

APPLICATION OF COMPUTER VISUALISATION TECHNIQUES IN PROJECT NEGOTIATION: THE NONTHABURI SUSTAINABLE CANAL DEVELOPMENT PROJECT IN THAILAND

Gunnar Wiessner

United Nations Centre for Human Settlements (UNCHS), Thailand

Richard M. Levy

Associate Professor, University of Calgary, Canada

The Project Idea

For centuries Bangkok was known to the outside world as “Venice of the East”, where water traffic on the Chao Phraya River with its vast network of adjacent canals almost replaced road traffic as the major means of urban transportation. Old prints and photographs show the Bangkok canals as a picturesque urban landscape of wooden houses, built on stilts in traditional Thai architecture, with dense plantations of coconut palms in their backyards. Rapid urban growth over the last decades, however, fostered massive road building, accompanied by systematic filling of the traditional canals. Apart from a very limited number of meanwhile heavily polluted canals in downtown Bangkok on the Eastern bank of the river, only a few and rather unspectacular canals remain in the area of Thonburi on the Western bank.

A few kilometres North of Bangkok, however, close to the city of Nonthaburi -- a municipality of about one million residents, but practically a suburb of Bangkok -- the canal landscape of the Bangkok Noi and Khlong Om canals to some extent still preserves the special value of this nowadays rare

urban settlement pattern in Thailand. While canoeing on these canals along traditional stilt houses and through orchards and coconut plantations, visitors easily forget that they are just a mere hour away from Bangkok's bustling city centre. Luckily from the perspective of today's spectator of this unique area, the Nonthaburi canals were largely bypassed by urban infrastructure development due to their location at the fringes of Bangkok's geographical expansion. Persistent lack of government funds in these less well-off parts of Greater Bangkok additionally limited the extent of public infrastructure construction, especially road building.

Over the last couple of years, however, Bangkok's uncurbed urban growth has been more and more encroaching to the canals of Nonthaburi. Shaken by the foreseeable disappearance of the last urban canal network of Thailand's capital, several Thai architects, government officials and urban planners identified a need for protection of the area as a part of Thailand's national cultural and environmental heritage.

First discussions

In April 1999, the Social Research Institute of Bangkok's Chulalongkorn University organised a workshop with support from UNESCO and the United Nations Centre for Human Settlements (UNCHS) to identify future development scenarios for the area. In July 1999, the initiative was taken over by the UNCHS Urban Management Programme (UMP) for Asia and the Pacific as a facilitator of inter-governmental discussions, and first negotiations were held among representatives of the provincial and municipal governments of Nonthaburi to consider the possibility of a joint project activity to identify a comprehensive development strategy for the canal landscape.

A major challenge to the idea of a joint planning project right from the beginning was the need for proper coordination processes among the various governments and government agencies concerned. In addition to the provincial and several independent municipal governments, a number of smaller "rural"

administrative districts (*tambon*) are found in the area, each of which is presided by an independently elected head. In the light of such administrative heterogeneity, it was understood that only close cohesion between governments at all levels would be the key to a successful initiative. However, as a consequence of the rather centralised administrative structure of Thailand, experiences with horizontal coordination among lower administrative levels are generally limited.

Figure 1. Typical view of traditional housing structures along the Bangkok Noi canal



During these early meetings with government representatives it became further evident that the development of a common future vision for the area would provide another major challenge. Experience had shown over the years that different government departments were uncoordinatedly pursuing different development strategies for the area in question, many of which with vaguely defined or even contradicting objectives. As an example, government officials mentioned that plans to build a six-lane highway right through the middle of the canal landscape conflicted directly with plans of other agencies at different governmental levels to develop the area into a destination for local tourists as the first eco-friendly natural recreation zone for Greater Bangkok.

Diverging views

During these initial discussions, while all agencies concerned agreed on the specific environmental and cultural value of Nonthaburi's canal landscape, it became also clear that the idea of a planning project was generally met with mixed feelings. Concerns were expressed, for instance, that any ecological preservation might only be possible at high opportunity costs considering the economic development alternatives foregone. Such alternatives were mainly seen in accordance with experiences in most other Bangkok suburbs, where residential areas, commercial centres and even industrial zones are developing in close vicinity of each other with almost no governmental intervention to keep them separate. This pattern of "laissez-faire" urban development, it was emphasized, has been the basis for Bangkok's remarkable economic growth over the last decades with market supply and demand rather than governmental restrictions being the main forces behind the emerging pattern of urban settlement.

To illustrate the importance of this argument in the case of Nonthaburi, attention was drawn to the fact that real estate companies already started to accumulate land property in the agricultural hinterland of the canals, where land was currently only used for low-profit economic activities such as fruit cultivation and for the production of the well-known Thai orchids. Based on these considerations, it was emphasized that systematic real estate development,

which would eventually lead to the construction of high rise apartment buildings and the establishment of small-scale industries, might result in higher economic returns and higher tax-income for the government.

On the other hand, the growing need for recreation space for Bangkok residents was stressed. It was pointed out that the unplanned nature of Bangkok's urban development over the last decades, fostered through low transparency in real estate development and land use speculation, has resulted in an almost complete and irretrievable loss of open spaces. Consequently, Bangkok's millions of residents today were facing the fact that they had access to only two parks of adequate size in the densely populated parts of the inner city. Furthermore, unregulated urban sprawl within a radius of approximately 120 km around Bangkok has made it extremely time consuming to escape the city, even for a weekend. At the same time, however, in assumption of continuing growth of Thailand's economy and predicted changes in employment structure and labour productivity, it was to be expected that demand for recreation space in Bangkok will even further increase in line with the increase of disposable income and leisure time of a growing urban middle class.

These developments, it was mentioned, would have a major economic impact on the Nonthaburi canals. Over the last years more and more middle class residents have already begun to buy houses along the most scenic canals, while a few tourist companies set up businesses to take mostly local tourists from Bangkok through the canal network. These observations combined with the socio-economic trends mentioned above promised even significant long-term economic benefits from a systematic planning project aiming at a preservation of the environmental and cultural value of the area.

The need for visual elements

In discussions of these diverging views at times misunderstandings evolved. The "laissez-faire" approach, for instance, was partly understood as granting the right to greedy profit-maximizing investors for setting up polluting factories at canal banks, for logging of the remaining plantations in the hinterland, and for

tearing down traditional housing to construct high-rise apartment buildings of low architectural value instead. On the other hand, the “preservation” approach was misunderstood as advocating a museum-like conservation of a lifestyle of the residents at the canal banks, which was perceived to be “old-fashioned”.

A particular reason for these misunderstandings, it was identified, was the difficulty to describe “visions” verbally. Consequently, the suggestion was made to introduce visual elements into the discussion in order to facilitate a common understanding regarding potential outcomes of the planning project under negotiation. These elements should actually make the ideas of individual officials “visible” for the whole group as a more illustrative basis for the debate. In evaluating options of the various visual tools at hand, including tools such as drawings and photographs, in the end a number of considerations strongly suggested the introduction of computer visualisation techniques.

Evaluating the Virtual Testing Environment

As the most convincing argument it was stressed that a CAD (Computer Aided Design) based approach encourages a critical examination of different urban design scenarios in the most flexible way. Unlike a single architectural rendering, computer modeling can reflect a much broader range of possibilities. A single proposed change in a design regulation or the cumulative impact of alternative scenarios, for instance, can be tested at any urban scale. Design issues such as massing, density, public access, open space, landscaping, zoning, viewscales, sun and shade, can easily be addressed within this interactive environment. Digital models of cities also enable urban communities and other stakeholders to visualize the issues critical to the design of their cities adding realism to the debates. Even though the opportunity to use computer modeling as a tool to shape public opinion early in the planning process is still not widely used today, more and more cities in the last decade have embarked on the creation of fully detailed CAD models

of their downtown districts (Brenner, 1998; Hamit, 1998; Liggett and Jepson, 1993; Littlehales, 1991; Mahoney, 1997).

An additional key aspect of computer modeling of urban environments is the ability to generate images from multiple viewpoints on demand. Experiencing a computer model as an animation, VR (Virtual Reality) world or QTVR (QuickTime's panorama format) can give community groups, planners and real estate developers the experience of the pedestrian or of the passenger in an automobile, bus or water-taxi. This experiential perspective stands in marked opposition to the more traditional approach in plan review. Here, participants must project in their mind's eye a three-dimensional view of the project based on a series of two-dimensional elevation and plans. It is doubtful that even among design professionals this approach results in a common shared vision let alone among lay people. Often members of the community are compelled to simply accept the professional judgement of architects and planners (Knack, 1991; Forester, 1989). Having an accurate image of a proposed development can empower a local community group by focusing energy and communication on areas of common concern.

Unlike traditional media, a computer model is also independent of the image. A variety of products can be produced from a computer model depending on the requirements of the project. According to the audience, an appropriate forum can be selected for the distribution of images including WEB, video, VR or display panels. Although there is no guarantee that computer visualization will reduce the time and energy spent in community consultation, it may lead to a more equitable policy through a greater clarity and accuracy in the visual representation of urban design alternatives.

Building the Computer Model

In the case of Nonthaburi, the decision was made to model two scenarios based on discussions and findings of previous workshops and joint field trips of government officials and canal development experts. The first scenario would be a portion of the canal as it might look in the future if no regulatory

guidance was in place. This would offer decision-makers a possible view of an uncontrolled future to contemplate. The alternative scenario would consider how the same section of the canal might look if specific development controls were in place. These controls would limit use, building form, the location of bridges and canal treatments along the water edge.

An underlying assumption during the construction of the model was that the goal of any proposed by-law or architectural guidelines would be to encourage the preservation of the canal's visual character. For instance, limiting the massing of buildings to two-story residential structures would maintain canal views of the trees and foliage immediately behind and adjacent to existing development. In addition, it was assumed that the use of local materials and architecture that relies on traditional building forms as models would result in new development sympathetic to the existing traditional architecture. Finally, barring the construction of highway bridges over the canal would help preserve the character of vistas and eliminate a major source of sound pollution in the immediate area. Although in the future other permutations of the model may be tested, as an initial test, two scenarios showing the canal with and without regulatory guidance were constructed (Table 1).

Table 1. Examples of Proposed Design Guidelines

Without guidelines	With regulatory guidance
Multi-story apartment buildings	No apartment structures would be permitted
Industrial buildings	Industrial and temporary buildings would not be permitted
Residential buildings	Residential buildings permitted
Highway bridges	Construction of highway bridges would not be allowed along scenic portions of the canals
Concrete retaining walls as flood protection walls	<ol style="list-style-type: none"> 1. More compatible forms such as earth dams would be used along the canal edge 2. Use of overflow areas in case of high canal levels would be encouraged

The source of the specific features in the model was photos and video taken early in 2000 from a water-taxi on the canal. During the construction of the model, rather than modeling a specific portion of the canal, proto-typical buildings and landscape features under design review were assembled along a one-mile portion of the canal. This approach would guarantee that a 20-second animation created from the model shows all of the key elements in each of the two scenarios.

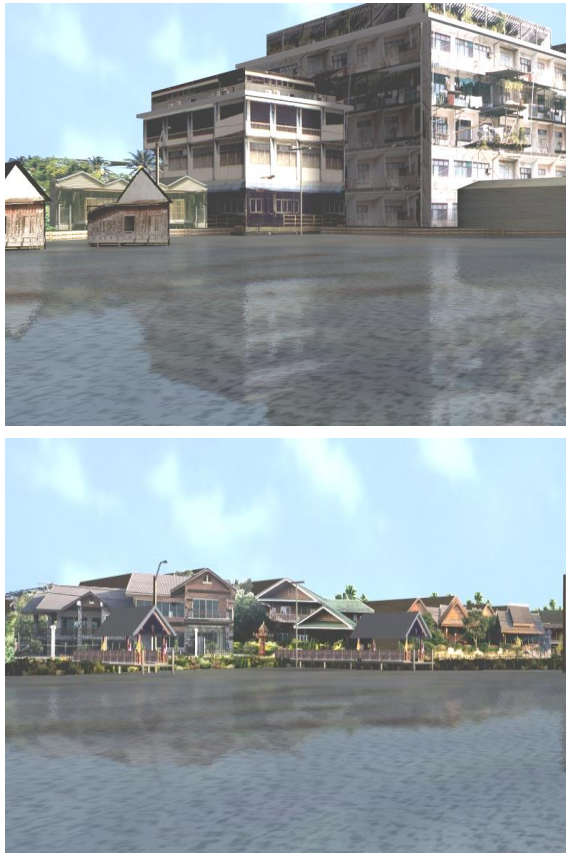
The actual model was built in 3D STUDIO VIZ (Kinetx, Inc), a professional modeling and rendering application used in architectural rendering and in the production of video games, CG (Computer Generated) animations and special effects in film and video. The technique applied in constructing the model was to create simple geometric primitives with applied image maps. Most important, this approach generates photo-realistic view along the canal. Output from the first test model was reviewed by establishing a website for the Nonhaburi project (<http://www.acs.ucalgary.ca/~rmlevy/Noi/index.html>). Both images and interactive panoramas (<http://www.imove.com>) were placed on this website. Changes could then be made and the website updated as new images were produced. For the final review a PowerPoint presentation with embedded animations was created along with a supporting video and website.

Building Consensus: Developing a Common Vision

The final model (Figure 3 and 4) was presented to the government officials on 21 March 2000. Over the following weeks, the model was frequently quoted in discussions as a common source of reference. At the same time it was observed that individual suggestions of development approaches, particularly concerning the necessity of introducing building regulations, became more illustrative and were easier understood by others. The discussion also began to focus sharper on specific technical details, such as how building guidelines exactly should look like and how the co-ordination between physical planners and planners involved in identifying suitable economic development strategies could be intensified. The agencies

concerned in general felt easier in advocating ideas, as the flexible and adaptive nature of the model encouraged proposals to add or remove certain elements.

Figure 3. Computer visualization of development scenarios, view of along the canal.



Note: The two views generated from the computer model show the canal without regulatory guidance (top) and with the proposed design guidelines in place (bottom).

**Figure 4. Computer visualization of development scenarios,
view down the canal**



Subsequent to the presentation of the model, the 16 local governments of the canal landscape and the provincial government of Nonthaburi agreed in April 2000 to establish cooperation mechanisms among themselves with the purpose to jointly identify a sustainable development approach for Thailand's last remaining urban canal landscape. The application of computer visualization techniques thus did not simply serve as a more contemporary and more convenient tool of architectural design. Beyond the plain technical aspects, the computer visualization applied in Nonthaburi helped enhancing the generation of ideas in discussing various development alternatives and helped avoiding a threatening deadlock in initial negotiations. The most valuable contribution of the computer model was therefore not the visualization of architectural elements as such, but the positive impact the visualization had on the underlying political flexibility of the project.

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