, already a nightmare to some, had suddenly ended as a pipe dream. Two hundred and five years after Belle van Zuylen's demise, her namesake tower had met its own death.

13.6 CONCLUSIONS

At first sight, the story of the rise and fall of a bold development scheme like the Belle van Zuylen skyscraper proposal seems interesting for the people of Utrecht and Dutch planning policy makers only. But obviously, there is more. As an example of GIS application, Belle's adventures show the level of precision with which the visual impact on the horizon of high and/or voluminous objects can be forecasted. Moreover, there is the political aspect. The Belle van Zuylen visibility study would never even have been considered if there had not been an ever-broader discussion in the city of Utrecht and in Dutch government circles. The study may not have been decisive in itself, but it was clearly helpful to many policy makers because it provided objective and accessible information to support their case (this does not only relate to opponents, as some might be inclined to think; this author heard advocates of the Belle project happily conclude that 'their' tower would be visible from the outskirts of Amsterdam as a shining landmark for Utrecht).

NOTES

- [1] Books and articles on the life and works of Belle van Zuylen are mostly in either French or Dutch. For the English-language reader, the following two sources may be of interest: Courtney (1993) and Van Dijk et al. (2006)
- [2] Belle van Zuylen - Madame de Charrière, a film by Digna Sinke, 1993 (in Dutch). In 1996, the film was reworked into a three-episode TV series
- [3] For information on the project from the developer's and architect's point of view, visit <http://www.bellevanzuylen.info/english/index.php>
- [4] The term 'Groene Hart' appears in Dutch planning documents since the first National Memorandum on Spatial Planning (Nota Westen des Lands (1958)). The term is supposed to have been coined by Albert Plesman, a Dutch aviator who founded KLM Royal Dutch Airlines
- [5] See the ministry's press release on September 24th, 2007: *Rijksbouwmeester brengt advies Belle van Zuylentoren uit aan minister Cramer*
- [6] The calculation proceeds as follows:
 - If 'd' is the viewer's distance to the object, our horizon height is 375 metres, and we realise that 60 degrees is 1/6 of an all-around vision (the 'panorama'), then the viewer's horizon will be $H=2d\pi.375/6$.
 - Next, we have to establish the surface of the object's silhouette by multiplying its height ('h') and width ('w').
 - Finally, the object's surface is set against the viewer's horizon 'H' to calculate the percentage ('P') of the horizon that is taken up by the object: $P=100.hw/H$.For more information, see Lörzing, et al. 2007
- [7] Off the record comments by representatives of the Chief Government Architect's office, the Ministry of VROM, the City of Utrecht and the tower's designers

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