

FINDING VALUE IN CHINA'S ENVIRONMENT

Munsell McPhillips, Ph.D

Author's Biography

Munsell McPhillips has participated as a team member in Value Analysis since the mid 1990's. She has practiced as a science advisor to a governor, a research scientist, and designer in river and ecosystem restorations throughout the US. Her designs evolved from biomedical engineering for human health to sustainability design for the planet. Her Value Analysis projects with Strategic Value Solutions, Inc. have varied from manufacturing, restoration design of natural systems to transportation.



Abstract

China's rapid growth and new emphasis on sustainability can produce either intractable design conflicts or exciting opportunities for creativity. In a recent project outside Tianjin, PRC, Value Methodology helped achieve the later. The author is part of a team of wetland/stormwater designers invited to bring this technology to a fast track design of a city with housing, schools, commercial/ industrial and entertainment facilities for 50,000 people. The entire complex had a three-year construction period and included stringent water quality standards. Over the course of the VM study, the essential elements of sustainable design were integrated throughout the project and a true team was created. Value Methodology, particularly function analysis, was critical to the process. In this application VM was used as a design tool rather than for project review. The project was successfully constructed and the designers are incorporating the methods learned in other projects throughout China.

Introduction

China is grappling with a staggering population, rocketing economic growth and pollution problems that are literally breath taking. It is difficult to overestimate the scale of the challenges facing this country or the energy and determination of its people to overcome them. This paper describes the application of Value Methodology to a large civil project near Tianjin in northeastern China. At Dongli Lake, the largest commercial developer in China is building what they call a new development. It's what most of us

would call a new city. Housing, commercial, recreation and the entire assorted infrastructure for 50,000 people is under design and construction simultaneously. The aspect of the project that was most problematic to the local design team was a water treatment wetland in the heart of the city. Its purpose is to receive and treat all of the water that falls on the development. The government as a condition of the building permit required the wetland. Water quality wetlands are well understood in the US and are both common and effective. This technology, however; is not well developed in China. Moreover, the Dongli Lake case has some particularly challenging features; the site receives less than 12 inches of rain each year to feed the wetland, the development is ultra dense generating increased runoff volumes relative to most US developments of the same area and the region has highly saline groundwater, a problem inherited from four thousand years of intensive agriculture.

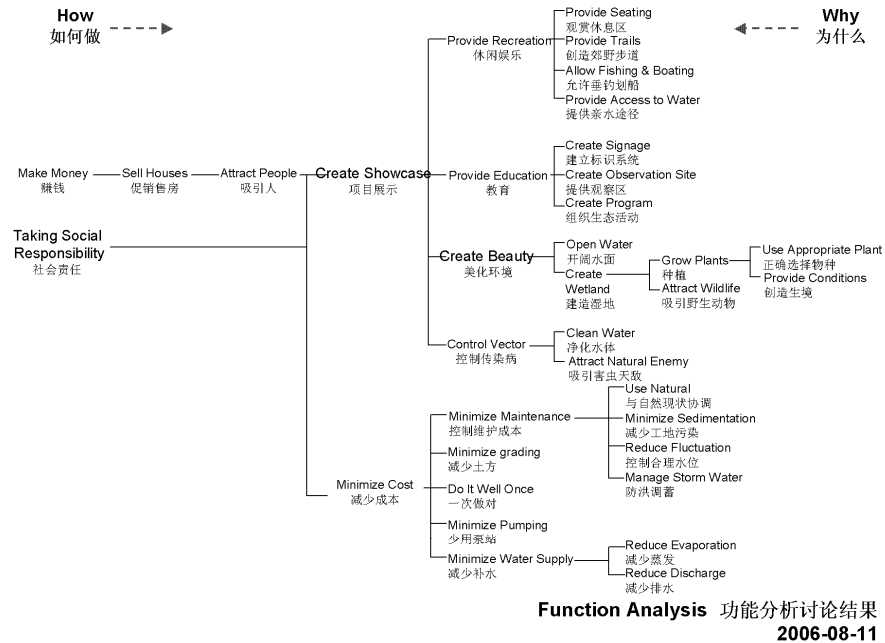
The Value Methodology Process and Project Design

The Tianjin designers are superb engineers in their own right; the purpose of the Western technical team was to fill in a very specialized gap in technology. However, a functioning wetland cannot simply be plugged into an ongoing design. To be effective, the entire stormwater system must be integrated into the design. Moreover, the project owners required that the wetland be the primary aesthetic feature of the development. The combination of near-simultaneous design and construction, cultural differences and a design team that though excellent, had no prior experience with the technical aspects of wetland design made the one week VM workshop/design challenging. The time and performance constraints placed on a multinational, multidisciplinary team were intense.

After a brief but tense opening session in which the VM team leader negotiated a short break in construction, the information phase generated both surprises and new challenges. Wildlife is essential to wetland function and habitat development is integral to any wetland design in the US. At Dongli Lake, the concept of setting aside space designed specifically for animals was greeted with intense skepticism and a bit of disdain. The bilingual members of the design team helped the westerners understand that in China, agrarian for thousands of years, animals were for eating or for pulling a plow. When the people are so crowded, making room for animals was just not considered appropriate. Moreover, a panel of senior academics advising the project made it clear that animal habitat is ridiculous – no one living in the city would want it and no human could possibly know how to build it anyway. The subject should not be raised again.

The Function Analysis phase provided the critical breakthrough that dramatically altered the project. The FAST diagram was generated in Chinese with English subtitles. This process worked well even though the verb-noun constructs don't translate very well into Mandarin grammar. The team leader kept asking "what must you do to make this new development a success"? Finally the entire project team settled on the Basic Function. There were two things that are absolutely necessary, without which this new city will be a failure. They said "We must create beauty and protect society." That is a great place to

start a design conversation but it is not at all where anyone in the room thought this exercise was going to lead. In the rush to build, these larger goals had lost a little focus. Once the designers had said out loud that their purpose was to create beauty and protect society, the project changed. The wetland was never a trivial part of the project or the designers would not have brought a bevy of foreign consultants over to help. But it was mostly understood as an aesthetic feature to help sell houses with a dose of water quality treatment thrown in. However, once we all started talking about beauty, the previous notions of that concept which had been limited to pretty paving stones and nice kitchens expanded quite a bit. When examined in this framework the apparent conflicts between sustainability and profitability were revealed as illusory. The FAST diagram for the project is depicted below.



The project site visit did not occur until just after the Function Analysis. On the construction site in the midst of all the heavy equipment, exhaust pouring from tracked vehicles and earthmovers everywhere, a black-necked stilt landed in a muddy pond. We wetland designers noticed the bird, admired it for a few moments then turned back to the drawings. But the chief engineer didn't turn away from the bird. The lead engineer watched the bird for a long time before saying finally, "Its pretty, maybe the people *would* want to see it" He regarded the wetland designers with a take-no-prisoners stare and said "Do you really know how to make birds come here?" Suddenly the wetland didn't just have to look good; it had to be good. The wetland then became about life – all

life. What must the entire project look like to keep the water clean enough to support fish and birds and insects? We also had some interesting discussions about a bird's need to be left alone. The idea that the wetland would include nesting islands designed to deliberately prevent people from accessing them was a shock. When there are 1.3 billion people to house it isn't easy to choose to share the space with avian neighbors. Nevertheless, the final version of the wetland drawings included some hummocks labeled "bird privacy areas."

Once the Function Analysis sparked the shift in understanding of the project and the beautiful bird indicated the possibilities, the Creative phase finally pulled the whole team together. Each member of the VM team, including the leader was an accomplished designer in his or her own right and any distinctions between companies, countries and disciplines quickly dissipated. In the development phase, the FAST diagram was the designer's touchstone, allowing the team members to quickly focus on and integrate new technologies into more traditional design approaches. For example when the team members were focused on developing ideas related to minimizing sedimentation, it became easy to see how both the civil and wetland designers had a part to play and the design "silos" that often plague large, complex projects never materialized. In the Idea Development phase, the technology transfer occurred at a furious pace. Wetland designers are accustomed to quickly generating rough calculations of hydraulic retention time for pollutant removal. This and other concept-level design methods for sizing pumps, setting lake elevations, evaluating basic hydrology and generating plant quantities were not commonly used by our Chinese counterparts until this study. In turn, the Western teammates got a crash course in Feng Shui design principles. We learned how to include those principles along with our more familiar disciplines of site layout, plant biology, ecology and soil bioengineering. Moreover, our Chinese colleagues had a clearer sense of place built into their design approach, a skill that many Western designers would do well to emulate. In such challenging circumstances a design approach must be robust enough to cope with rapidly changing conditions so that regardless of regulatory or economic changes, the central elements of the project remain in focus. The VM process provided that framework.

Results

By the end of the VM study the core designers surprised their western colleagues and perhaps themselves as well. It is difficult to imagine what happened next occurring stateside in a private development though our world would be better for it. Our Chinese colleagues sketched out a science station at the edge of the marsh so that everyone in the city can understand how it works. They planned to build an exhibit to help the residents recognize the plants and animals and show how each depends on the other, how wetland processes clean the water and to put in testing equipment so the people living there can make sure that the wetland is working. They planned to display some of the basic calculations of stormwater and wetland design so that children can learn the science and engineering behind treatment wetlands because many more wetlands must be built to help clean the polluted water in China. They explained to us that the Chinese people fully

understand the magnitude of the environmental problems they face and will quickly adopt and adapt new ideas that will help them. The finished wetland is not the product of some imported westerners. We will have supplied some necessary technology but the overall sense of the place is Chinese. Within one week using the Value Methodology the team had developed a preliminary-level



design incorporating all of the major functions. In VA terminology, this represents a near-100% acceptance of the developed ideas. Over the following two years, the core team completed and built the design with only minor revision.