GOLDEN GREEN

DRAWING UPON LANE DESIGN PRINCIPLES
TO DESIGN INTEGRAL SUSTAINABLE ROADS

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Front cover: detail of Golden Green design for the Utrechtseweg (by author)
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Abstract

The Utrechtseweg provincial road is situated in the centre of the Netherlands, following the edges of the lateral moraines of both the Utrechtse Heuvelrug and the Veluwe massief. The road has a long history as being bo a landscape structuring lane and the main road infrastructure between the cities of Utrecht, Arnhem, and Zutphen, and the estates in the areas between those cities. The structuring properties used to derive from the continuous lane profile and its embedded qualities. The road is at risk of losing its landscape structuring function through the now strongly fragmented road profile. At the same time, demands of the Dutch road network are changing through the upswing of new forms of mobility and the need for climate change-adaptive designs. What is the future value of such provincial roads? What can be learnt from lanes as an example of best-practice road design? How can lane design principles help develop a strategy for integral sustainable road design? The Golden Green research-by-design focusses on the following main question: How can lane design principles be used to create an integral sustainable road design strategy?

The area of the Utrechtseweg is used as a field laboratory, in which the past and present designs inform the design strategy through the application of a road quality assessment tool. The design strategy is based on the outcome of the assessment. The new design aims for a future scenario in which both the lost cultural identity is regained and current issues on safety, speed, and sustainable road design are addressed.

Landscapes in general and road networks in particular are defined as a constellation of spatial, socio-economic, and mental aspects. Lanes are defined as a type of road, lined with trees or other natural objects within a specific pattern and functioning as a type of boundary between the road and the landscape. There are different lane typologies, each with their own spatial, socio-economic, and mental aspects. The road quality assessment tool is based on these aspects, providing an integral view on the road design. The assessment is conducted on three different spatial scales: detail or micro scale, the individual experience; local or meso scale, the impact on the location; regional or macroscale, the impact of the design strategy on a larger scale.

The resulting design strategy re-envisions the Utrechtseweg as a lane, now with a safe place on the road for each road user (pedestrian, bike, e-bike, car). The Utrechtseweg can again function as a backbone for the area with the new lane profile, activating the existing rich programme along the road.

The design evaluation points towards the potential of the design strategy in connecting cultural heritage with modern road design and the creation and connection of biotopes. Application of the design strategy on different roads can improve the over-all spatial quality and experience of those roads, while staying true to the traditional lane design principles.
**Origins**

The project Golden Green originates from both a personal fascination with lane design and previous research into lane design. Growing up in the area of Haarlem, I frequently encountered lanes during hikes in the dunes and forests close to home. For six years I passed the Herfstlaan every day on my bike towards my high school (figures 1 and 2).

The first time looking at lanes from a professional perspective came during a workshop in the municipality of Renkum (2013-2014), which led to the research ‘Avenues in the Municipality of Renkum: Deterioration of an Estate Landscape’ (Verschuure-Stuip, Dijkstra, & Cubells Guilen, 2016). This research is an investigation into the lane structures in the municipality of Renkum, and the position and function of lanes within the estate landscape of Renkum. The work on this research forced me and my co-authors to really dive deep into the lane subject. Previous research and literature on lanes is scarce, and often not conducted from a landscape architectonic point of view. This means that even an unambiguous and complete definition of lanes as a type of road was nowhere to be found. The conclusions from this research project pointed towards the importance of lanes as landscape structuring elements, while also observing how the lane structures in the Renkum municipality have been heavily damaged or have disappeared altogether. Still, the described lane definition and the overview of lane design principles is not complete. There is no answer given on how lanes should or could be preserved as cultural heritage, nor is the application of the lane design principles tested. Combined with the sheer joy in finding new knowledge on the lane matter around every corner it was a fairly easy decision to focus my graduation project on lanes. There was simply still so much to do.

While many paths were still unexplored, the research by Verschuure-Stuip et al. (2016) created a solid foundation for the Golden Green research. This research offers an elaborate overview of the historic development of the area between Wageningen and Arnhem, an elaborate literature study into the different lane design principles, and already mapped a large part of the lane system in the area for both the past and present situation (1872, 1904, 1954, and 2013), using a clear method to do so. This work allowed me to start with the Golden Green research on a high level of abstraction: fine-tuning the lane definition rather than starting from scratch.

**Historic landscape lens**

The research by Verschuure-Stuip et al. (2016) also motivated me to approach the Golden Green project from a landscape historic point of view. The project shows how even well-maintained lanes are used completely different now compared to the original lane design. The history lense has allowed me to discover several new perspectives on lanes.

Firstly, the realization that trees are living, growing landscape elements that can be cut down and replaced over time. Nowadays, most people tend to protect trees and heavily resist the cutting down of trees. In the past, trees were used for the production of wood, a fully socially accepted process of being cut down and replanted in cycles of set amounts of years. This realization allowed me to really think differently about trees, even lying the foundation for the circular elements in the design strategy.
Secondly, the realization that lanes as structuring elements in the landscape are so very important for the quality of estate landscapes. Estate landscapes cannot be properly understood without lane structures. The whole social aspect of lanes as a physical connection between estates as an expression of the friendly relations between the estate owners, for example, would never be understood. The *Avenues in the Municipality of Renkum* research allowed for this understanding to grow and to act upon this understanding.

Additionally, the structuring function of lanes are also an expression of the connection between different layers in the landscape, both in place and in time. Lanes are constructed from natural elements (trees), positioned on reclamation roads (Verschuure-Stuip et al., 2016, p. 03), and connect urban tissue with country estates. This is literal connection between the natural, the cultural, and the urban landscape. The fact that trees take a long time to reach a mature age and size also connects the landscape through time: design automatically still have an impact after fifty years or two generations further. Therefore the application of lane design principles makes it possible to experience multiple landscape layers at once.

Finally, the *Avenues in the Municipality of Renkum* research forced me to truly question the concept of historic restauration. As mentioned before, even well-preserved lanes have a different image and functionality to them (figures 3 and 4).

The Van der Molenallee is an example of a beautiful, well-preserved lane, with even the double row of planted trees intact. However, the 1872 situation shows how the road tracks were used differently. Pedestrians have a place on the road on the other side of the trees, whereas the current situation does not provide space for pedestrians. This example keeps inspiring me to question seemingly well-preserved landscape elements, constantly searching for ways to simultaneously improve the spatial design and the experience of the place, while also honouring the cultural heritage of the site.

**Research objective**

With the foundation from the *Avenues in the Municipality of Renkum* research, the Golden Green research-by-design set out to achieve the following goals:

1. Create a theoretic framework in understanding how lanes function as integral road design, and collect design tools from this framework;
2. Formulate a design strategy that can be used to redesign existing roads into integral sustainable roads;
3. Test this design strategy on the location of the Utrechtseweg.

**Theoretic framework**

An elaborate theoretic framework has been composed from linguistic research, literature review, and design analysis. This has resulted in the formulation of an inclusive definition of lanes as road typology. A lane design toolbox was developed based on the definition, and applied in the design strategy.

**Design strategy**

The design strategy is based on the lane design toolbox and on the newly developed road quality assessment tool. By taking extra time to develop the toolbox and the assessment tool, the design strategy has gained a depth and completeness that helps to really design integral sustainable roads. The strategy is tailor made for the Utrechtseweg, but could be applied on other locations or road types too. Further testing would be necessary in order to establish whether or not those designs would reach the desired quality. This testing can be done with the use of the road quality assessment tool, as this tool is directly applicable to other locations or even to other landscape elements.
Design for the Utrechtseweg

The design for the Utrechtseweg truly is a method of testing the design strategy, the functionalities of the road quality assessment tool, and the lane design toolbox. The location was chosen for its exemplary issues related to lane preservation and rapid road network changes. As such, the location proved to indeed have many issues related to, amongst others, problems with the approach towards cultural heritage (figure 5).

![Figure 5](image)

Figure 5 Assessment of the present qualities of the Utrechtseweg (by author).

The design helped to better understand the interrelation between the different aspects of road design. The road quality assessment tool helped to maintain oversight over the design, and to easily assess which design goals were met.

Methodical line of approach

In order to better understand the history of the location and the theoretic background of lane design, this research started with two parallel theoretical analyses. Firstly, a theoretical analysis into the definition of lanes as road typology was conducted. This included a linguistic research into the origins of the word ‘lane’ and related terms, and an elaborate literature study on lane design, the origins of lane design and development of lane design through the ages. Secondly, a literature study was devoted to the development of roads in the Netherlands in general, placing the development of transportation infrastructure into historic socio-economic context. These two analyses were used as the foundation of both the lane design toolbox and the road quality assessment tool. The vast amount of data provided both an opportunity and a challenge: the resulting methodology has become richer and well-rooted in a theoretical basis, while at the same time sometimes cluttering the main storyline.

The essence of the Golden Green research, based on the main objective ‘defining lane design principles to design integral sustainable roads’, lies in the comparison between the past design of the Utrechtseweg and the present design of the Utrechtseweg in order to find leads for a better future design. From this comparison lost values and current issues are established in order to re-design the road for the future. The road quality assessment tool was introduced to make the assessment of past and present both comparable and reproducible. Therefore the tool is constructed on the basis of all aspects of lane and road design from the theoretical analyses. This tool was created from the notion that landscapes are constructed from both tangible and intangible aspects: spatial, socio-economic, and mental aspects (figure 6). This abstraction level allows the tool to be used for different time frames, different scales, but also for different locations and different landscape elements.

![Figure 6](image)

Figure 6 Golden Green road assessment tool, based on Taverne, Dembski, De Klerk, & Ramakers (2012); Bendiks & Degros (2013); James, Magee, Scerri, & Steger (2015); Verschuure-Stuip (2018).
An important limitation of the road quality assessment tool is the fact that such a tool is always an oversimplification of reality. Some aspects might be excluded, by accident, or when the road design is seen from a different perspective. A civil engineer, for example, might devote much more attention to the specific technical qualifications of a road and therefore might have the need to add extra aspects.

Also, the simplification of reality led to the definition of separate aspects. These aspects cannot truly be seen apart in reality. The individual experience of a road for example, is a mental factor. The experience itself however is created through a combination of the spatial configuration, the embedding in the landscape (spatial factors) and even through the involvement of the individual (socio-economic factor). The experience of an resident of the city of Oosterbeek travelling daily on the Utrechtseweg will probably be different from a tourist who visits the area for the first time.

A final note to the assessment tool is the importance of the assessment scales. When an assessment is conducted for a small area, on a detailed scale, qualities might seem much higher than they truly are. For example, when the experience for one location is measured, assessment on a solely a detailed scale might lead to a high value, because that specific location is well-designed. If that location is, in fact, the only well-designed location, zooming out to a local scale or regional scale might drastically diminish the value, creating a completely different perspective and starting point for design.

**Flowscapes framework**

The Golden Green research was conducted within the Landscape Architecture graduation lab ‘Flowscapes’. This graduation studio is an exploration of spatial, societal, and environmental issues through design research and research-by-design approaches (Nijhuis, 2016, p. 8). Golden Green researches the impact of changing spatial configurations of the Utrechtseweg on spatial, socio-economic, and mental aspects of the landscape. Therefore, this research focusses not only on lanes as road typology, but also on their spatial application and impact on both tangible and intangible aspects. As lanes are roads with planted trees, they (can) function as both transportation infrastructure and green infrastructure. In the case of the Utrechtseweg, the road is situated parallel to the river Nederrijn, connecting the location to a blue or water infrastructure, too (figure 7). For future research, it might prove fruitfull to cross-reference the analysis and assessment with blue and green infrastructures, to provide a deeper and better understanding of the system, and provide more opportunities for design.

![Figure 7 The Utrechtseweg (orange) connects cities and forests and runs parallel to the Nederrijn (blue) (by author, based on Aerodata International Surveys et al. (2017)).](image)

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Research vs. design

Design is used in different ways in order to find answers for the research objectives. Past and present design of the research location is used for both analysis, precedent study, and assessment. The past profiles of the Utrechtseweg hereby serve as a ‘library’ of examples of lane design. The design itself is applied as a field laboratory, where the capabilities and effectiveness of the lane design principles are tested. The design is also a reflection on the profession of the landscape architect: can the problems that exist within the location of the Utrechtseweg be solved through (landscape architectonic) spatial interventions?

The application of design as a form of research is in line with the Flowscapes graduation studio and follows the goal of the graduation plan. An important realization is the fact that conducting research is as much an iterative process as designing. The process of redrawing, rewriting, and checking extra sources is never truly done. There will always be another source or technique that could be applied, too. Fortunately, I have also found a joy within this process. Discovering correlation between historic sources, maps, images, and the issues on the location itself is invigorating and directly led to the formulation of the design strategy.

The importance of drawing as a means of thinking became more and more clear throughout the research. In translating the written information of the literary sources into images, it became possible to really experience, and test the different lane design properties. In drawing dimensionally stable for all scales and time frames, the data became comparable. The moments I started drawing, everything became clear.

Research vs. social context

The project as a whole connects to the wider social context on different subjects and on different scales. First and foremost the Golden Green research connects to the cultural heritage of the Utrechtseweg. The project takes in account the fast development of highways and other road infrastructures over the past 75 years and establishes how the values of the existing road structures are being lost or in danger of being lost. The Utrechtseweg has been in existence since at least the Middle Ages, connecting cities in between, and even beyond the archdioceses of Utrecht and Cologne, Germany. In this period of over 750 years a spatial richness was developed through the specific road profiles and embedding, addressing technical road design issues and the travel experience simultaneously.

With the development of motorized traffic that spatial richness is at risk of being lost completely in favour of fast and safe travel. By creating an integral design strategy this project offers a way of combining both values: designing for the future, without forgetting about the past.

Three other societal issues are addressed. The project offers a design strategy in which sustainable road design is a principal goal. The application of the design strategy offers the opportunity to not only strengthen the cultural identity of the location, but to also create long-lasting road design that takes into account the need to reduce carbon emission and other greenhouse gasses. By using lane design principles, the design strategy also improves existing or creates new connections between biotopes, hopefully improving the biodiversity in the region. As the design strategy creates a new travel experience, new socio-economic opportunities are created for the region. Access to cultural programme in the region is improved, creating the possibility for new cultural or economic developments.

As the project advanced, many (local) media reported on related societal issues. By keeping up with publications on transitions towards sustainable living and sustainable design, changing mobility concepts, and other landscape architectural development, I have been able to continuously place my research within a wide societal context: current issues like the need for CO2 emission reduction, a decrease of insect life partially due to bare road side planting zones, the structural removal of roadside trees as advocated by the ANWB, the large scale use of the e-bike and upcoming self-driving cars for the consumers market. The Golden Green strategy offers to the opportunity to really integrally tackle these issues.

Future endeavors

The lane design toolbox, the road quality assessment tool, and the design strategy could be used for other academic studies on lanes, but also in practice. The design strategy has proven to really be able to create positive change and add value to existing road profiles (figure 8). Two important steps have to be taken first in order to really apply the design strategy on the location of the Utrechtseweg.

Firstly, the design strategy should be discussed and improved through design collaboration with civil engineers. The current strategy is solely based on the knowledge and values of a landscape architect.
The feasibility of the design strategy will be properly improved by collaborating with civil engineers and other experiences road designers.

Secondly, the lane design toolbox, the road quality assessment tool, and the design strategy should be proposed to the ‘owners’ of the Utrechtseweg: Rijkswaterstaat, the province of Gelderland, the municipalities of Wageningen, Renkum, and Arnhem, and the local residents. This would help establish if these parties can see and feel the value of the method, and offer a practical clear-cut method for the cultivation and preservation of the lane structures as cultural heritage in the area.

References


Figure 8 Impact of the design strategy on the future quality of the Utrechtseweg (by author).