数字景观

——中国首届数字景观国际论坛

东南大学建筑学院
全国风景园林专业指导委员会
成玉宁 杨 锐 主编

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数字景观·南京宣言

20世纪以来，在人文艺术与科学技术的双重推动下，风景园林学发展成为人居环境类学科的重要组成部分。我们积极运用科学技术，结合风景园林学科的自律性，激发风景园林学发展的潜能，确信数字技术业已成为继生态学之后新的学科引爆点，必将实现风景园林学21世纪的飞跃。

纵观风景园林发展历程，传统的感觉与定性超越为今天的知觉与定量；昨日的虚拟成为今日的现实。半个世纪以来，数字景观技术对于推动风景园林学科的发展起了重要作用。我们关注基于数字技术、参数化手段的数字景观研究与实践，以先进的数字技术为平台，依托数字化信息采集技术、参数化分析技术、耦合设计方法等策略推动风景园林学科的进步，我们更加确信数字景观技术必将发挥创新引领的重要作用。

风景园林学在经历了20世纪的百年沧桑之后，必将走进自律性与开放性并存、艺术性与科学性共融的数字化新时代！

中国首届数字景观国际论坛

2013年11月15日

目 录

Visual Project Analysis for an Office Park: Evaluation of Method Used, Comparing Before, Simulation and After

Erich Buhmann

1 Introduction

For the evaluation of the impact of building a large-scale office park of 640,000 square meters on the surrounding landscape, a landscape visualization study was performed. The Campeon office park is the new headquarters for Infineon Technologies AG. The visual landscape evaluation study was done as part of the environmental impact assessment for the legal planning. The scale of the study is 1 : 5,000 to 1 : 2,000. These scales represent the level of preliminary planning of the development. The intention of this study was to communicate the dimension of planed development and the concern for the visual aspects of the overall design.

The changes were visualized as part of the urban planning phase from potentially representative user points. After ten year there was the need for renewal of the legal planning enabled the environmental planner to evaluate the visualization method initially used. After a period of ten years, the original simulated scenes could be compared with the current landscape.

Fig. 1 Project site as non-accessible agricultural land in 2001 prior to Development

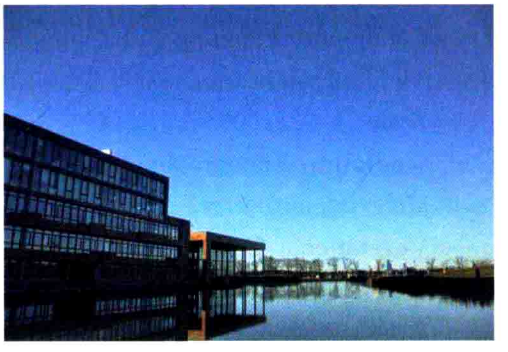


Fig. 2 Office park in spring, 2011 as open-to-the-public landscape park

This paper is concerned with describing the method used for the visual simulation of landscape change, the evaluation of the method in comparing the simulations with the built situation, and finally discussing future methods utilizing 3D GIS tools.

2 Method of Visualization

Scale and LOD

The Level of Detail (LOD) and the appropriate visualization techniques have to be considered during the conception phase of project visualization. Landscape models can be derived from different data sources for the different levels of details. In the discussed office campus project, the midsize-scale between the following three levels of detail (LOD) had been applied.

LOD 1: Regional Planning Scale: Far Distance Scale 1 : 200,000～1 : 25,000

— Landform: Radar data, 90 meters by 90

meters from SRTM (Shuttle Radar Topography Mission)

— Vegetation: Remote sensing satellite data, such as LANDSAT 80 m by 80 m

— Software: ArcGIS, ArcGlobe, ERDAS, Google Earth et. al.

— Observer location: from above (helicopter)

— Model: GIS model of existing landcover condition, data provided by Zentrum für Luft-und Raumfahrt e. V. (DLR) et. al.

LOD 2: Community Planning and Zoning Scale/ Middle Distance,

Scale: 1 : 25,000～1 : 1,000

— Landform: Topography from the state surveying authority, 10 m by 10 m

— Vegetation: Orthophotos (DOP 20) from the state surveying authority

— Architecture: ATKIS Geometry, 3D CAD from the involved engineering companies

— Software: ArcGIS, ArcGIS City Engine, Autodesk Infrastructure Modeler, 3D Studio Max, Photoshop et. al..

— Observer Location: From above, up to 20 meters above the ground and eye level

— Model: GIS model of scenarios, data provided by architect, hydrologists, environmental planer et. al.

LOD 3: User Planning Scale/ Near Distance,

Scale: 1 : 1,000～1 : 10

— Landform: Topography from the state surveying authority, 10 by 10 m performed with an airborne scanner, 1 m. by 1 m, or LIDAR data

— Vegetation: 3D Object

— Architecture: ATKIS Geometry, 3D CAD of the involved engineering companies

— Software: Lenne 3D, ArcGIS, 3D Studio Max, Photoshop et. al..

— User Location: Eye level

— Model: GIS model data provided by architect, hydrologists, environmental planer et. al..

The architect provided the 3D model of the preliminary planning. According to the zoning laws, the details included the footprint for the building, the lake, the main open park area, the building height, the clear definition of roof gardens on top of the buildings and the general colour scheme. It did not include textures or any additional details.

General Workflow of Simulation

For the first Visual Landscape Evaluation of the large scale office park, the following principal Workflow for the visualization on LOD level 2 was adapted:

Ⅰ. Preparation of Visual Landscape Evaluation

Define objectives of visualization

Select the appropriate visualization method

Decide with client on scope of study

Refine visualization method according to scope of study

Ⅱ. Visual Landscape Visualization of Images Using 3D Modeling

Choose method for Choose a method to identify viewpoints for documenting the visual character of the proposed design (defining fixed points).

Capture and geotag high resolution images from the viewpoints

Build 3D model of preliminary design

Locate the 3D model according to the viewpoints in the 2D image

Complete the 2D simulation with 3D rendering, applying 3D libraries and final rendering of 2D image

Ⅲ. Visual Landscape Evaluation

Compare "Before" and "After", quantify the proposed changes and evaluate the visual impact of these changes.

Discuss the effect of visual impact of preliminary design and suggest visual improvements

Ⅳ. Evaluation of Visual Landscape Simulation After Construction

Compare images of visualisation after construction

Suggest further changes and additions to improve and maintain visual quality

Suggest improvements for further Visualisation of Projects

Ethic Principals by SHEPPARD

According to Sheppard (1982), Appleyard (1977) had already suggested the following "public" criteria for judging a "good" simulation:

It should be realistic, accurate, comprehensible, evaluable, engaging, flexible, and cheap.

These criteria were developed further by Sheppard. In order to represent the extent of landscape change landscapes to the client and/or to the public, the landscape modeller has to follow the ethical principles of Sheppard (1989) listed below in order to show objectiveness:

— Representative Simulation
— Accurate Simulation
— Credible Simulation
— Comprehensive Simulation
— Bias-Free Simulation
— Defensible
— Engaging
— Accessible
— No "sale effects" such as animation, etc.

3 Landscape Visualization

Selection of Representative Vistas

Before development, the planning area was farmland and within the context of recreation was accessible mostly by way of the road Zwerger Allee. A highviewer frequency could also be noted from the direction of the Fasanenpark train station. Furthermore, the property could be briefly viewed by drivers on the A8 autobahn heading out of Munich. Additionally, children playing on the hill in a playground to the south could look to the area of the future Campeon office park.

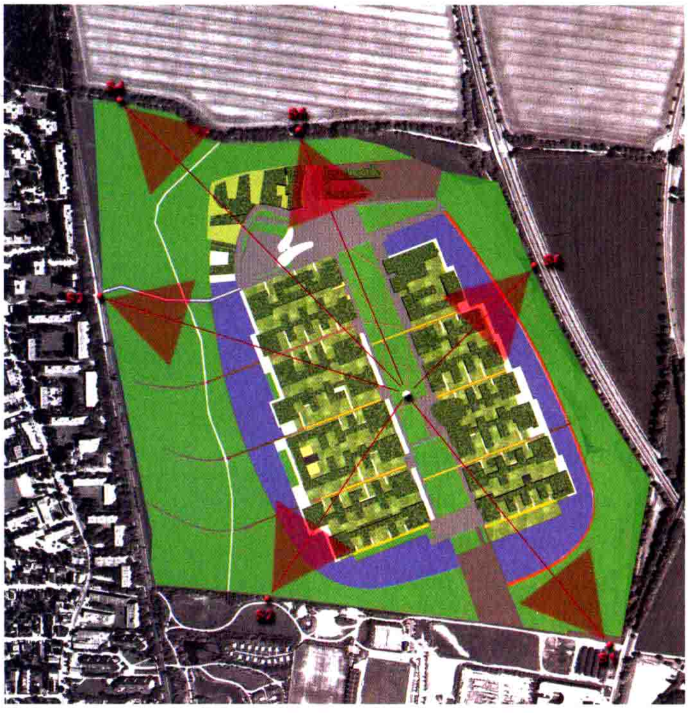


Fig. 3 Selecting representative user vistas towards the 640,000 square meter development (about 750 meter by 900 meter) from S1 to S6, and selection of view directions and view angle

Based on these conditions, the following six viewing areas were selected to compare "before and after" views

S1 View of office park after entering from the autobahn bridge

S2 View from the hill the existing playground

S3 View from Fasanenpark train station(S-Bahn)

S4 View from Zwerger Allee (I) after entering from Fasanenpark residential area

S5 View from Zwerger Allee (II) at the level of the future office site

S6 View from A8 autobahn

Dimension and Selection of View Angle

The human eye is capable of observing a landscape within a view angle ranging from 180° to 200°. As a rule however, the view is focused mostly within the range of 60° to 100°. For the visualization of individual pictures we therefore asked the professional photographer to use a view angle of 84° which was taken from a 35 mm format. If a wider view angle had been used, the horizon would have been shrunk. With the lateral view angle of 84°, a representative view angle for landscape visualization of individual pictures was chosen.

From every point where a picture was made, the view was always to the center of what would become the office park so that from every potential user point the view was directed toward the site of the future office park.

Precision of Location

All points where the photos were taken, as well as the 18 outer corners of the planned buildings, were surveyed by a surveying office according to location and height, and marked with wooden poles. For the photos, a sunny late summer day with a clear view to the Alps was picked. The photos were processed as fine grained negatives and then scanned in a professional lab. They were then burned onto PRO PHOTO CDs. The high resolution led to a data volume of 72 MB per photo file. This high resolution allowed for elements with a height of 10 cm to be recognized from a distance of one kilometer. In the method used the incorporation of the edges of the planned buildings could be, depending on the distance, placed with a precision of between 20 and 50 centimeters.

Consequently, the 3D computer model of the buildings and the planned site (elevation model of sound barrier, etc.) could be continually mounted with more points, true to scale. For the visualization of the planned trees, a height of 8 to 10 meters was used which approximated the height of the woody plants after 10 to 15 years of growth.

The planning scale data of the preliminary design from 2001 was used to create the simulations. For the landscape simulation, the proportions of the planned buildings and elements such as trees and terrain modeling were exactly rendered onto 3D computer models. The individual textures of the architecture and the detail true individual features were not stressed so as to keep the proportions of the landscape in the foreground.

In the Munich area, Foehn weather conditions allow for views of the Alps from many locations. This view is also possible from Zwerger Allee. For this reason, the Alps panorama from S4 was again presented in detail as can be seen in the enlargement.

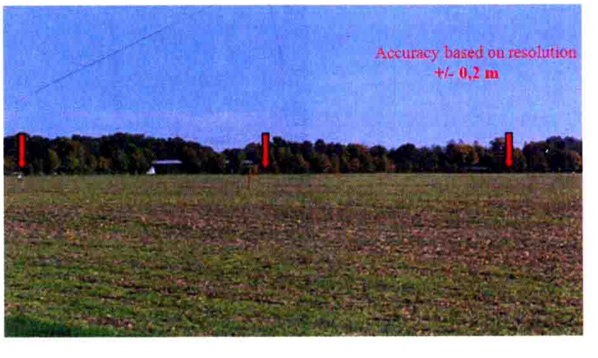


Fig. 4 Marking the building corners on site using 2 meter poles at all images taken of the existing condition "before" in order to fix them accurately in the digital model

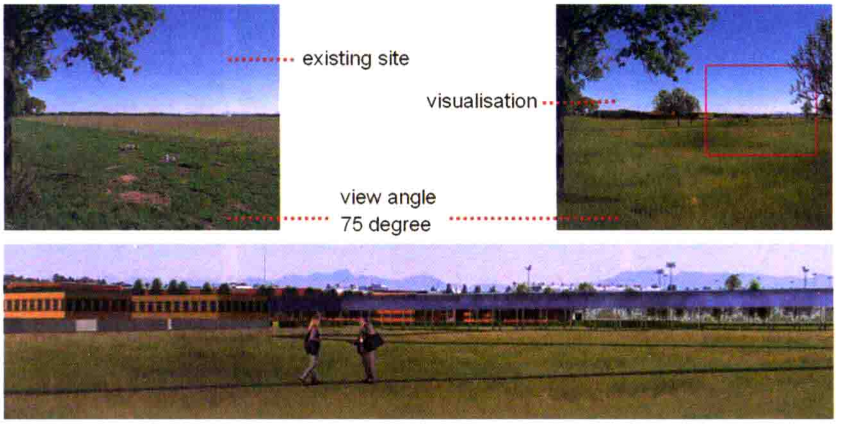


Fig. 5 Detail showing the Alpine panorama

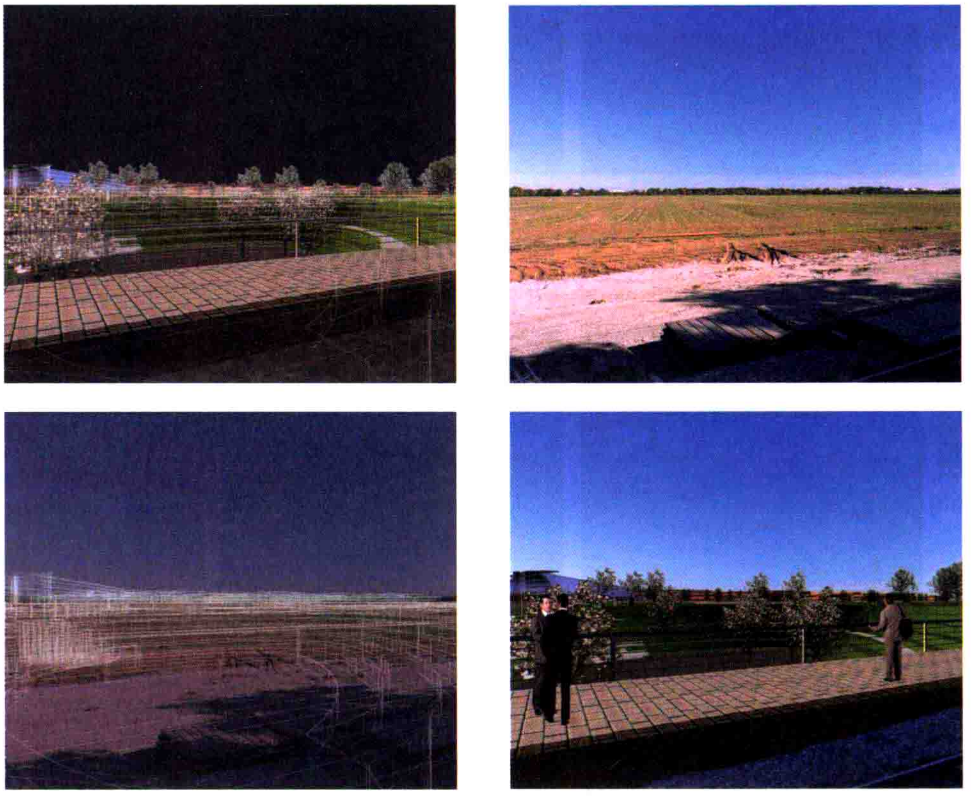


Fig. 6 The sequence described in the Workflow

a) High resolution image of existing situation

b) 3D CAD model scaled to high resolution image by the marked fix points of the building corners

c) Rendering using 3D libraries

d) Final photoshop work

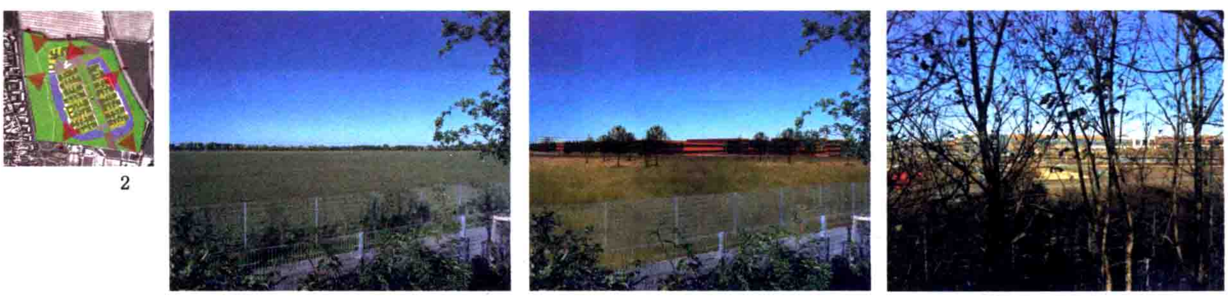
The evaluation of the visualization was discussed with the client and the architectural team. The visualization viewpoints were selected to provide a full visual coverage with an emphasis on the primary urban design features: two building free corridors, the "inner campus" and the 120 meter wide corridors towards the exiting development in the west to allow for air circulation from the rural areas in the south and to protect the vista to the Alps. The need for air circulation and the value of the vista resulted in building heights of only 4 to 5 floors (see simulation figure 5 and image of build structure in figure 2). Only two higher buildings in the north had been planned to indicate the more traditional image of a headquarters. The simulation was used for public meetings with the city to communicate the scale and layout of the built development.

After 10 years, the update of the legal planning permit for completing the not yet built plots gave the opportunity to compare the landscape simulation of the original design with the mostly completed office park.

4 Evaluation of Method Used Compared With Built Situation

2001 Simulation 2011

Fig. 7 View 1: comparing "before" — "visualization" — "built, after 10 years"



2001 Simulation 2011

Fig. 8 View 2: comparing "before" — "visualization" — "built, after 10 years"

2001 Simulation 2011

Fig. 9 View 3: comparing "before" — "visualization" — "built, after 10 years"

Fig. 10 View 4: Quantitative comparison "before" — "visualization" — "built, after 10 years"

Sample of Evaluation after Development

Tab 1 Development of distribution of main landscape elements for view 4: comparing "before" — "visualization" — "built, after 10 years"

	Before		Visualization		Built (2011)		+/−%
Sky	216	30%	129	18%	144	20%	+2%
Tree+ Shrubs	144	20%	173	24%	158	22%	−2%
Grassland	216	30%	324	45.1%	216	30%	−15.1%
Field	144	20%	0	0%	129	18%	+18%
Building	0	0%	87	12%	58	8%	−4%
Paths	0	0%	7	0.9%	15	2%	+1.1%
Cells	720	100%	720	100%	720	100%	

The set of images of the original site, of the simulation, and the condition after 10 years of growth were compared using a raster analysis of the relative amount of sky, vegetation, grassland, field, buildings and paths.

Result: The chosen method of landscape visualization described the dimension of the changing of the landscape very well. The decision, based on the dimension on the project that all views from the surrounding potential user points were towards the theoretical middle of the project was also plausible when repeating the pictures at a later time. Additionally, all user points were so accurately described in the initial study that making photos of the built condition from the same locations could be carried out with great assurance.

Differences between the simulation and condition after 10 years could be observed in the foreground through the growth of shrubs, or by changes in detail which in part were outside of the project, or by buildings which have not yet been built. Through the comparison it became clear that two planned building parcels have not yet been built on so that in these areas the amount of building in the image counts then it appears in the simulation.

One can reach the conclusion that for a project with a circumference of approximately 3,300 meters, six points for visualization are slightly too few to satisfactorily describe the changes of the landscape for any possible long term analysis. For this undertaking, before and after visualizations of the previous and future user points of the surroundings would have had to be done approximately every 400 meters. Eight instead of six simulations for a project of this size using LOD 1 information seem to be more unreasonable. As we have experienced in this study a higher number would buffer the effect of influences outside the influences of the visualization team, as unexpected changes of for grounds.

Google Earth allows for a good, generally accessible documentation of the development of the project. After searching for *Munich Campeon* and activating the icon *historic pictures*, the project can be followed from farming use in 2001 until today, including the period of construction and the current addition of the breeding pond for European Green Toads in the north-east corner in 2012. This time-travel using archive aerial photos, very clearly shows the dramatic change to the landscape. In this case the change led to a landscape park from intensively farmed land to an extensive park for the entire district, lucrative employment opportunities in information technology, as well as a habitat for a large range of species. The judgment of the changes to a landscape through a project is often very focused on the effects to certain species. However, we must admit that the overall effect presented by the simulations of the creation of the office park could only represent the visual change, and was unable to convey the major increase in value of the area for all parties concerned.

5 Future methods utilizing 3D GIS tools

At this time of real time modeling, when GIS works on all devices, when LIDAR data is at our fingertips, when data services are likely to be offered all over Europe and when GIS is finally making the attempt to get 3 dimensional, the described method of using high resolution photographs and a 3D wire frame model to generate realistic 2D images appears to be outdated. However, the basic workflow is not so very different today; all processes are faster, and there are definitely more 3D image libraries available, and many of the processes are now known routines to many young professionals in landscape architecture. During this visualisation we had been very pleased that the imaging expert Guido Liesecke, who as a trained landscape architect, understood our intention for bias free work. Today we would additionally have an interactive model of the entire office park, but we still would need detailed visualizations from representative viewpoints. It is the attempt of the author to prepare this interactive virtual version using 3D GIS and continue monitoring the development of this exciting office park of Maier Neuberger Architekten, Munich, Rainer Schmidt Landscape Architects Munich and Gtl Kassel.

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Bibliography

[1] Appleyard, D. *Understanding Professional Media: Issues, Theory, and a Research Agenda*. In: Human Behavior and Environment, eds. I. Altman and J. F. Wohlwill. New York: Plenum Press, 1977.

[2] Buhmann, E. *EDV in der Landschaftsbild simulation. Technische Möglichkeiten. Design*. In: Garten und Landschaft, 1994, 10:31-32.

[3] Buhmann, E., U. Nothhelfer & M. Pietsch (Eds.). *Trends in GIS and Virtualization in Environmental Planning and Design*. Proceedings at Anhalt University of Applied Sciences 2002. — Wichmann, Heidelberg

[4] Buhmann, E., P. Paar, I. D. Bishop & E. Lange (Eds.): Trends in Real-Time Visualization and Participation. Proceedings at Anhalt University of Applied Sciences 2005. — Wichmann, Heidelberg.

[5] Buhmann, E., & M. Pietsch. *Interactive Visualization of the Impact and of Flooding Measures for the Selke River, Harz*. In: Buhmann, E., M. Pietsch & M. Heins (Eds.): Digital Design in Landscape Architecture, Proceedings at Anhalt University of Applied Sciences, 2008. — Wichmann, Heidelberg: 152-162.

[6] Buhmann, E. & Pietsch. M. Interaktion mit digitalen Landschaften, Szenarien und Modellen. — In: Garten + Landschaft, 2008, 3: 35-38.

[7] Ervin, S. & Hasbrouck, H., Landscape Modeling: Digital Techniques for Landscape Visualization. — McGraw-Hill, 2001.

[8] Hoppenstedt A. & B. Stocks. Visualisierung von

Landschaftsbild Veränderungen. In: BFANL (Hrsg.): Landschaftsbild — Eingriff — Ausgleich. Handhabungen der naturschutzrechtlichen Eingriffsregelung für den Bereich Landschaftsbild, Bonn, 1991.

[9] Jessel, B., P. Fischer-Hüftle & D. Jenny. Erarbeitung von Ausgleichs und Ersatzmaßnahmen für Beeinträchtigungen des Landschaftsbildes. BfN Bundesamt für Naturschutz, Bonn, 2004.

[10] Krause, Ch. & E. Buhmann: Bildsimulation für Projektanalysen / Video imaging: Improvement for visual project analysis. In: Garten und Landschaft: Planen und Entwerfen mit dem Computer, 1989,10:44-48.

[11] Kretzler, E. Improving Landscape Architecture Design Using Real Time Engines. — In: Buhmann, E. & S. M. Ervin (Eds.), Trends in Landscape Modeling. Proceedings at Anhalt University of Applied Sciences. — Wichmann, Heidelberg, 2003: 95-101.

[12] Mach, R. Workflow for Interactive High-end 3D Visualization in Site Planning. — In: Buhmann, E., M. Pietsch & M. Heins (Eds.): Digital Design in Landscape Architecture. Proceedings at Anhalt University of Applied Sciences. — Wichmann, Heidelberg, 2008: 174-179.

[13] Mach, R. & Petscheck, P., *Visualisierung digitaler Gelände und Landschaftsdaten*. Springer Verlag, Berlin/Heidelberg, 2006.

[14] Sheppard, R. J. *Predictive Landscape Portrayals: A Selective Research Review*. Landscape Journal, Vol. 1. no 1. 1982: 9-14.

[15] Sheppard, R. J. *Visual Simulation, A User's Guide for Architects, Engineers, and Planners*. Von Nostrand Reinhold, New York. 1989.

[16] Sheppard, R. J. *Manipulation und Irrtum bei Simulationen. Regeln für die Nutzung der digitalen Kristallkugel*. In: Garten und Landschaft: Visual Landscape, 1999, 11:28-32.

[17] Sheppard, R. J. *Visualizing Climate Change. A guide to Visula Commincation of Climate Change and Developing Solutions*. Routledge London and New York, 2012.

[18] Smardon, R. C., J. F. Palmer & J. P. Fellemann. *Foundations for Visual Project Analysis*. Jon Wiley Sons, New York, 1989.

[19] The Landscape Institute with the Institute of Environmental Management and Assessment: Guidelines for Landscape and Visual Impact Assessment, Second edition, Spon Press London and New York, 2002.

Data Sources: Bayrisches Landesvermessungsamt, Orthofotos 1 : 10,000, Bild-Nr. 241 Bildflug 96106/1, Bild-Nr. 243 Bildflug 96109/1, AZ:DLZ-LB-2927

C. Vohler Photogaphie, München, Bestandsfotos 2001.

Yangwa Lu, Bestandsfotos 2011.

The Education of Geodesign Proponent

Stephen Ervin

1 Introduction

I am many things. A painter, an architect, builder, a landscape architect, a computer scientist. I enjoy making things, and I am a student of the art and science of representations. For 20 years I have taught in the landscape architecture department at the Harvard University Graduate School of Design where I am currently the Assistant Dean for Information Technology. And I am a Geodesign proponent.

How did I become a Geo design Proponent? I owe my education to a dozen or more very good teachers, the interaction of two or three forces, an observation about six elements, five laws, and the convergence of all of these things into one concept: the concept of geodesign.

2 Design Education

I received my Masters in landscape architecture degree from the University of Massachusetts at Amherst. In that education I had several great teachers, and I learned to understand the meaning of landscape as multi-scale and allencompassing.

For me it includes river valleys like the Connecticut River Valley where I studied, as well as forests, pleasure gardens, vest pocket parks, and bustling cities. These are all landscapes for my definition.

And I make no fundamental distinction between planning and design. As Herbert Simon says, "everyone Designs who imagines a change from the existing situation to a better one." Often times planning is used to describe design activities that cover large areas and may have non-spatial components such as policies or tables of numbers; and design is used to describe projects of a smaller often personal scale with spatial and other physical attributes such as size, shape, color, texture, and etc. This distinction is real, and is reflected in various professional practices, but many of the fundamental cognitive activities of imagining and evaluating and implementing are much the same. Some of the computer tools used in these two kinds of design are similar, too.

So the first two forces I want to consider are design and technology. In my education I also learned many formal and informal definitions of design as a process. Most emphasized the nonlinear, often unpredictable, and yet convergent nature of design. One model I find useful has seven essential components: conception, representation, communication, fabrication, inhabitation, perception, and measurement or analysis. In this model these are connected in a circle and it matters not where one begins. It is often the case that conception of some design idea is followed by representation in the form of drawings, for example, followed by communication, to a client perhaps, and thence by fabrication, say by a contractor, into inhabitation by somebody. But we can also imagine starting with inhabitation, in which the inhabitant has some perception of her surroundings, may detect some mismatch, and by measurement and analysis — say the room is not light enough or the door not wide enough — proceed to a conception, or a plan, or a design, for improvement... These categories are not all clear cut,