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HARBIN RIVERNORTH SUSTAINABLE PLANNING: AN INTEGRATED APPROACH

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Summary

In July 2004, the Harbin Municipal Bureau of Planning, Songbei Branch conducted a charrette to focus on environmentally sustainable design and development opportunities for the planning and construction of a new district north of the Songhua River. This new district, the Songbei District, is to become the new administrative center for the Heilongjiang Provincial Government and the Harbin Municipal Government. In addition, the city of Harbin sees the opportunity to create a model sustainable city, which would set a new standard in China and beyond.

A team of experts in the field of planning, architecture, energy, and water, led by Environmental Market Solutions, Inc, (EMSI) were assembled to review the current master plan for the new district, identify opportunities for sustainable design and development, and create district sustainable development guidelines.

The vision statement created for the Harbin Rivernorth New Development embraces the ideal that it can become a world class ecological community, achieving international recognition. Songbei District can set the standard for a sustainable community in China – and the World.

Harbin Songbei has shown great leadership in setting goals for a sustainable community and assembling an expert team to realize this vision.

1. Introduction

The World Bank predicts that by 2015 half of the world's new building construction will take place in China. The vast majority of these projects are large—commercial office buildings between 100,000 and 150,000 m2 and residential developments that span more than 500,000 m2 of construction area. China's entry into the World Trade Organization and its subsequent investment boom is spurring new real estate development across the nation, and Beijing's successful bid for the 2008 Olympics will result in billions of dollars in new construction in the capital. China's Ministry of Construction (MOC) estimates that China will add 2 billion m2 in new construction in 2005 and will double its current building stock by 2020 (Langer et al, 2004).

The booming construction industries in major cities are increasingly drawing concerns among government agencies and scholars about the sustainability of the industry itself as well as its implications on the country's development. Over the past few years, there have been initiatives to introduce the concept of sustainability and "green" to these industries.

1.1 A New Government Priority

For the majority of the last 20 years, the government's top priority has been economic growth. More recently, however, environmental degradation has become so severe that, in some areas, it threatens to undermine economic growth. China's State Environmental Protection Administration (SEPA) estimates that damages from pollution total nearly 10 percent of annual GDP. Though much of this pollution stems from increased manufacturing for the domestic and global markets, China's rising demand for electric power, which is predominantly fueled by coal, is a growing factor. Electricity production accounted for 34.2 percent of China's air pollution last year. Water, too, is short in two-thirds of China's cities, with less than half of the water fit for human contact (Langer et al, 2004).

Environmental problems have prompted national, state, and local governments to emphasize environmental protection. China budgeted $84 billion for environmental projects in the current five-year plan (2001–05). Shanghai's annual budget for environmental protection is a healthy 3 percent, and Beijing has allocated roughly $12 billion for environmental projects in preparation for the 2008 Olympic Games. These funds accompany a host of new government initiatives: research into new technologies, creation of green product certification and labeling programs, demonstration projects, and a flurry of green building seminars across the country. Shanghai, in preparation for the 2010 World Expo, is planning to move or overhaul hundreds of factories, residential housing, and other buildings to meet environmental codes. The municipal government has also established the Shanghai Green Building Council and has hosted three international conferences on green construction in the past half year alone (Langer et al, 2004).

Certain progressive cities are beginning to offer financial incentives to developers using energy-efficient building technologies. For example, the Shenzhen municipal government recently announced interest-free mortgages for hotels that install thermal ice storage system, a technology that shifts energy consumption to off-peak hours (Langer et al, 2004).

These measures clearly cue real estate developers to the government's position behind environmental protection. With few exceptions, neither national nor local governments are currently offering tax breaks or other incentives. Nevertheless, Chinese real estate developers are showing increasing curiosity (if not interest) in green building technology. Supporting the genuine interest is a practical consideration: responding to governmental priorities can only help developers who are constantly seeking land concessions and building approvals, uninterrupted electric power, and other benefits (Langer et al, 2004).

1.2 Low Impact Communities

Development is generally destructive to local ecology and has negative impacts to the global environment. Air, water, and soil quality are all jeopardized the instant the first line is drawn; excessive amounts of limited natural resources are stripped, often from locations far from the project site, and transported several times over to finally reach a project site; and habitats are lost when undisturbed land areas are encroached by human development. It is a necessary component of human living to develop—to create more sophisticated environments in which to live and work. However, there are less destructive methods of development that do not compromise our need for the built environment.

Decisions made at a planning level for real estate development usually have the greatest impact on a project's sustainability. Issues of building orientation, solar access, transportation relationships, water management, and environmental integration are greatly influenced by master plans, which may facilitate or negate opportunities for sustainable design. Decisions responding to the intrinsic relationship between people, nature, and technology made early in the development process provide significant benefits toward sustainability for large scale projects and can have far more impact than those made on a building-by-building basis.

The goals for sustainable master plan development projects must be established up front in the design development process. Establishing goals early sets a clear direction and provides benchmarks for success.

Ultimately we are talking about the creation of thriving communities in balance with a healthy environment. These communities are called *Low Impact Communities*. *Low Impact Communities* can achieve levels of social well-being, economic prosperity and environmental health that are superior to common community development practices. Low Impact Communities are planned in such a way that people are part of the site ecology. Strong bonds are formed between neighbors, the larger community, and the environment.

Low Impact Communities are holistic developments, placing importance on both horizontal (site) and vertical (buildings) components, which is achieved by bringing together experts in a variety of specialized fields (such as design, planning, architecture, engineering, ecology, and finance) to work hand in hand with the client and their design/development team. The integrated design approach results in better planning by eliminating the linear, or additive process, which breaks down not only the mission of the master plan and the future architectural expression, but also the unity between the two. The performance of building systems, budgets, as well as schedules are also affected. An integrated design can lead to a more marketable, economically viable, and environmentally sustainable development.

1.3 Harbin Rivernorth New Development

The city of Harbin, located in northeastern China, is currently in the planning and initial construction phases of a new development of urban proportions. Seeking to expand the city north of the Songhua River, Harbin intends to create three new city districts totaling 54 square kilometers from the ground up. This region is largely green land with only sporadic small scale development. The land is dominated by the flood plains of the Songhua River, the large area of wetlands, and outlying agricultural sustenance farms.

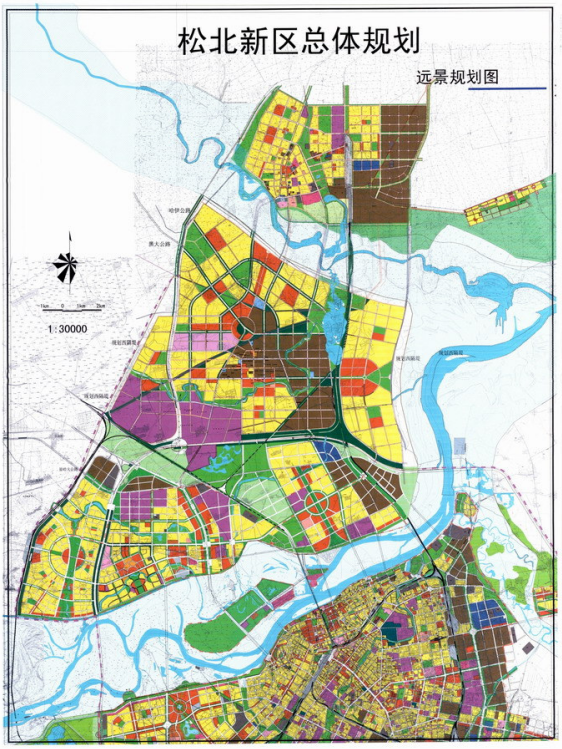

Figure 1 Map of the Rivernorth New Development. The existing city of Harbin is to the bottom of the figure, on the south side of the river.

Recognizing the impact that such a large development would have environmentally, the Bureau of Planning sought to create a model "ecological city" with stringent standards for environmental protection. Members of local government, namely the Vice Mayor of Harbin, and that of the Bureau of Planning had the foresight to seek expertise early in the process. An international team of experts in the fields of sustainable design and development, led by Environmental Market Solutions, Inc. (EMSI), were assembled to review and critique the master plan for the Rivernorth Development during its design phase. This process was intended to begin with an intensive and integrated design charrette, or workshop. The charrette process is an essential tool in the development of sustainable planning and development. Through the collaborative charrette environment, effective learning, communication, problem solving and innovation transforms the planning and design process, resulting in an infinitely better development.

Building on the work generated in the charrette, the next step involved the development of detailed design guidelines and strategies for the Rivernorth New Development. These guidelines and strategies detail design direction for the entire project including site planning, landscape design criteria, architectural design criteria, water and wastewater strategies, materials selection, and energy and water use guidelines. In essence, this document will become a guide for directing the entire development over the next 15 years. EMSI's team approach was to identify the strategies that could be employed in the project, provide an initial assessment of the feasibility or viability of those strategies, and provide guidance to the land planning exercise to incorporate the strategies.

2. The Guidelines

2.1 Goals

The goals for the new development identified by EMSI's team were developed during the initial design charrette. Focusing on "ecological preservation", as defined by the Bureau of Planning, these goals were required to be broad and all encompassing. Ultimately the target was to pursue the creation of a low impact community (on an urban scale).

1. Protect Natural Resources (Air, Water, Soil)
    a) Heat Island Reduction
    b) Erosion Control / Soil Health
    c) Air Quality (Indoor and Outdoor)
    d) Water Quality
    e) Water Conservation

2. Provide a Healthier Living Environment
   a) Balance between Landscape and Built Form
   b) Integration of Natural Open Space Elements
   c) Less Toxic Living Environment
   d) More Natural Light and Ventilation
   e) Reduced Use of Automobile

3. Reduce Energy Consumption
   a) Construction Methods
   b) Materials
   c) Transportation
   d) Building and Systems Operations

4. Preserve Ecological Health (Plants, Animals)
   a) Habitat Preservation / Enhancement
   b) Sensitive Species Preservation
   c) Enhancement of Biodiversity
   d) Preservation of Ecological Diversity
   e) Protection of Valued Resources

These goals were then organized into six categories with a vision established for specific category that laid the groundwork for the specificity of the guidelines that followed.

2.2 Water

Clean water is a precious resource in Harbin, and it is probably the most significant element in developing the city that encourages tourism, industry, ecological balance, public safety, and a high quality of life for city residents. It is necessary to consider the responsible use and protection of water at every point in the water cycle, from the time the water falls on the land as precipitation, to the final discharge of water into the river. The City of Harbin, specifically the area north of the river, has a unique opportunity and a responsibility to minimize the impact and maximize the ecological benefit of urban development. Managing stormwater, providing clean drinking water, recycling water, conserving water, minimizing the impact on the groundwater resource, and enhancing the water quality in the Songbei River will encourage tourism, business, and new residents to come to Harbin. The water cycle is completely connected; a complete clean water strategy must include cost effective, maintainable, and integrated strategies for stormwater, greywater, groundwater, irrigation supply, and drinking water.

2.3 Transportation

The City of Harbin is in the unique position of establishing an efficient transportation network from scratch. A proper approach towards transportation planning requires that Harbin strive to meet the community's public transportation needs so every segment of the population is served efficiently and with an appropriate level of service. Public transportation will be able to fill the role of a viable and attractive travel alternative for all residents and workers in the Rivernorth New Development.

Progressive and active planning for key elements of the transportation grid is important to providing an infrastructure that is efficient and promotes sustainable growth. A properly planned, efficient transportation system will use less resources from private and public sources, will increase public well-being through reduced commute times, and will foster healthy economic growth . Proper public transportation is developed through careful attention to land use planning. In addition, the following opportunities should be explored:

1. Multi-modal transportation
2. Bus rapid transit
3. Light rail
4. Bicycling
5. Commercial Inter-modality
6. Parking

2.3 Energy

Second to water, energy is a commodity that we can do little without. The building sector is largely responsible for the growing needs of greater energy generation, accounting for an estimated 30-35% of China's commercial energy use. The energy appetite is so great in China that in 2005 alone an additional 50 gigawatts of new power plants are planned to come on line. With the majority of all energy production coming from coal, one can quickly see the environmental impact that this building boom is responsible for.

Three heating plants are currently 'on the map' and one is nearly completed. Unfortunately, the current plan is not consistent with the advanced approach to technology and green development that Harbin is seeking for Songbei, and it needs to be amended. If Harbin wants Songbei to be an *international leader in environmental and energy productivity*, it must focus on using clean, alternative, and renewable sources of energy. The vision for the new district is simple and logical:

1. Use clean fuels, especially gas rather than coal

2. Use highly efficient means to produce energy supplies that produce both heat and power rather than single use systems
3. Use highly efficient buildings where improved shell performance reduces demands for heating and cooling
4. Develop distributed smaller scale combined heat and power projects for commercial projects for use of landfill wastes and for city gates for natural gas systems.
5. Use the unique renewable resource in Harbin, a groundwater energy reserve, for cooling and in some cases heating.
6. Use highly efficient appliances to reduce the demand for electric power and gas

2.4 Architecture

Fast paced environmental degradation has been China's price for fast paced economic and developmental growth. According to the World Bank, eight of the world's ten cities with the worst air pollution are located in China – some with particulate air pollution levels that are six times the levels recommended by the World Health Organization (WHO). China's rising demand for electric power, which is predominantly fueled by coal, is a growing factor. Electricity production accounted for 34.2% of China's air pollution last year. Water, too, is short in two-thirds of China's cities, with less than half of the water fit for human contact.

Building related energy use represents 35-45% of China's total energy demand. The built environment is a key component of tackling these issues head on to ensure environmental and economic stability. Reduced energy use equates to capital cost savings, operational cost savings at the user and district level, and reduced pollution and environmental impacts. Energy alone is a multi-tiered opportunity that can be addressed at the design level. Buildings also require large quantities of resources in the form of construction materials, resulting in large quantities of construction waste. Considering people spend on average 70-90% of their time indoors, the quality of interior environments is important for occupant health and well being.

The planning, design, construction, and operation of our buildings are vital aspects of environmental and economic stability. The new Songbei District is in a unique position to establish high performance green building guidelines that set a new standard for China. The guidelines aim to focus on the following areas:

1. Sustainable Site Development
2. Water Conservation
3. Energy Efficiency
4. Materials & Resource Conservation
5. Indoor Environmental Quality

2.5 Industrial Ecology

Industrial ecology is the study of the physical, chemical, and biological interactions and interrelationships between industrial processes and ecological processes. The field of industrial ecology strives to find ways in which industry can mimic nature in regards to high yield/low energy production. Our current industrial processes require vast amounts of energy that have very low efficiencies. This type of production is wasteful and not sustainable for future generations. Industrial ecology has the potential to reduce enormous amounts of pollution and waste from any region or ecosystem.

The goal of industrial ecology is to change the linear processes that exist in industry to processes that are cyclical in nature, where products are reused and by-products are diverted to other industrial uses. The following is the basis for underlying principles of industrial ecology:

1. Researching interactions between industrial and ecological systems
2. Integrating disciplines during planning, design, construction, and operation
3. Converting linear or open processes to cyclical or closed processes, so the waste from one industry is used as raw materials for another
4. Reducing the impact of industrial production on ecological systems
5. Integrating industrial activity with ecological systems
6. Mimicking natural systems as a model for industrial systems!

2.6 Waste Management

A properly developed and implemented construction waste management plan can reduce project costs and reduce the environmental impact of building activities. The following points highlight some of the benefits.

- Recycling, reusing, and salvaging construction waste saves money by utilizing reused and salvaged materials on site and reduces the need for new materials. Less post-construction materials end up in the landfill, which creates a safer and cleaner project site, which in turn can improve community relations and create a positive image for the new project.
- Environmental impact is reduced from construction waste management programs. Preventing waste reduces dependence on natural resources such as trees, oil, and minerals plus creates less pollution

by reducing manufacturing and transportation related emissions. Reduction of the energy and water required to produce building supplies from virgin materials contributes to reduced greenhouse gasses related to the manufacturing and transportation of those materials.

- Recycling and reuse of construction waste can also help the economy through the creation of jobs related to salvaging and recycling of construction waste. New products create jobs through the manufacture of recycled content materials.

3. Conclusion

As the pace and breadth of development throughout China continues to progress unchecked, Harbin is in the unique position to set a new standard by way of its own transformation. Rarely does reinvention take place at an urban scale, yet through the Rivernorth New Development Harbin has the opportunity to embrace an urban plan that favors environmental stewardship and "ecological preservation". To get there will require greater focus and determination on the part of the City of Harbin. The development of specific guiding principles is a tremendous first start. With that said, it is the creation of such principles and strategies that are the easy part. The challenge lies in enforcement. Guidelines are only useful if they are being followed. As the planning stages begin to wind down, and the construction phases begin to ramp up, new parties are introduced into the process and key players are given new responsibilities. To be successful, the original goals established by Harbin must be made a priority and applied to each and every project carried out.

Considering the scale, if Harbin were to apply the guidelines that have been created the social, economic and environmental benefits would be unprecedented. Reduced energy and water demands, clean and efficient transportation systems, reduced green house emissions, healthier livable communities, reduced construction waste, and more effective storm water management are only a few of potential benefits that await this new city. These benefits alone should be the impetus to strive for sustainability. However, the payoff is much greater. As a model low impact community, or 'eco-city', Harbin can set the example for the rest of China (or the rest of the world for that matter) to follow.

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