The Bai Ma site is located in the district of Songjiang, on the Southwest outskirts of Shanghai, X km from the city center. Although currently a quiet suburban area, the site is located along a major growth corridor being planned by the municipal authorities. Commercial expansion and a planned increase in transportation infrastructure could lead the area to a major increase in density, as the population of Shanghai continues to spread and expand across the city.

Along with its proximity to Shanghai, the site is located near the growing new town of Songjiang city, home to several universities, as well as an industrial zone that has successfully drawn several electronics manufacturing facilities. The site is only a few kilometers from the growing town of QiBao, where the other site considered by this studio is located.

Although now an area of formless residential sprawl, we believe that the increased attractiveness of the area will probably cause the area around Bai Ma to look more like Qi Bao in the coming years. Our plan attempts to respect the current suburban environment of the area, while anticipating a rapid shift toward a more urban context.
expanding transportation system

The Bai Ma site is located about 20 kilometers from a station on the planned high-speed train line between Shanghai and Beijing, and approximately 7 kilometers from the nearest Shanghai Metro station. Because the area is of low density, it can only support extremely limited bus service, leading to a “last mile” problem for those who commute by public transport. With higher population density, the site and the surrounding area will probably be able to support improved transit links to the subway, similar to those found around Holiday Town.

Bai Ma is also poised to attract the increasing number of Shanghai residents who drive. The site is currently outside the Xth Ring Road, and will be located near what will be a major thoroughfare between a new proposed highway and the Ring Road.

The site itself is bisected by a major roadway, leading the site to often feel like two distinct parcels. Whether to consider these two parcels separately or to bridge this gap is one of the major challenges that the site
**Immediate Surroundings**

The Bai Ma site is a greenfield development built on land that until recently contained a farming village. To the North of the site is new housing built independently by local farmers, to the South of site is and to all other sides, there is either planned or existing villa-style development.

The area is a patchwork of development from different developers, built in radically different styles. The developments are all gated, and do not relate to each other at all. The only commercial services within walking distance are found at a nearby farming village that will soon be relocated for more villa development.

Another interesting feature of the site are the series of agricultural canals that run through the entire area. The canals connect to a major navigable waterways, making them a possible conduit for connections between communities, recreation, and possibly, transportation.
Through the course of this semester, this studio has planned the Bai Ma site through a three step process:

» Identification of site and current plan (Vanke Scheme) challenges and shortcomings
» Preparation and evaluation of a plan that could be enacted immediately, providing moderate improvements within the existing framework (Enhanced Vanke Scheme)
» Preparation of a flexible, phased development plan that resolves the challenges of the Vanke and Enhanced Vanke Schemes (Phased Scheme)

The Vanke Scheme is typical of suburban housing development plans in Shanghai. It provides context for subsequent schemes, as well as a baseline of sustainability by which to measure the schemes' improvements. The Enhanced Vanke Scheme serves two purposes. First, it provides obvious improvements to the Vanke Scheme that can be easily implemented. It does not involve long-term evaluation of the site or serious reconsideration of the Vanke scheme. Second, it provides a benchmark for a more thoughtful, progressive development plan for the site (Phased Scheme). The Phased Scheme is a long-term approach to the development of the Bai Ma site that more aggressively pursues ecological, economic, and equitable sustainability. It responds to real estate values and resource scarcity in its timing and technology. The studio's Program Group recommendations for site systems, building systems and technology, and community were used to evaluate and shape the Enhanced Vanke and Phased Schemes.
THE VANKE SCHEME

Vanke purchased the Bai Ma site and inherited the existing units on the Northwest corner of the site from another developer. With Vanke’s complete build-out plan, the site would have a population of about 6,100 residents, 3,700 square meters of retail, 8,360 square meters of community space (including a kindergarten), and approximately 35% of the site reserved as open space. The Bai Ma units are targeted at lower-middle class households.

SCHEME SHORTCOMINGS

The Vanke scheme could be improved in several ways. Although over 100 units have been sold, only about a dozen are occupied. Because of the end of the speculative market, the new customers for Bai Ma are potential residents looking to move in immediately.

The site poses several challenges, and, as designed, as several shortcomings, including:

» The site is marketed at a demographic that does not yet have high car ownership, yet there are poor transportation connections to nearby retail options and Shanghai.

» Extensive bicycle infrastructure is provided outside the site, but there is no infrastructure for internal bicycle circulation.

» The hard boundaries around the site make it unattractive from the outside, and decrease resident connections with nearby areas.

» The canals are underutilized as features of the site.

» There are few retail options in the surrounding area, and there is no town center in the development, increasing the sense of isolation in the environment.

» The underground parking is threatened by the high water table.

» Although the developer considers the site a single development, there is little connection between the two sides of the development.

» In our interviews, at Holiday Town, many residents felt a sense of community within their small group of buildings. Due to the monotony of the site plan, there are no “subcommunities” within the current Bai Ma scheme.
ENHANCED VANKE SCHEME

Our first step in looking at the site was to develop a scheme that kept the basic metrics of Vanke’s scheme, but made some improvements to the shortcomings noted previously. With these shortcomings in mind, we developed what we called the “Enhanced Vanke Scheme...” While not an ideal plan, this initial strategy for looking at the site this way allowed us develop a few ideas about what could be easily changed.

The Enhanced Vanke Scheme provides an immediate alternative to the Vanke Scheme. It makes obvious and easy-to-accomplish improvements to site systems, buildings, and community.
 APPROACH TO PHASING

Phased plans often use chronological benchmarks, or triggers, to initiate phases. Within the framework of China’s fast-growing economy, increasing energy demand, extensive greenfield development and urbanization, stratifying society, and its emerging role in global markets, it is difficult to predict appropriate years at which to initiate phases at Bai Ma with any certainty. Instead, real estate values and resource pricing have been used as demand indicators to initiate phases. (This approach is in line with Real Options Theory valuation of the development rights.)

starting out

Phase I would be undertaken immediately to invigorate the existing Bai Ma community and begin soil remediation and waterways restoration. Given that current sales are slow and Vanke does not have to pay property taxes, it is reasonable to assume that they could delay full development of the site. This would allow for remediation and restoration work, as well as appreciation of land value.

leveraging market conditions

Phases II and III would be triggered by market conditions in the surrounding area. Using market conditions and financial indicators to initiate subsequent phases would allow Vanke to avoid slow sales and lower-than-expected prices. This is a significant shift from the Vanke Scheme, which relies on investor speculation for sales and has faltered under recent government regulations that limit speculative investments.

responding to resources

Once a phase is triggered by an economic condition, current resource availability and pricing would determine the technology used to develop the housing needed to respond to market conditions. If resource the outlined resource criteria are met, more aggressive “high road” technology is implemented. The Phased Scheme outlines one site plan per phase, with sufficient flexibility to accommodate all levels of technology.

utilizing the building systems toolkit

The Building Toolkit, created by the Building Systems Program Group, outlines low and high road strategies, and provides specific technologies to achieve each strategy (the “tools”). These tools have been pulled from the toolkit to illustrate the technologies employed in each phase.

The Phased Scheme that follows demonstrates the most resource-restricted scenario.

Redevelopment of the surrounding low density housing will signal that the market is ready for higher density housing. Vanke should initiate this phase as soon as nearby redevelopment begins to avoid the possibility of a saturated market later on.

Phase I

Soil Remediation
Waterways Restoration
Managed Open Space
Infrastructure
Retail, Rental

Market Trigger: 2x real estate values

Resource Condition:
24 Hr Water Service
Electricity Costs @ 2x

Full Site Build Out
High Density For Sale
“Middle Road” Systems

Phase II

Continue Remediation, Restoration
Increase Density, Activity at Center
For Sale, Partial Build Out
Additional Retail
“Middle Road” Systems

Market Trigger: redevelopment in surrounding area

Resource Condition:
24 Hr Water Service
Electricity Costs @ 2x

Full Site Build Out
High Density For Sale
“High Road” Systems

Phase III

Full Site Build Out
High Density For Sale
“Middle Road” Systems

Two times the current Bai Ma real estate values is comparable to current real estate values outside Qi Bao Town.
**Phase One**

Phase I responds to Bai Ma’s lack of identity and inability to draw residents by creating a central node without over-building. The development of a town center along the east-west arterial road is prioritized as a way to define a Bai Ma identity.

The town center includes a vibrant court where an urban waterscape interfaces with the clubhouse (community/athletic center). Wide, patterned pedestrian street crossings connect this active area to retail and services on the southern side of the site. The first retail buildings are large enough to accommodate a grocery store and have a significant street presence. Visible surface parking makes access easy for non-residents, increasing the customer base. Urban water re-emerges on this side, creating a more pleasant central area. This new commercial center is supported by a variety of additional housing types that make Bai Ma attractive to a variety of homeowners and renters. As part of the town center, studios, similar to the A-Nesting building at Holiday Town, reinforce the urban street character.

The retail buildings are engineered to facilitate additional floors in anticipation of future demand for office space and housing. The retail and studio buildings wrap around structured parking.

Undeveloped land, held as an investment for later development, can be leased for sustainable agricultural uses. Remediation work on the canals and surrounding area will be initiated for current and future open space.

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</table>
phase one massings

site systems

In Phase I, the site plan that will carry the site through future changes is established. The canals are remediated and cleaned to prepare for their role as recreational spots and stormwater management features. Site infrastructure, such as future roadways, are laid out. After this basic infrastructure is established, the undeveloped part of the site can be leased back to farmers for sustainable agricultural practices, including the cultivation of bamboo or poplar to be used as biofuel.

The road infrastructure is developed with two goals - creating easy access for vehicles moving between residences and the outside of the site, and minimizing interference with the canals. Automobile connections between residential units on the site are discouraged through a road system that does not provide arterial automobile connections between the quadrants of the site. Intra-site transport is expected be by walking or by biking. Residents that choose to drive between different residential units on the site will be encouraged through this street design to use the public roads outside the site, maintaining a quiet, private atmosphere inside.

In addition to road infrastructure, the future energy infrastructure of the site is also established. Along with roads, the infrastructure for cooling and heating through a regional boiler system is developed. The boiler can burn biofuels, but can later be converted to other fuels. Although with the limited build out of the site regional cooling and heating will not yet accrue economies of scale, creating the infrastructure at this stage looks forward to the time in the future when this becomes more feasible with increased density, and eventually to a time when Vanke can act as a regional provider of heating and cooling for the entire local area.

Parking spots are made of semi-permeable pavings, as found in other Vanke developments.

Remediation of the northern and southern canals begins so that these areas can become valuable open spaces.

Road and utility infrastructure is laid out early to prepare for future development.

Landscaping is provided by cultivated fields of poplar or bamboo that can be utilized as biofuels.

The main vehicular entrance to the site is separated from the signalized pedestrian crosswalk to improve traffic flow.
phase one massings
building systems and typologies
flexibility

Buildings in phase 1 are designed for maximum flexibility. The town center is designed with a structure capable of supporting additional residential towers above. Roof systems are designed to be green spaces in the future.

Rental units are clustered around the town center. The 4-walk up low rise was chosen as the main housing building type. Its flexibility lies in its appeal to all ages of occupants, proximity to green space and parking, and ample outdoor spaces. Its utilization of passive ground coupled cooling, natural ventilation, high thermal mass make ensure that it uses less energy for heating and cooling. The balcony system offers passive solar access and summer time cooling, while the roof system is set up for rainwater collection. Because there are no elevators or required mechanical ventilation, the stand by energy required is low.

The infrastructure is laid into place for the distribution of hot and chilled water from a central plant. On-site treatment of sewerage begins in bio filtration berm zones on the western site perimeter.
Phase One is a critical step in creating a sustainable community at BaiMa. The town center’s retail and services may need to be subsidized initially, as they are at other Vanke developments. The early build out of convenience retail, such as food stores, and services for the surrounding area, are important pieces to creating a sense of place that draws in residents and attracts customers from other nearby developments.

Transportation will continue to be a concern. Ample parking should be provided as car ownership and use is expected to increase in the short term. Alternatives, such as shuttle service to mass transit and car sharing should also be provided. Perimeter bike routes will meet up with the existing bike lanes on major roads. This will initiate a cycling hierarchy that will encourage local biking.

Open space, both landscaped in its final form and as leased agricultural land, must be promoted as an attraction and valued by residents. Vanke can use the open space as a lifestyle marketing tool, and as an educational tool to promote sustainability.

The key concern with security is to maintain the appearance of a distinct secure site that meets residents’ psychological needs. This can be done with light fences and keyed gates along the canals and landscaped burns along major roads. Car entrances can be equipped with card-reader access and guard gates allowing flexibility between these two systems, as well as the potential to remove both. (See drawing in Phase Two.)

Studio apartments targeted at students from nearby colleges, young professionals, and older parents locating near children and grandchildren.

Bus stop centrally located to serve retail and community spaces. Cooperative community shuttle connects to other developments and subway.

Two story convenience retail with surface parking to attract through traffic. Destination services such as health care clinics and local community council office located on the second floor.

Children’s outdoor area with separate play equipment for toddlers and older children to encourage physical development. Small hard surface areas for ball games. Benches for parents.

Services programming should respond to the BaiMa population. Vanke can use surveys at BaiMa and other developments to determine specific resident needs and ensure that residents will participate in services provided. Phase One is an excellent opportunity for Vanke to find and/or train a professional service provider.
phase two

Phase II is triggered by a doubling of the real estate values in the Bai Ma area. It primarily adds housing on the northern side of the site. A small amount of commercial space is added to expand retail opportunities.

Housing continues to maximize solar access, and is organized around the improved canals and open quads. The combination of flats and rowhouses accommodates multi-generational families that wish to live close to each other, but not in the same unit. The live/work units along the east-west arterial are targeted towards young professionals and entrepreneurs. These households help create a vibrant atmosphere near the town center and may eventually move into flats or rowhouses as their families grow.

Building clusters are loosely bounded by internal streets and parking areas. Each building cluster shares a small, more private open space, and has access to a canal. These clusters promote community interaction on a smaller, more intimate scale, which should be considered in the design of individual buildings and entries as well.

The new commercial space completes the urban waterscape courtyard with leisure retail. Restaurants and coffee shops can provide outdoor seating. The proximity to the clubhouse and athletic fields allows parents and grandparents to watch children at play.

A diversity of open spaces provides a wide variety of recreational options for residents. The meandering path on the center island of the western canal provides public access through the site during the day without compromising resident security. It passes through the town center as it connects the northern and southern canals. The paths and open space along the northern portion of the western canal are landscaped to provide a tranquil walking experience. Outdoor seating and tables are provided for small gatherings and games, which are popular with the older generations. An extended green can be used for tai chi and larger gatherings, and transitions to the urban waterscape and athletic fields. As the canal emerges from the town center on the southern side of the site, the surrounding area provides play structures and open spaces for children.

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In Phase II, some of the land leased for agriculture is brought into development. The site systems are enhanced to respond to the increased density of the area by introducing a public pedestrian walk through the western side of the site, connecting the retail town center with the canals to the North and South of the site. The privacy and security of the residential areas is ensured with a separation of this path from the residential areas using the water feature itself, creating a sense of privacy and a sense of public vibrancy at the same time.

As the canals become major focal points for the development, Vanke should be leading the way in working with other developers and district officials in actively managing the water quality of the canals, and preserving their use as open space. This development preserves a 50-meter setback from the major canals. By being the first developer to take this step, Vanke can show leadership in developing the canals as major amenities, and should lobby government officials and create partnerships with other developers to monitor water quality, create connections between developments, and ensure public access within 50 meters of the canals.
phase two massings
building systems and typologies

» Phase two adds more of the 4 story walk up, and row house building types. A key feature of both of these is the balcony zone which is designed for reconfiguration. By utilizing a steel structure in this area, components of the building façade may be reconfigured at a later point. Building occupants may choose to fit-out their balconies in a variety of ways. For example, one owner might choose to purchase a glass solarium, while another may prefer a screened in porch with wood shutters. The increasing cost effectiveness of owner installed and operated solar thermal and photovoltaic façade panels are also accommodated in this system. As technologies become more affordable, panels can be purchased from a manufacturer under contract with the development to provide façade-integrated panels for harvesting solar energy.

» The balcony zone also allows for plant life to be incorporated directly into the façade of the buildings. Plants offer a natural shading system and cooling effect (through transpiration) for the units beyond.

» In phase II the central mechanical plant begins integrating bio mass as a fuel source for generating hot water, and chilled water. The chiller energy consumption is reduced by the utilization of a ground source heat exchanger integrated into the wetlands of the site.
Phase Two builds on the community infrastructure of Phase One.

Additional landscaped quads provide new opportunities for residents to enjoy the outdoors. There are specific areas for young and old children, as well as walking paths and outdoor seating for seniors.

The town center expands in square footage. Distinct pedestrian crossings, at traffic lights, allow shoppers to easily cross between the two sides of the street. Second floor services, including the local Community Council, health care, and management offices are above ground destinations. The urban waterscape is enhanced by sidewalk cafes, which provide parents and grandparents places to rest and watch their children at play on the athletic fields.

Inter-development coordination can be strengthened through cooperative shuttles that stop at a number of developments as well as services, shopping, and transportation. Inter-development athletic leagues and events, organized through the clubhouse, can also promote interactions.

Recreational bike paths along the canals enhance larger community connections, and options for physical activity. Opportunities for alternative transportation are increasingly important and appropriate as density increases and energy resources decrease.
**Phase Three**

Full site build out is achieved in Phase III. The original, existing housing is replaced with more efficient, higher-density buildings. Additional floors of housing are added above retail buildings to expand housing options, and to create more of an urban feel.

High rises, responding to the higher density of the area, are located on the northeastern edge of the site to preserve existing sunlight penetration. Luxury triplexes, along the northern and the southern canals, provide high-value, private units. The live/work lofts in the center of the site may be converted into retail, depending upon demand.

Because of increasing density, a bus rapid corridor may enter the arterial road running through the site. Planning for a major BRT station on the site can solidify the role of the site as a major hub of retail and recreation in the area. Due to increased pedestrian traffic, an overhead crosswalk may become necessary, connecting the bus station with retail, residences, and open space across the street.

The school is located on the northwestern corner of the site. This location is a private atmosphere for learning, and avoids traffic and access conflicts with the residential development. The nearby path connects the school to the town center and clubhouse, as well as providing pedestrian and bicycle connections to homes and open space. The canal near the school can be used for educational purposes and will include an interpretive center and boat rental.

The canals become active recreational waterways through docks and overlooks provided on each quadrant of the site. The dock at the southwestern quadrant, near a site entrance, is developed as the most active, public node, with possibilities for cafes and boat rental. Other nodes can be established as the popularity of the site as a water recreation destination increases.

### Phase Three

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</table>
phase three massings

site systems

Density in the form of high-rise development is added to the new buildings on the Eastern side of the site and in the core, maintaining sun exposure for earlier buildings, and creating more of an urban feel in the town center. Low-density units near the canals become high-value, private units ideal for large families. A bus rapid transit corridor becomes possible with the added density. A major station at the Bai Ma site solidifies the development’s role as a major hub of retail and recreation in the area.

At this stage, increased density on the site, as well as in the surrounding neighborhood, makes regional cooling/heating extremely cost-efficient due to increasing economies of scale, and creates the potential for expanding service to other nearby developments. At this point, Vanke will be in an ideal position to provide heating and cooling to nearby residences, capitalizing on an increasing demand for comfort from residents as overall living standards increase.

Hi-rises are placed on northeastern side of site to allow maximum sunlight to other units.

Bus Rapid Transit stop along new, high-density corridor New pedestrian traffic demands possibly require an overhead crosswalk to the retail across the street (photo: State of Maryland website)

School has its own entrance to separate development and school traffic.

View looking South: urban water feature creates a hardscape plaza area perfect for coffee shops, elderly recreation, leading to more natural canal environment further along the canals.

Canal dock becomes an active node, inviting possibility of water transport between communities.
phase three massings
building systems and typologies
energy

The hi-rise building type is added in phase III. The building systems accommodate enhanced natural ventilation through the incorporation of air inlets and open vestibule spaces. Stand-by energy is conserved by using stack ventilation, low horsepower elevator systems, and daylight in building common corridors.

In some locations, the hi-rise building type is built directly above existing commercial space. In this case, areas behind the buildings are converted into construction staging areas. The construction sequence for later is integrated into the initial site plan.

Triplex luxury villas are added in the areas adjacent to the green belt. These lower building types ensure that sightlines from taller buildings to the canals on both the north and the south are maintained.

If it is economical to do so, a combination-fuel turbine is added to the central mechanical plant. This element adds the possibility on-site electrical power generation with utilization of the waste heat produced in the process for building heating and cooling systems (co-generation). Two new bio-filtration berms are added to the eastern perimeter of the site.
phase three massings

community

Phase Three realizes full build out and a robust development and area community.

The school is located to take advantage of the canal and dock as a learning resource. Its separate entrance reduces traffic strain on the residential development. The main public path connects the school to the clubhouse, enabling students to move back and forth for activities during and after school.

A dock and interpretive center is built at one of the canal intersections, near the school. The other canal intersections can be built out to meet demand for small restaurants and boat rental. The canals, now clean, can provide both recreation and transportation.

The “wild” quad allows residents to retreat to a less manicured environment and, similar to the open space in Phase One, offers Vanke a highly marketable, unique amenity.
SITE SWITCH

bai ma site - qibao team plan

Goals of the plan

- Due South and SE (site perpendicular) orientation opens up new layouts
- Four entry points rather than two on the east-west axis
- Smaller phased zones within site
- Public/private test buildings on southern perimeter of northern parcel
- Public park corridor connecting north and south ends across canals and into external developments
- Use canals as walls, stormwater treatment and public amenity
- Earth berm parking along perimeter as a wall and stormwater treatment
- Higher midrise (8-10 stories) where possible around greenspace
- Integration of natural systems
- Protect and utilize healthy soils
- Maximize use of greenroofs, permeable paving, rainwater and greywater harvesting, target 100% onsite stormwater treatment
- Onsite greywater treatment and reuse for non-potable uses
- Develop basic commercial amenities onsite
- Build such that new stormwater mitigation techniques can be added
- Discourage ubiquitous car ownership and use by encouraging alternative modal choice
- Provide spaces for bike parking
- Comfortable walking areas, especially along waterways
- Develop combination of four, six and ten storey buildings
- Small scattered playgrounds
- Creation of neighborhoods
- Four entrances, six guard stations on northern parcel
Key links highlighted in this diagram include:

- Frequent canal crossings, linking the site by water and accompanying pathways.
- Overlap of school, commercial, and community uses.
- Flexible design for potential future links to other sites using canals and greenways as circulation pathways.
- Frequent pedestrian crossings of the road dividing the site to serve as a traffic calming measure and aiding in unifying the two sections of the site.

**Potential building-specific programming**

Community Facilities/Commercial A: Overlap community facilities that will also benefit school. Examples of overlapping uses include study/game rooms, recreational facilities, Internet facilities for school work, basement skate park.

Commercial A: Mixture of commercial, restaurants, and additional community facilities if needed.

Community Facilities/Commercial B: The existing buildings are very narrow limiting potential uses. Consider mixed uses here, including street facing restaurants with rear access to the inner patio (rather than a pool), a health clinic that can utilize the narrow building structure, and a security station, post office, or bank in the inner left building.
REGIONAL POLICY RECOMMENDATIONS

Site Systems

Create flexible zoning requirements

Sustainable developments are flexible, and able to respond to changes in real estate market conditions and resource scarcities. In this time of rapid urbanization, zoning regulations should be flexible enough to allow for rapid changes that allow an efficient use of resources.

Encourage appropriate landscape elements

Because of the wealth of cheap labor found in China and the subsidization of water, developers tend to want to create labor- and water-intensive landscapes. By choosing appropriate landscape elements and using water-saving maintenance practices, site water usage can be decreased by more than half without compromising the design or the aesthetic of the site. The “xeriscape” movement in the US promotes the creative use of landscape elements that do not require any net addition of water to survive in their habitat. In a sub-tropical climate like that of Shanghai, there are many options for plants that do not require additional water. The district can encourage indigenous landscaping by using this type of landscape in prominent public areas, holding design competitions for the use of water-efficient landscape, and providing monetary incentives to developers. These one-time expenditures will yield continued water savings over time.

Canopy cover over 40% of the public right-of-ways maximizes carbon absorption by trees, reducing the total carbon emitted by a development. This should be standard in design approval. A variance from this standard should require additional plantings elsewhere to offset the loss of canopy.

Encourage district-level power generation

In large residential districts, new towns could collaborate to produce energy at the district level, and even to sell power back to the municipal grid. Municipal governments should allow developers to sell electricity.

Recycle at the household level

Informal recyclers collect and recycle glass, paper, and cardboard throughout Chinese cities. However, in gated new communities, this type of recycling is less convenient for homeowners. The district can step in by either picking up recycling at a household or block level, or by licensing existing informal recyclers, working with developers to give them access to gated communities. Recycling services should be extended to local businesses as well.

Encourage regional open space systems

The canal system in the Soong Jun area should be developed as a regional waterway and green-belt to provide recreational opportunities, remediate the water through natural systems, and improve storm water drainage. A 50-meter setback on each side of the regional canals provides enough space for a green corridor and bike path. Requiring this space to be publicly accessible would create a regional network of recreational bike paths and healthy canals, as well as signature attraction for the region. Public access to the canals should be visible, clearly marked, and open during daylight hours. Plantings that can filter and remediate these natural systems should be chosen.

Building Systems

Require the use of more environmentally friendly concrete

Fly Ash, a by-product of coal burning power plants, can be substituted for energy-intensive cement in concrete, as can other industrial byproducts such as tire rubber and recycled post-consumer aggregate. Concrete with these admixtures requires less cement and has greater insulation value and less weight.

Create an energy efficiency rating system for homes

Chinese developers are not encouraged to develop more energy-efficient units because, even though these units pay for themselves in energy savings over time, the increase in construction costs is borne by the developer, while the lowered maintenance cost would be enjoyed by the consumer. Chinese consumers do not have enough information to know how much money they would save by purchasing an energy-efficient home. Having a codified rating system would encourage developers to build more energy-efficient units that they could sell at a premium to consumers who can see exactly what their cost savings would be.

Allowing building codes flexibility for grey waters systems

Grey-water re-use and rainwater catchment systems are some of the most inexpensive resource-saving improvements that can be made to a building. However, in many countries, these systems face regulatory hurdles because of outdated building codes that require redundant water systems from other sources. By reviewing building codes with greywater systems in mind, governments can make sure that they are not imposing extra fees on developers that want to create such systems.

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Impose stringent disposal fees for construction waste

Some US states, such as California, require builders to submit a Waste Reduction and Recycling Plan during the permitting stage of building. If such a requirement were created in China, a developer that could create an efficient plan for recycling materials would have a significant cost advantage. Recycled building materials are competitive in price and quality with new materials, and are resource-efficient because they close the recycling loop while avoiding extraction of more resources. Online and regional markets for recycled materials exist in the US and in most of Europe, but are not yet well developed in China.

Community Development

Link developments to create a regional identity

Coordination and common requirements between different developments could create a more cohesive region. Soft boundaries between developments, using features like plantings, low fences, and berms reduce the visual and social severity of development edges, as well as extending view corridors. Multiple pedestrian access points to a development promote local pedestrian activity by diminishing the barriers between home and destination.

Security

Municipalities can utilize design regulations and review to reduce the use of fences and walls, particularly around areas designated for public use. They can also facilitate meetings between the management companies of neighboring development, as well as local police, to address safety and security issues on a district level.

Promote bicycle usage

Secure and convenient bicycle parking for residential and retail tenants is critical to maintaining China’s current rate of bicycle use; developers should provide covered bicycle parking for 30% of the residents and one space for every 100 square meters for retail (0.01).

Limit car usage among drivers

Car parking ratios can be used as a deterrent to car ownership, by requiring proof of dedicated parking in order to buy a car and additional parking fees, as is the case in Japan. Where the water table is low, underground parking can cause great environmental harm. District governments should encourage surface and structured parking where this is a concern. Car-sharing is increasingly popular in the US as an affordable, convenient alternative to car ownership. Developers are often granted reduced parking requirements for including car share spaces and arranging service. This has great potential in China.

Promote bus usage

The bus is quite popular in China and developers must accommodate its service through curb cuts and signage. In addition, there are social and cost benefits to combining the shuttle services of individual developers into one or a few shuttles that service the community clubs, nearest subway station, and local grocery store(s).

Create a network of community facilities

A vibrant district has an array of community facilities and activities available to its residents. District planning and design review can discourage duplication and overbuilding, and thereby promote diversity. Public access requirements also promote social interaction and wider use of facilities. In addition to built facilities, sufficient open space is critical to a high quality of life. FAR and footprint maximums should be in place, and compatible with flexible zoning and building codes. An alternative is to set a minimum open space requirement for large developments (i.e., 30% of site retained as open space). A variety of open space programming ensures it is accessible to all; elderly and young children derive different benefits from open space and both should be accommodated.

Provide comprehensive services

Services, such as health care and education, that are of high quality and conveniently located promote active, competitive communities. Services should be located near public transportation. Co-locating a variety of services together can encour-
CONCLUSION

As a typical Chinese greenfield development, the development of Bai Ma can serve as an example for future developments by Vanke and other developers. Our approach, reflected in the development decision chart, was to create a process that is widely applicable to greenfields, taking Bai Ma as a specific example. This emphasis on process requires that the approach to development, as well as the application of methods and features, be sustainable. This was achieved through phasing, which gives the developer greater flexibility to respond to the market in terms of timing, product, and technology.

The work done by the programming groups earlier in the semester was used to guide the process and assess each phase. Community concerns, site systems, and building technologies were applied to the Bai Ma plan to create a site that has a strong sense of place and, at the same time, is connected to its surroundings.

This process also provides a framework to utilize local landscape features, such as canals, to promote community and environmental sustainability. It encourages building at a sustainable pace: building at a density that accommodates growth without flooding the real estate market. Overall, the aim was to provide a plan, specific to the Bai Ma site, that also provided a process for the sustainable development of large-scale greenfield development in China.