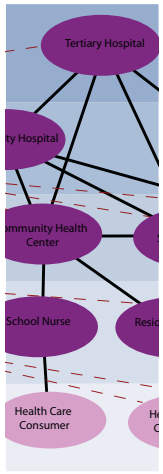
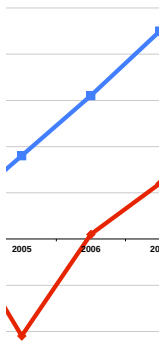
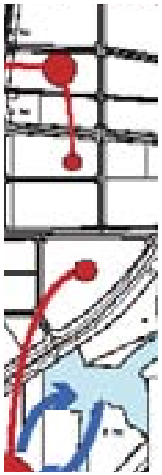
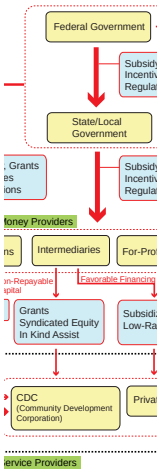








Vanke MIT **SHENZHEN** Planning Studio. Spring 2009.
Department of Urban Studies and Planning, MIT.

CONNECTIVITY AND ACCESSIBILITY
Development for Sustainable Futures



ACKNOWLEDGMENTS

SPONSOR

VANKE CORPORATION

Wang Shi
Xie Dong
Xiao Nan
Chen Yunsheng
Zhu Jianping
Du Jing
Hong Yan
Jiang Chunyang
Fang Yi
Chen Xiaowei

INSTRUCTORS

Tunney Lee, Professor Emeritus
Liang Zhao, Lecturer
Kanda Song, Teaching Assistant

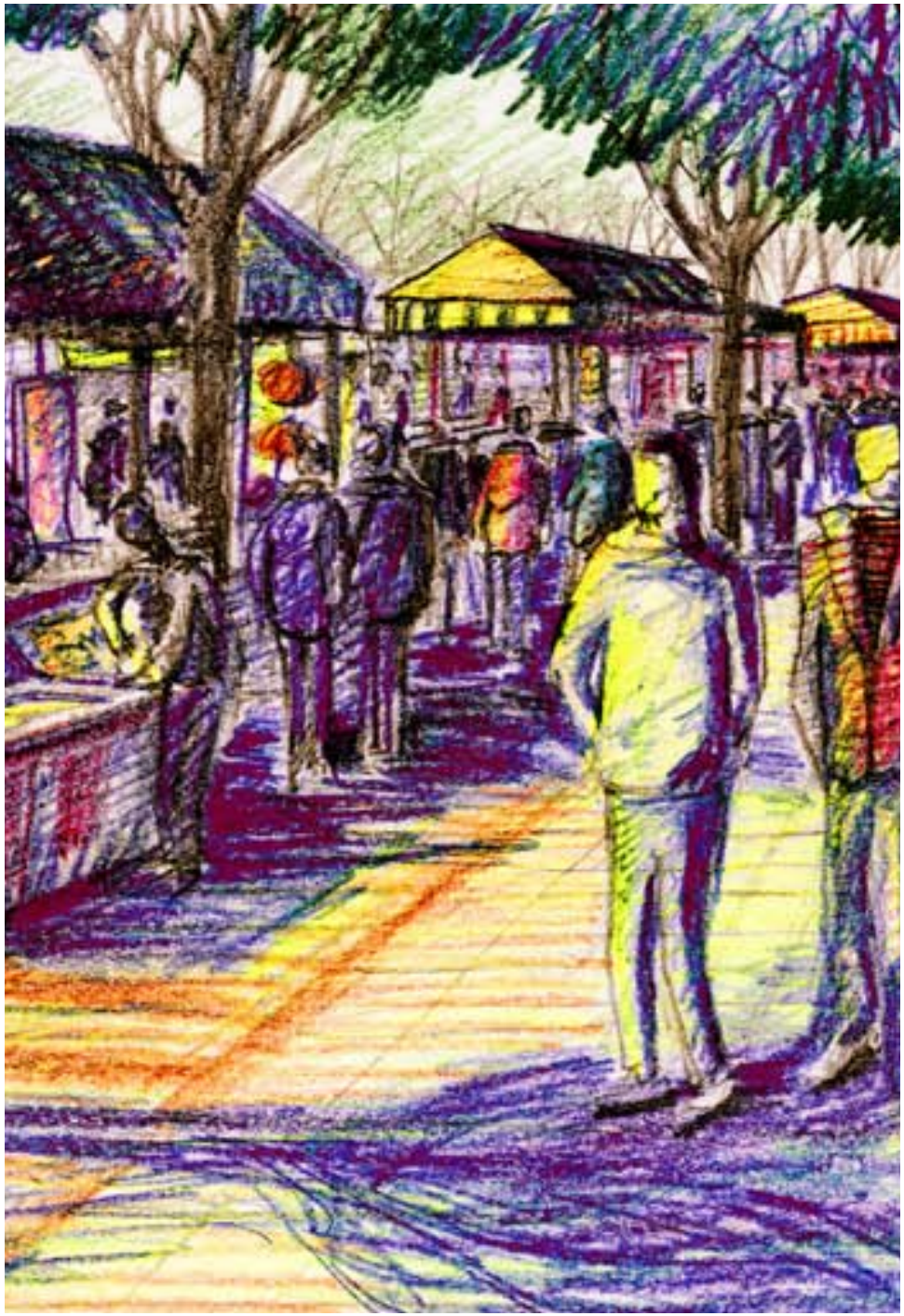
REVIEWERS

Xiaohui Chen
Minqu Deng
Antonio DiMambro
Amy Glasmeir
Randall Imai
Kai-yan Lee
James Lee
Martha Ondras
Anthony Pangaro
Tom Piper
Jing Wu

STUDIO MEMBERS

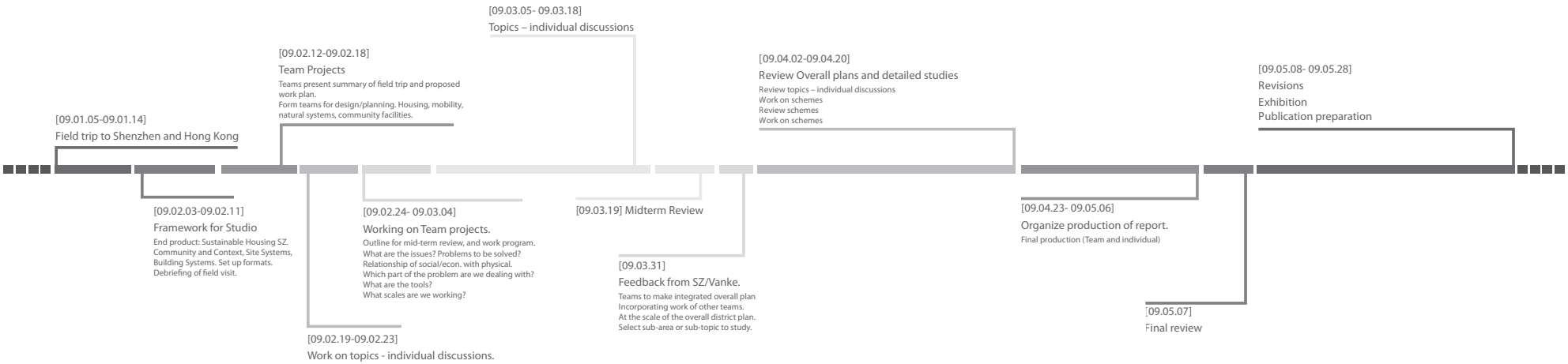
Gordon Hansen
Haley Heard
Yang Liu
James Madden
Pedram Mahdavi
Aditi Mehta
Eric Minikel
Gary Shu
Kristin Simonson
Ruifeng Tian
Feifei Zhao

TABLE OF CONTENTS



Street View: Community Facilities

STUDIO TIMELINE



INTRODUCTION

Tunney Lee

Sustainable Residential Development in Shenzhen

Starting in the fall of 2005, MIT's Department of Urban Studies and Planning has offered a series of studios and research seminars on sustainable residential development with sponsorship from the Vanke China, . This report contains the work of the Spring 2009 Shenzhen Planning Studio, the third to be set in the Bantian District of Shenzhen. The studios' goal has been to address sustainable neighborhood and related environmental, social, and economic issues expected to emerge over the next twenty years.

The students undertook extensive research on selected topics and tested them through hypothetical re-planning of the Southeast sub-area of the Bantian district of Shenzhen. This report records that process and outlines a series of ideas and guidelines for developing a sustainable community in Shenzhen in the future. The report has two parts: the first comprises the re-planning of Southeast Bantian by four student teams; the second includes each student's individual research work on related topics.

Scenarios

"Scenarios are not predictions, forecasts or projections. Rather they are stories about the future with a logical plan and narrative….Scenarios usually include images of the future – snapshots of the major features of interest at various points in time…."

—Gallopin

In the next twenty years or so, Shenzhen, the Special Economic Zone which has played a central role in China's development, is expected to transform into a "normalized" city with a more stable population and less rapid economic growth. Urban housing is a physical reaction to the future social, economical, and environmental context. Although no one can predict the future, we still can ask: what will be a likely socioeconomic environment in the next twenty years when the next generation of housing and community is formed? The MIT project starts by describing reasonable scenarios of the future by looking at a series of meta-trends in urbanization, economic development, demography, and lifestyle. From these assumptions, we begin to lay a base for the studio. The assumptions include the following:

Economy

>The Pearl River Delta's economy will continue to grow, but less aggressively.
>The economy will grow in a more balanced pattern between high-tech manufacturing, services, logistics, etc.
>Household income will continue to grow steadily.
>Income and municipal benefits will be distributed more equally – housing, schools, health care, etc.
>Integration with Hong Kong will increase.

Population

>Transition from an immigration city to a more stable and "normal" population profile.
>Fewer single workers, more families and children.
>Less disparity in educational/socio-economic level.
>More active elderly population.

Energy and Resource Use

>More national and local regulations on energy efficiency, water conservation, materials, recycling and waste disposal. Restrictions will be placed on polluting sources.
>Higher energy costs will make alternative sources more economical.

Lifestyle

>Increased demand for mobility for com- muting, recreation, entertainment, etc.
>Higher automobile ownership.
>Extended families will still be important but the elderly will become more independent from their children.

Transportation Planning

>Increased auto ownership along with increased truck and cargo volumes will create bigger problems of congestion and air quality.
>Public transit system continues development.
>The government will control automobile use through road pricing, auto sharing, etc.
>Incentives for transit use through more convenient and comfortable transit options and easier access to stations.

Land Planning

>Integration of land use and transportation planning.
>District planning to accommodate mixed income groups with access to transit, open space networks.
>Land disposition procedures will be more regulated and based on district plans.
>Need for redevelopment of areas/structures reaching obsolescence.

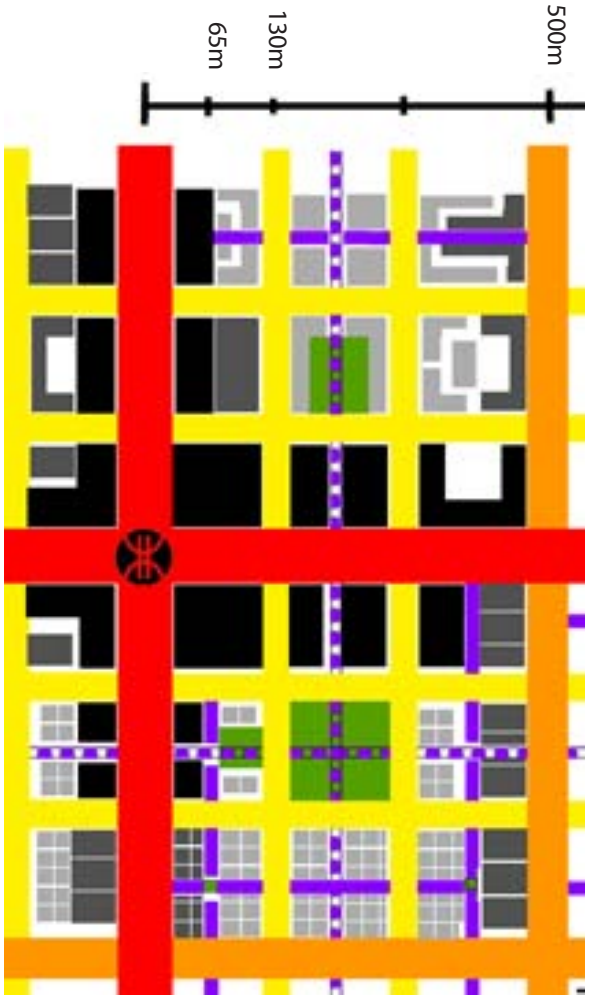
Technology

>Cell phone usage for multi-purposes.
>More widespread internet access.

RESEARCH FRAMEWORK

These scenarios will affect people's lifestyles and provide challenges and opportunities for housing and community development in the future. The next generation of neighborhood should be smarter and more considerate of people and the environment – more sustainable. Here sustainability is characterized by the "three E's": environment, economy, and equity. Sustainable residential development covers a wide range of topics related to the three E's. We start to organize the topics under four categories: resource efficiency, demographic inclusiveness, community facilities, and mobility. Each category has different implications at different scales and each of the topics may be addressed by different parties including national and local government, developers, and local organizations.

It should be noted that the framework is by no means complete and only a starting point as a guide for future research and studios. It is also clear that one studio can not cover every topic. Research on sustainable residential development should be a continuous, multi-year effort. We have been fortunate to have the support of Vanke China in building on previous studio work.



Mobility Group: Spatial Layout of Hierarchy, Density and Development

Planning for Connectivity and Accessibility -Neighborhood Systems

Our study site is the Southeast most sub-district of Bantian District located just north of Shenzhen's Futian district and government center. Over the last several years, Vanke China has been building several hundred units on a series of sites. There are low-rise units inspired by the spirit of traditional Chinese houses along with other housing types. The district was originally out of the Special Economic Zone and composed of a mosaic of local and international manufacture factories, urban villages. The studio takes the district as a reference to explore how to plan the neighborhood of the future with sustainability as the starting point. The class does not attempt to make a comprehensive plan for Southwest Bantian. Instead, it takes the idea of "research through design," testing ideas through the planning of different site systems. Four teams organized to address the following issues:

> Public Systems
> Converging Spaces
> Accessibility
> Housing Systems

The students first concentrated on their particular emphasis but they also coordinated over-lapping aspects of their systems to start the process of coordinating the different systems. The main ideas driving our work were to connect all the residents of the neighborhood by connecting them through community facilities, open space and walkable, bikable networks. Equally important is that all residents should have access to public goods – education, health, recreation and housing. All of our work was informed by these ideas. We hope that our work might be useful for future planning.

INDIVIDUAL TOOLS

Each year, students focus on group and individual research topics that reflect their own interest and skills. In this studio, eleven students from different academic and professional backgrounds selected their topics. Each looked at previous tools and cases from other places in the world and developed a series of "tools" for Shenzhen and China. The research can be found in the second part of the report. There is always the risk of misapplying planning ideas from another place. In order to avoid superficial or improper adaptation, the students carefully examined their "tools" by asking the following questions:

> What is the tool?
> What is the goal of using this tool?
> On what scale does the tool apply (e.g. district, site, building)?
> Who will use the tool (e.g. developer, government, residents)?
> How do you measure the cost effectiveness?
> What is required to make the tool work?
> What are the best practices?
> What research already exists and what further research is needed?

[PUBLIC SYSTEMS]

Gordon Hansen
Haley Heard
Gary Shu

INTRODUCTION: PUBLIC SYSTEMS

Shenzhen 's Bantian District : Yesterday (1980), Today (2009) and Tomorrow (2030).

(1980) Source: Flickr user *lwdemery*

The intrinsic topography and hydrology of Shenzhen's Bantian district demands comprehensive open space and water resource planning. The overall dimensions of the area mirror those of a tipped bowl: water collects and runs to the north from mountains and high points in the south, east and west. The mountains that encircle the Bantian district also provide a natural ring of open space resources and opportunities. Our studio's site sits at the Southeast corner of the district, at the edge of a crop of high hills; through its foothill-like topography originally ran a series of tributary streams that collected runoff that drained to the river that runs through the center of Bantian. The stream flows were not constant, however: given the region's monsoon summers and relatively dry winters, the streams likely fluctuated between a flood and a trickle as the seasons changed.

Throughout the district, villages sprung up alongside the streams, presumably harnessing them for developing and sustaining agriculture. As the district became a site for increased development following the creation of the Shenzhen Economic Zone in 1980, and the expansion of rapid urbanization in the early 1990s, reservoirs were built for flood control. As a result, in the last twenty years the site has been re-graded, and hills cut down to fill in the stream-valleys. The streams themselves have, for the most part, been culverted or diverted. The old agricultural villages have transformed into urban villages In the last fifteen years, and private industrial and higher-end residential developments have filled in the gaps between yet-unaltered topography and these urban villages. The piecemeal development that currently exists is emblematic of an area experiencing heightened urbanization.

In this studio, we have been asked to respond to the site in twenty years' time. At present, the Longgang district planning agency is preparing and beginning to implement its long-term Bantian strategy. The planning document outlines transportation, community facilities, open space, and land use changes. Taking this plan as a given, we sought to craft a public systems strategy that could unite the planning agency's open space proposal with the site's natural topography, hydrology, and cultural history. What follows is a proposal for an integrated system that ensures interconnected, accessible open spaces, as well as a sustainable and aesthetically-pleasing mitigation of local runoff, stormwater and graywater treatment. We hope that our plan can be a template to reproduce across the district, as well as a model for future Chinese urban development.

We retain a number of the 2008 MIT studio report's natural systems premises, but only include them as a background to our more site-specific assumptions:

Development Assumptions

> The Bantian District will be built as delineated in the planning agency's long-range plan. The proposed land uses as seen in the current plan will, in twenty years, be those on site.

> The green space allocated in the Planning Department's proposed land use plan is adequate for projected population growth, but does not create a cohesive, interconnected and evenly accessible green space network.

> Government incentives will promote private developments that include in-house greywater processing, as well as integrated pocket parks near community facilities.

Policy Assumptions

> Increased Government Focus on Sustainable Water Treatment & Conservation. This emphasizes on-site water filtration and controls on stormwater quantity and quality; government-level design and enforcement of greenways and open space regulations; and the conservation and connection of natural riparian corridors to create an integrated network.

> Any proposed sustainable water and open space network will require significant and ensured maintenance. We assume that implementing such a plan would include additional mitigation processes and schedules for regular service.

Project Assumption

> Our site proposal and its associated recommendations reflect a strategy to create a repeatable typology. Ideally, our plan will be used as a template for responsible open space and urban development that can be replicated to form a connected regional network.

Goals

Social

> ***Create fully accessible, evenly-distributed and connected open space networks.*** On-site, this simply ensures that everyone who wants to walk, cycle, or e-bike to a park will have the opportunity to do so. At a district level, a regional park system will be connected by a web of trails and paths, and made accessible to adjacent urban areas.

> ***Promote environmental awareness through pedagogical design.*** An integrated wetland and open space network brings the subject of sustainable water treatment to the visible fore, making ideal policies tangible. Wetland parks will be designed in such a way as to reveal the water treatment processes within, whether through informational walks, placards, or artwork.

> ***Reintroduce cultural heritage and preserve neighborhood landmarks.*** Despite the cutting down of hills and filling in of streambeds over the past twenty years, there still exists an old school, a village hut, and a art deco-style building sitting at the confluence of two streams, adjacent to three urban villages. In a place marked by rapid urbanization, "history" is seemingly short -- from the 1970s on. But the vestiges of a buried (and outmoded) way of life are important to the intrinsic heritage and uniqueness of any site. Local landmarks such as these, as well as later examples of development like urban villages, or older industrial buildings, should be preserved and included in open space schemes.

> ***Plan contextually-appropriate park programming.*** Open spaces will be carefully designed to encourage and sustain uses that respond to surrounding land uses. For instance, a local park bordering commercial, residential, and government/ public use (community facility) zones might offer a playground, a public theatre, shaded spaces, and a water feature.

Environmental

> ***Restore historic waterways, and preserve natural systems at district and regional levels.*** Reusing the natural streambeds provides an opportunity to not only reclaim the site's role in the district ecosystem, but also to imbue the site with a sense of hydrological heritage.

> ***Integrate ecological infrastructure into urban surroundings.*** By burying the natural streams, and collecting wastewater and runoff into an unseparated sewage system, the site wastes an opportunity to recycle and reuse substantial amounts of water. Integrating water capture and treatment into the urban fabric will raise awareness of sustainable practices, as well as process treatable water separately from sewage.

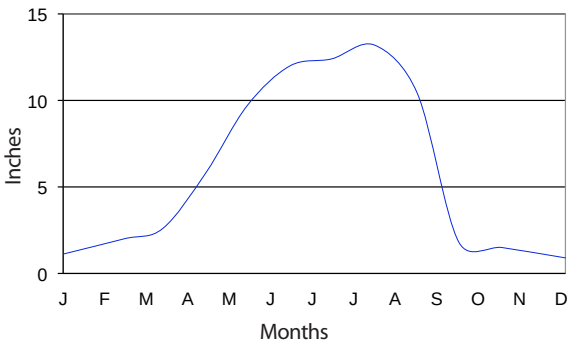
> ***Provide local stormwater and greywater filtration.*** Again, forms of treatable water will not be merged with sewage, allowing them to be processed and filtered on site.

> ***Use open space network to provide additional retention and treatment capacity.*** Integrating constructed wetlands into recreational open spaces will make sustainable water treatment practices more visible, as well as give the site's open space network a historically-influenced web of connections along the old streambeds. The new combined network will be a unique asset in the neighborhood, and be a beacon for future urban public systems across China.

Historical & Natural Context

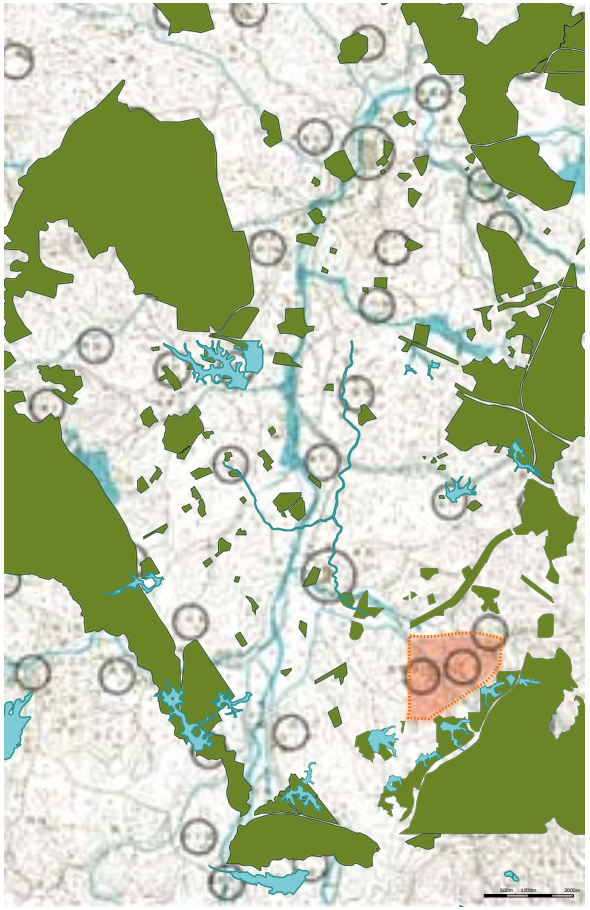
When considering the history of the site, the greater Bantian District, and the whole of the Pearl River Delta, one must consider two distinct but overlapping timeframes. The first is that of natural history, comprising the thousands of years the area existed as a complex topological and hydrological system. The second is more recent, involving the past fifty years, which has seen unprecedented reclamation of the landscape for human uses -- especially as a site for rapid urban development.

The 2008 MIT/Vanke Shenzhen Studio report contains a bevy of information on the intrinsic natural systems that comprised the Bantian of years past (See Beam, Peckett and Zhang, "Natural Systems" pp. 4-5, 6). To summarize, the natural context of Bantian is formed like a tipped bowl. Water runoff from the mountains to the south, east and west of Bantian collects and runs to the North in rivulets, channels, and streams

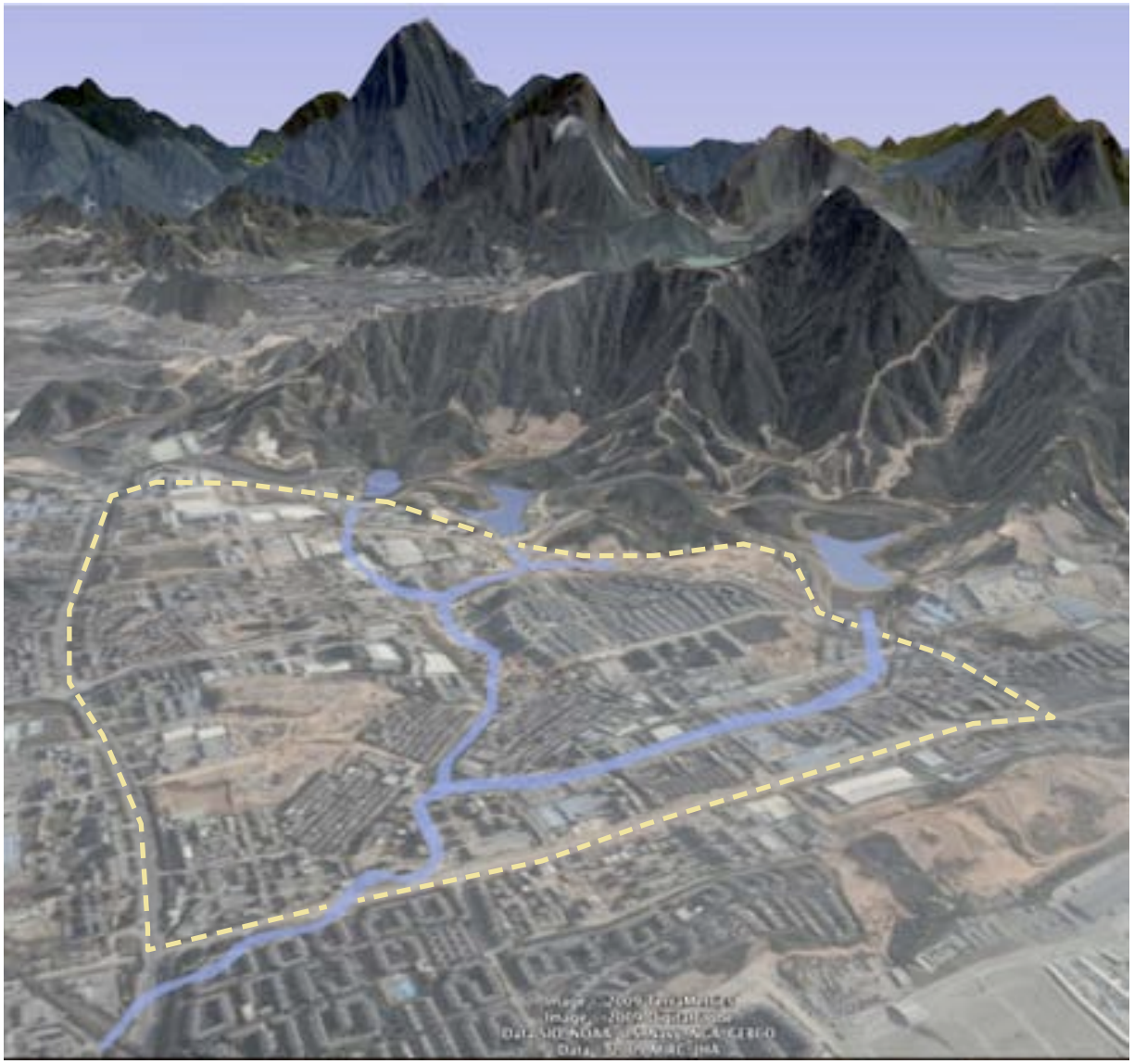


Shenzhen yearly rainfall. The Pearl River Delta follows monsoon patterns in which heavy and persistent humidity during the summer months saturates the site followed by a relatively dry and mild winter.

to a tributary of the "Dong Jiang (Eastern Branch)," and carries on to the Pearl River. Water to the south of these mountains, in what is now the dense heart of Shenzhen, flows into the Shenzhen River. The Bantian site houses several streams that carry runoff from the mountains in the Southeast of the district to the central Eastern River tributary. Although subsequent urban development has somewhat changed the appearance and function of these systems, meteorological patterns have remained constant over the years. The Pearl River Delta experiences a very wet summer -- the monsoon season -- and a comparatively dry winter. The natural hydrology system was well adapted to these cycles: the streams would often flood, as Beam, Peckett and Zhang note, in turn "replenish[ing] underground aquifers -- essential to the region's ecology and agriculture (and later, to its drinking supply)." The name Shenzhen itself means "deep drains," as the area was originally full of streams and other water resources



Current regional open space overlaid on 1931 topographical and hydrology map. Regional water flows in the area show how water collected from the south and flowed throughout the region to the East Branch to the north. Circles represent sites of historical and geographic significance, and are often located along water areas. The stream flows through the local site present specific challenges as well as opportunities to link future development with the existing natural resources and environment.



Topographically-enhanced (3x) aerial photograph of the site. The blue overlays indicate former water channels running through the site; the natural topography and streambeds are plainly visible.

Translation of Shenzhen. Source: Shenzhen City Guide <http://www.szcityguide.com/living/shenzhen/history/history.html>

A stylized historical progression of Bantian (and Shenzhen). From lush agricultural fields and stream-side villages (1900, 1920) to urban villages and a myriad of private developments (1985, 2009).

The Bantian site: drastic changes in a year. Between early and late 2002, as these Google aerial images attest, a hill has been partially leveled to fill in the vestigial agricultural stream valley. By 2009, this area is unrecognizable.

Indeed, as villages began to spring up alongside these tributary streams, the water was essential to local agriculture and the sustainability of these settlements. Perhaps the flooding was even harnessed to manage rice paddies. As seen in the 1931 topographical map, there were many villages dotting Bantian prior to urbanized development.

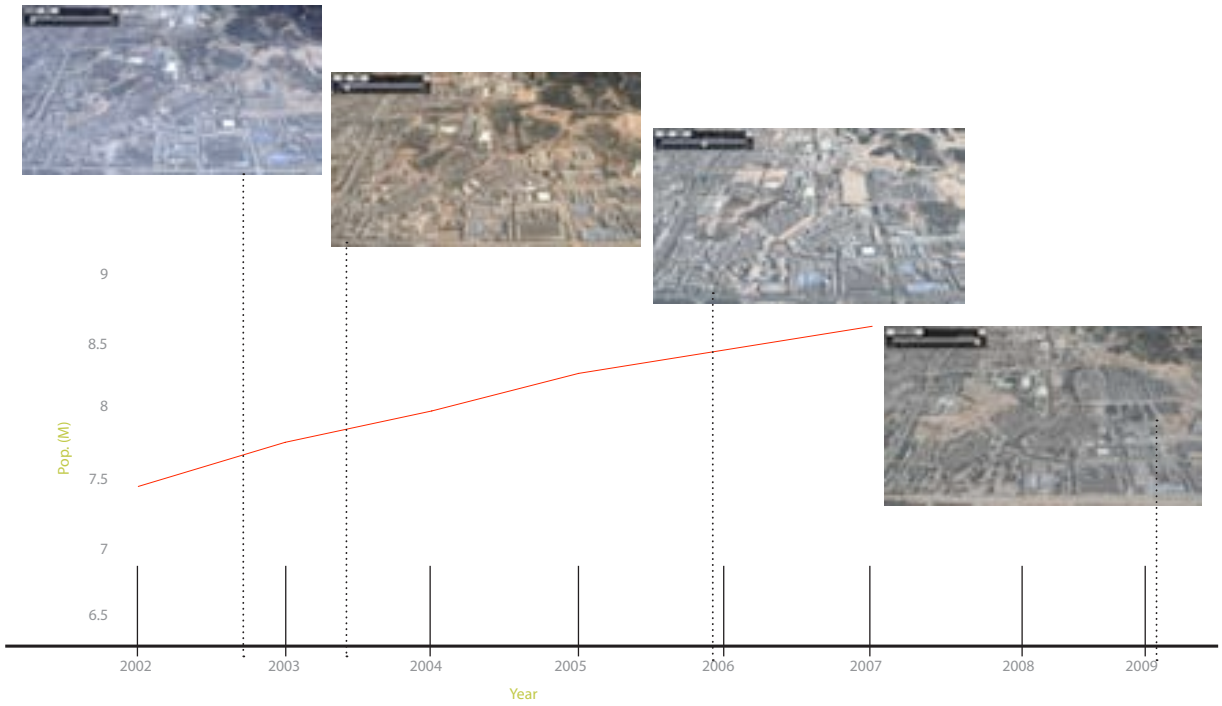
Urban Development & Present Conditions

Over the past thirty years since the Shenzhen Special Economic Zone was established, the core of the Zone and the city's outlying districts have seen tremendous growth. The once-lush, "deep drains" of natural water-table and storm runoff have been covered over and built upon. In preparation for urbanization, many agricultural villages divided up their land and built low-cost mid-rises (6 to 8 stories) on small plots in close proximity (urban villages). The former villagers became landlords, and their new buildings offered low-rent housing for the surge of migrant workers looking for an urban life. In a newly urbanized district like Bantian, the timeframe of conversion from agricultural villages to urban villages and a dense mix of surrounding uses is compressed. Indeed, at the studio's site in particular, much of this transformation has taken place in the past twenty years.

At the site today, high-rise towers like those at Vanke's Fifth Garden loom over a patchwork of mixed development, much of it constructed in the past decade. Urban villages stand next to obsolete manufacturing complexes, themselves mixes of worker housing and factories.

In spite of the abundance of local water resources, the Bantian district and Shenzhen must reach north some 100 miles to the East River to access potable

Shenzhen population growth between 2002-2007, with illustrations of the dynamic reshaping and growth of the Bantian site.



At the site, history is being buried. The village remnants (Top) are in the path of an arterial; the stream, now several feet below ground level, is exposed only by chance among factories and residences (Middle); when it is visible, it is often choked with garbage (Bottom).

water. Water resources in the basin are becoming increasingly stressed with pollution as the area continues to develop and the population explodes. The wide variation in regional rainfall creates conditions that require significant resources to be devoted to the management of water. Techniques used thus far include the leveling and culverting of existing streambeds and water routes, and damming off streams to create reservoirs and basins to store and control water flows.

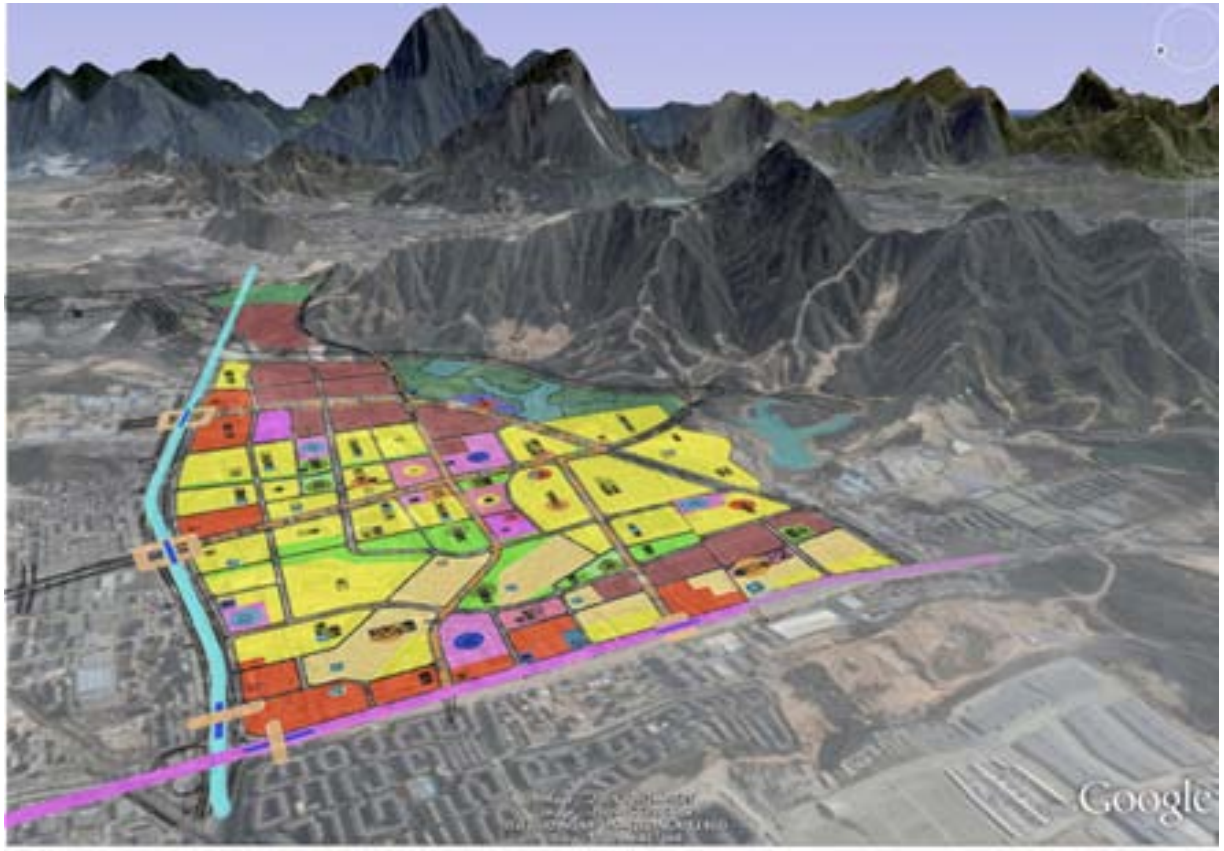
At present, the site lacks an acknowledged historical and cultural narrative. On a basic level, the area's streams and natural topography are buried under development, and vestiges of the recent ecological and social past are fast disappearing. In reality, as with much of Shenzhen, the population of the district is largely non-local. Migrants make up a large portion of the area's demographic, and income stratifica-

Reservoir to the south of the site. Used for flood control and mountain runoff, its water level fluctuates over the course of the year.

tion -- due to large upscale residential projects built on available land -- has intensified the site's current standing as a bloc of disconnected parts. The need for an integrated, accessible and interconnected water and open space scheme is already readily apparent.

The Longgang Planning Proposal

Part of the context for an integrated public systems scheme is the Longgang planning agency's long-term Bantian district plan, as it outlines the future of the site. This plan forms the foundation for our expanded, interconnected open space and water treatment proposal. The plan (seen at right) is comprehensive and detailed, and will change much of the site as it currently exists. The open space network in the Longgang plan is a fine jumping off point, but it is by no means an ideal system. For one, it does not offer access to a greater system of regional parks; within the site, it lacks cohesion. Secondly, it does not adequately refer to a hydrological past: the green spaces are merely green, and even in the places where streams once ran there are no plans for reclaiming the unique natural history of the site. Although the Longgang plan provides (needed) ample space around urban villages, park placement on the whole seems random, and an equal distribution in densely residential areas is lacking. Finally, there is no established hierarchy of parks identified in the land use plan, and no context-driven explanation for their placement. We seek to rectify these omissions with a clear hierarchy of open spaces and contextually-appropriate park programming. These planning tools, in addition to an integration of water treatment into the open space network, will imbue the Longgang park proposal with a responsiveness to neighborhood needs, and a vision of a sustainable future.



The Longgang Planning Proposal, overlaid on the site topography. Parks appear as bright green.

Water Treatment Techniques

Building on the Foundations

Our proposed plan suggests one way of advancing sustainable development in Shenzhen by integrating the transportation, economic, and social needs of the neighborhood with the functions of managing water, providing open space, and linking historical and natural waterways.

> ***Open Space***
Open space is linked throughout the plan in a way that all residents have access to them. Open space is strategically located to provide the greatest use and benefit at minimal costs.

> ***Water Management***
Using the linked open spaces as a conduits for managing water flow, the wetland park network would be able to treat stormwater and locally-produced graywater. By using water sourced from the district, regional water resources will become less stressed as piping distances are offset by local treatment.

> Historical Natural Systems
Open space network links will be sited along the original streambeds resulting in a partial daylighting of the watercourses. Because less grading and park landscaping will be required, these changes will sustain a low environmental impact while at the same time providing a reminder of the historical natural water systems of the area. By making apparent the connection between the proposed network with the natural environmental systems, the wetlands will serve a pedagogical purpose for the community.

> Transportation
By leveraging the existing road and transit infrastructure, the proposed network offers a usable open space for residents and commuters alike. Properly designed eco-streets minimize the costs of developing these open space connections.

> Community Facilities
A cohesive open space network will assist access to community facilities along the system by making travel to them easier and more enjoyable.

Proposed Recreational Open Spaces/Water Treatment Network Plan. As will be explained over the next few pages, an intricate system of water mitigation measures also serves as an accessible, interconnective web of open spaces.

Longgang Planning Proposal

MIT Public Systems Proposal

Comparison of the foundation open space system with an Integrated Network proposal. Shenzhen's Longgang District open space plan (L) demonstrates the disconnectedness of the open space areas as originally proposed. The web-like interconnections and wetland programming in our proposed integrated proposal stand out from the basic plan, as seen at right.

Comparing the Plans

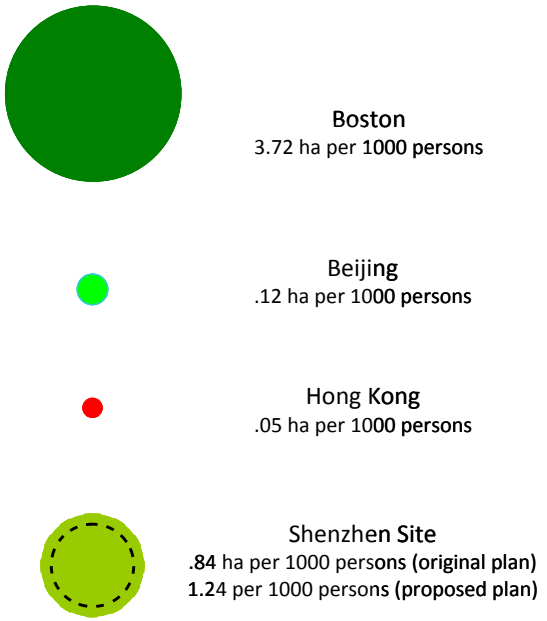
The currently proposed open space plan reveals a deficiency in linking anticipated park locations. While the proposed large regional park south of the site represents a major destination for recreational activity, the open space within the urban development are disconnected and concentrated in a bundle in the northwestern portion of the site.

By providing links along linear parks -- greenways such as eco-arterials and eco-boulevards -- residents will not only be able to travel along such avenues for daily needs, but will also be able to access other open spaces. Adjacent and nearby open spaces in the network will be more visible and approachable along such pathways.

Shenzhen's current open space provides generous levels of open space for the projected population when compared against other Chinese cities but not against some international cities. Nearby Hong Kong, famous for its extreme density, supplies over 20 times less open space than the current plan for Bantian. Urban Beijing also has signficantly less open space when compared against the current site plan.

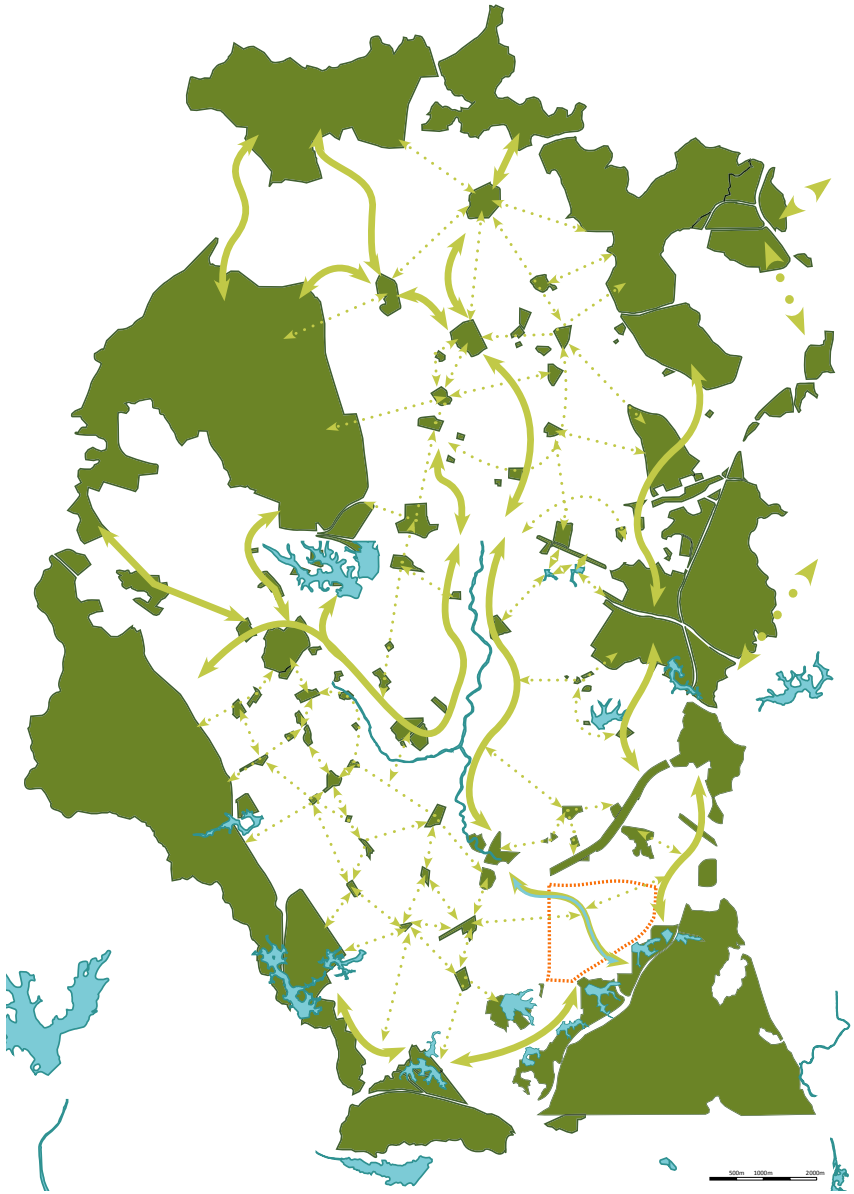
Instead of repurposing and converting parcels into open space, the new proposal more intelligently and usefully designates the existing street network as a way of linking disparate park spaces. The goal was not to perform a radical overhaul of the open space proposal; rather it was to put forward a more coherent and connected open space plan through connecting parks and reallocation. As such, our new proposal would not drastically increase the amount of open space for the site.

Per Capita Open Space Distribution. While Longgang's proposed plan offers fewer per capita open space for the site than Boston, when compared against domestic planning standards, the site's planned green spaces is relatively generous. Our proposal is does not require substantial take-offs to achieve while at the same time provding links between the site's open spaces.

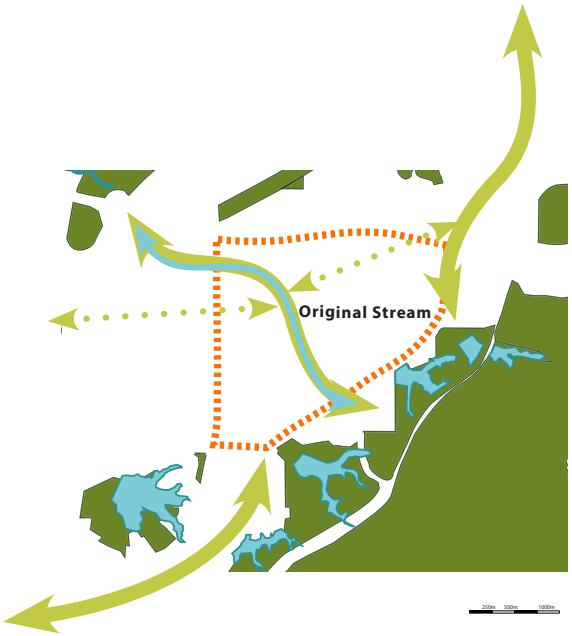


The proposed plan also links the MTR subway stations to the site network, provideing transit users with pleasant and convenient paths to reach their residences or places of business.

INTEGRATED NETWORKS > Regional Open Space Network Access



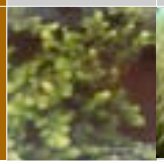
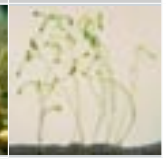
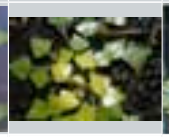
Regional Interconnections. Regional open space flows demonstrate stronger connectivity between open space areas. At left is an ideal system of regional open space connections throughout and encircling the Bantian district. At right is an enlarged portion of the regional diagram, showing site-level access points and connections to district resources.



A sustainable regional open space and water system would connect with the existing topology, hydrology, and planned land use. In the diagram to the left, a diagram demonstrates how regional flows and connections could develop. By providing linkages between pockets of open space on the district level, residents as well as wildlife will enjoy seamless access to a coherent open space network.

Many of these open space ties would follow the natural systems, like waterways. Although some of the lower lying routes have been redeveloped, culverted or smoothed out to manage and control these natural networks, a more sustainable and beneficial method of developing regional open space would coexist with these original environmental routes.

PEARL RIVER DELTA NATIVE WETLAND SPECIES

	SUBMERGED			
TYPE OF PLANT	Coontail	Eel Grass	Waterweed	
PARK CONTEXT	Linear, Local	Linear, Local	Linear, Local	
IN THE WILD				
	FLOATING			
TYPE OF PLANT	Lesser Duckweed	Semen Euryales	Water Caltrop	Water Lillies
PARK CONTEXT	District, Neighborhood, Linear, Regional	District, Neighborhood, Linear, Regional	District, Regional	District, Neighborhood, Linear, Regional
IN THE WILD				
	EMERGED			
TYPE OF PLANT	Asian Watermoss	Indian Lotus	Reedbed	Touch-Me-Not
PARK CONTEXT	District, Neighborhood, Regional	District, Neighborhood, Linear, Regional	District, Regional	District, Regional
IN THE WILD				

Native wetland plants can help treat water at various levels. The typology of the plants can be associated with certain kinds of open space. For instance, decorative floating and emerged plants can be serve as ornamentation for local and linear parks located in urban areas while other kinds of submerged plants that require large bodies of water would serve neighborhood and regional park spaces well.

Existing technologies for managing and treating stormwater and greywater are well-known. Techniques include green roofs, porous pavements, sustainable landscaping, constructed wetlands, basins and swales. To reiterate and add to previous studio analyses on low impact water and land use tools, several factors should be considered when planning and developing an area:

> Local Hydrology and Topology
> Seasonal Weather Patterns
> Local Flora and Fauna
> Historical and Cultural Landmarks
> Connections to Regional Networks
> Transportation and Community Needs

By keeping in mind these requirements *a priori* of design, the costs and impact of development on the natural environment can remain minimal. Analyzing the constraints of the site and neighborhood occurs concurrently with future planning processes.

Stormwater Collection and Flows

Reclaiming stormwater for local use relieves pressure from the regional water sources, such as the East River north of Shenzhen, from which the city pipes potable water. Shenzhen is in a sub-tropical and monsoon environment, providing ample precipitation for the site and neighborhood to reuse.

Due to its historically abundant and cheap water resources, however, the city has not developed the capacity to properly use filtered stormwater. Shenzhen could meet all its water resource needs over the course of a year through use of its rainwater resourc-

Site diagram demonstrating possible stormwater flows through an open space wetlands network. Rain water from the site as well as runoff from the adjacent hills would be captured into the reservoirs and basins of the large southern regional park. Water would flow through the rest of the site through open spaces linked by a series of interconnected swales and constructed wetlands.

es. Currently, however, this water simply disappears into the watershed as unusable and significantly polluted urban runoff.

Stormwater would be initially be captured in two ways:

> ***Distributed Rainwater Collection.*** Each building and development would be required to collect and reuse clean rainwater. A site's stormwater runoff would also be captured and undergo some initial processing so as to enter local wetlands network for neighborhood use. Techniques would include using green roofs and porous pavements.

> ***Local Water Flow Capture.*** The site where Fifth Garden and its surrounding developments in Bantian lies at the foot of several hills which feed now-culverted streambeds. Existing reservoirs used for flood control would be retrofitted to provide sources of stormwater.

Reservoirs, basins and cisterns would play a vital role in mitigating the extreme seasonal variation in rainfall. By providing a buffer for storing water, these containers could ensure a minimal level of local stormwater would be available for consumption.

Graywater Collection and Flows

With the requirement of separated streams for waste water - one for solid waste and another for graywater - graywater would be collected from buildings throughout the site. (Solid waste water would be processed at centralized treatment plants elsewhere in the district.) Graywater would undergo initial filtering for the most dirty and aromatic portions of the water so that the exposed open space network and water levels will not subject immediately surrounding areas to undesirable conditions.

Water Treatment Processing

Greywater collection. Lightly-processed graywater would flow from buildings throughout the site and enter the open space network. The water would then pass through the treatment network until it reached the final stage -- wetland parks -- where, after finishing a conditioning phase, it would enter circulation for reuse.

WATER TREATMENT METHODS

METHOD	EXAMPLE	SCALE	LOCATION	PURPOSE	TREATMENT LEVEL	COST
Porous Pavement		Street Surfaces	Linear Parks, Eco-Boulevards, Parking Lots	Stormwater Capture	Initial	$
Bioretention		Along Swales and Drainage Routes	Linear Parks, Eco-Boulevards	Filtering and Retention	Processing	$-$$
Wetland Swales		<1 Hectare Drainage	Linear Parks, Eco-Boulevards, Regional Parks, Neighborhood Parks	Filtering and Retention	Processing	$$
Wetland Basin		2-8 Hectare Drainage	Regional Parks, Neighborhood Parks	Filtering and Retention	Processing and Storage	$$$
Detention Basin		2-10 Hectare Drainage	Regional Parks, Neighborhood Parks	Retention	Storage	$$

Water treatment methods. Technologies are readily available for use in capturing and treating stormwater. Capture and initial filtering would start early in a wetland treatment process, while water would be stored in reservoirs and basins after bioremediation efforts have sufficiently cleaned stormwater and greywater.

Water treatment methods target common pollutants in graywater and stormwater. In rainwater run-off, the most common pollutants are be sediments, trace metals and chemicals such as phosphorus; in gray-water, pollutants to be targeted generally include organic hydrocarbons and bacteria.

As illustrated in the diagram on the next page, water would go through three stages of processing.

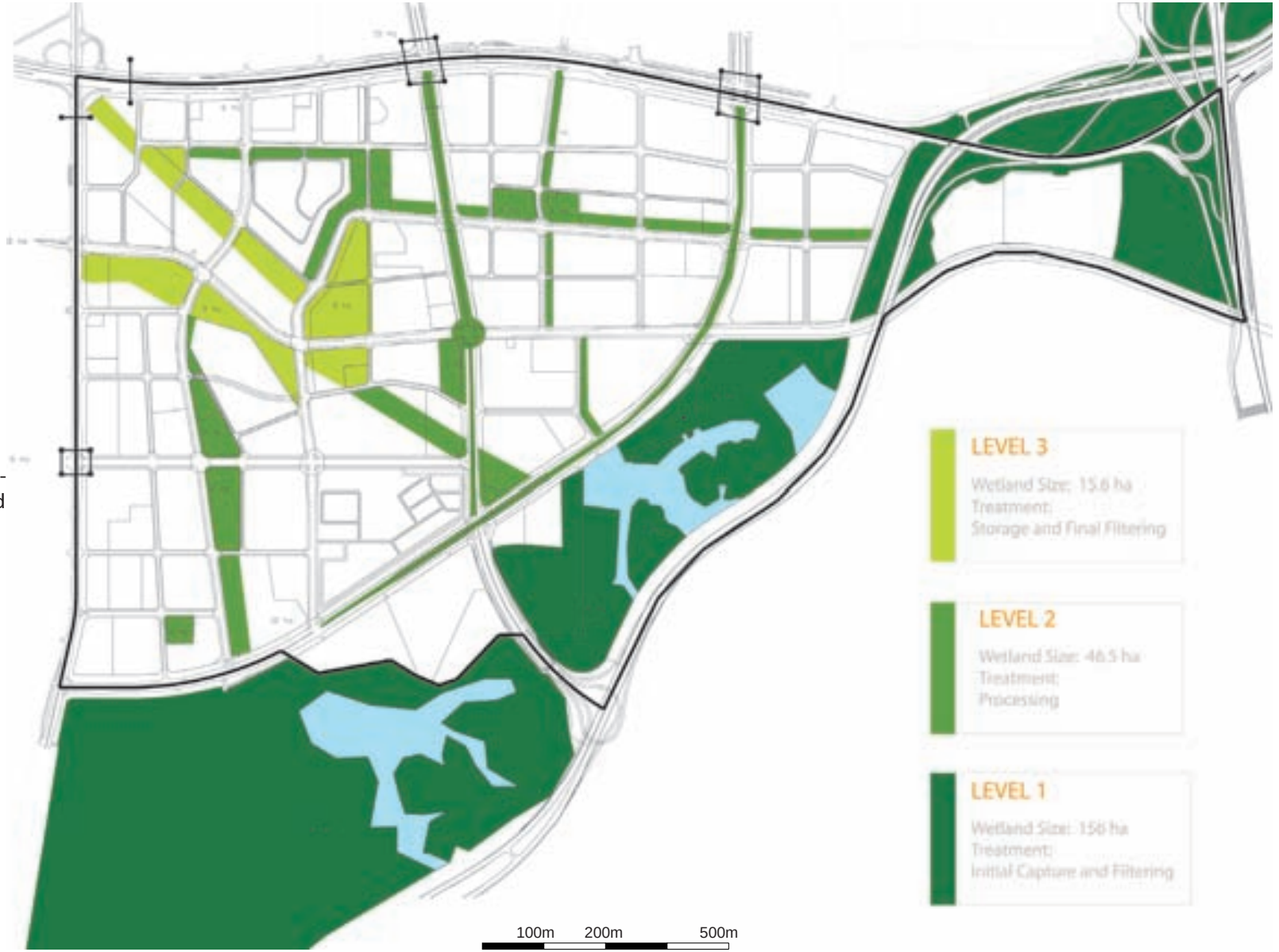
> Level 1: Collection and Initial Processing
Stormwater and gray water entering the open space system would need an sufficiently large input flow to justify the land space devoted towards its use. Thus, an initial stage of conditioning and filtering needs to occur to ensure that the water is appropriate for open air storage and flow in dense urban areas.

> Level 2: Filtering and Bioremediation
As the water flows through the open space network designated for the stage of intensive processing, the water flows through constructed wetlands and physical filters that treat the water to higher purity. These areas are planned so that water flows along the pre-urban natural conditions of the site, i.e. the original streambed and low-lying floodplains.

> Level 3: Storage and Final Conditioning
Treated water eventually reaches the areas of the open space network that acculmuate and collect water nearly ready for use. When ready for consumption, the water undergoes a final set of processing before being piped out for reuse.

Portions of the planned open space network are

allocated for water treatment levels. As the water flows through the system, increasing levels of processing and treatment would be applied to the water until it is adequately clean for reintroduction into the piped water system.



Local/regional open space programming matrix. Early in the process, we determined a range of uses that could be distributed within local and regional parks. While some of the programs and actitivies require larger spaces (hiking, swimming, boating), others can be enjoyed in both local and regional settings. This initial analysis offers a "kit of parts" which to consult when proposing programming for a district open space hierarchy.

Open Space: Parks & Recreation

The open space network should integrate recreational uses through a rigorous planning process that proposes a hierarchy of parks, and values responsive and contextually-appropraite programming. This process leads to a greater social benefit and a more efficient use of developed open space . Programmed activities should also complement the water and wetland infrastructure.

Responsive Recreation and Contextual Programming

Programmed recreation in the open space network should appropriately reflect the environmental surroundings and cultural context. Programming of activities should anticipate changing use demands: for instance, park designs could accommodate fishing and urban agriculture infrastructure if and when these activities are desired.

> ***Pocket Parks.*** These smaller spaces are located in a variety of land uses and contain simple amenities, such as playgrounds and picnic tables. Pocket parks could be strategically placed near schools so schoolchildren can conveniently access them. Government incentives should be drafted such that it is profitable for developers to build accessible pocket parks in suitable locations.

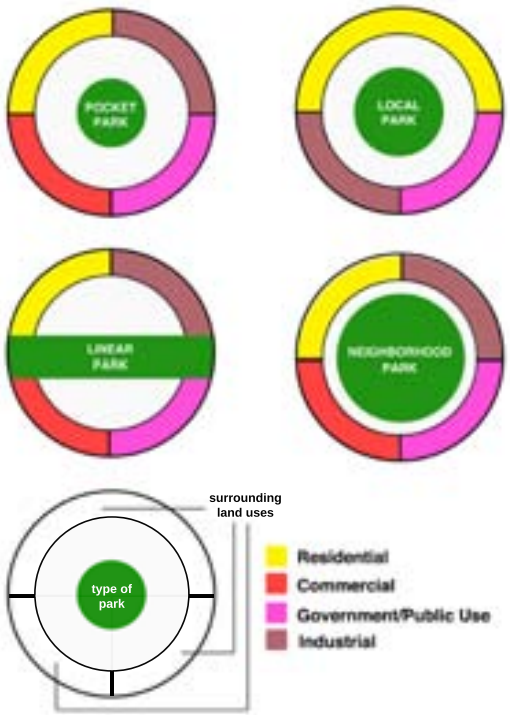
> ***Local Parks.*** Larger than pocket parks, local parks contain plazas, lawns and sports facilities like basketball or tennis courts. If located near residential developments, such spaces could also be programmed for urban agriculture and gardening.

> ***Linear Parks and Boulevards.*** Green spaces organized along straightaways provide routes for pedestrians, bikers and, along eco-boulevards and eco-arterials, vehicles. To maximize transportation use, linear parks and boulevards would connect major destinations and transportation hubs like main shopping districts and subway stations.

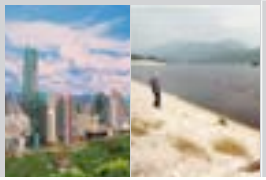
> ***Neighborhood Parks*** serve a larger base and, as such, accommodate a greater diversity of uses. These parks could contain wetland areas that are essential compo-

> ***Concise park hierarchy.*** This matrix breaks down open spaces into a series of defined *places*, allowing planners to more effectively locate and program recreational uses. At the Bantian site, this hierarchy informs our recategorization of the Longgang Planning Agency open space proposal as a network of accessible public assets.

Park hierarchy land use contexts. Park programming should respond to the needs of surrounding land uses so that open space benefits are maximized.



RECREATION/OPEN SPACE MATRIX

TYPE OF OPEN SPACE	SIZE	LAND USE CONTEXT	AMENITIES
POCKET PARK/PLAYGROUND			
	0.2 to 2 hectares	Commercial, Government/ Public Use, Residential, Industrial	Benches, Exercise Equipment, Swings, et al
LOCAL PARK			
	2-10 hectares	Residential, Industrial, Government/ Public Use	Benches, Tables, Recreational Courts, Lawn, Plaza Space, Small-scale Agriculture
LINEAR PARK/BOULEVARD			
	Variable	Residential, Industrial, Commercial, Government/ Public Use	Water Treatment, Trails, Benches, etc.
NEIGHBORHOOD PARK			
	10-15 hectares	Residential, Commercial, Government/ Public Use, Industrial	Picnic Areas, Recreation Courts, Play Fields, Trails, Water Amenities, Urban Agriculture
DISTRICT/REGIONAL PARK			
	15-30 hectares	All	Trails, Golf Courses, Water Amenities, Botanic Gardens, Museums, etc.

At the site: hierarchical parks, their relative locations, and some proposed uses.

nent of the water treatment system (for processing and storing water).

> ***Regional Parks.*** Larger recreational programming, such as water activities, golf courses, amphitheater events or hiking trails would be located here along large reservoirs, basins or mountains. These spaces would serve not only the site but the larger region and require transportation connections to provide accessibility for those further away.

While tailored to our proposal, a park hierarchy such as this is applicable beyond the site , and can be used to categorize open space in the Bantian district, and Shenzhen as a whole. By creating appropriate links between open space typologies, a larger regional network can be created through the replication of such a diverse range of parks.

Integrating Recreation into a Water Treatment Network

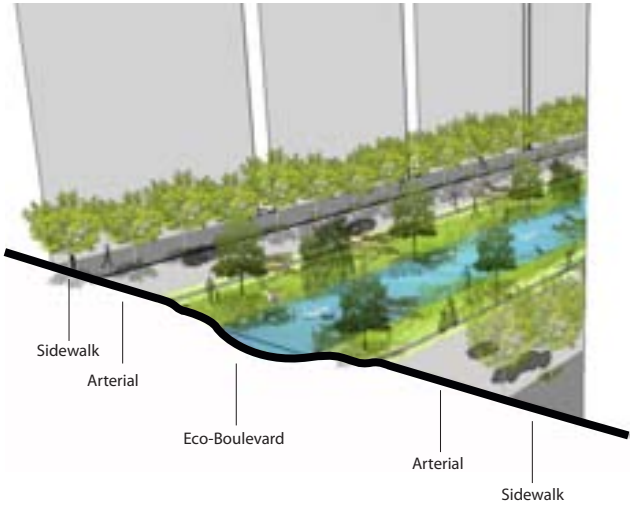
A connected open space network with integrated purposes would utilize linear parks and eco-boulevards to link open space areas. Programming suitable activities for these facilities would leverage such open space connections for the greatest benefit. For example, picnic tables or trails would typify appropriate recreation along such linkages, acting as rest areas or contemplation points.

Connections between open spaces also perform the vital role of handling the flow and treatment of the proposed water system. By providing artificial filters, constructed wetlands and other areas for bioremediation, open space linkages act as pedagogical assets by laying bare the infrastructure necessary to sustainably treat and supply water for the site.

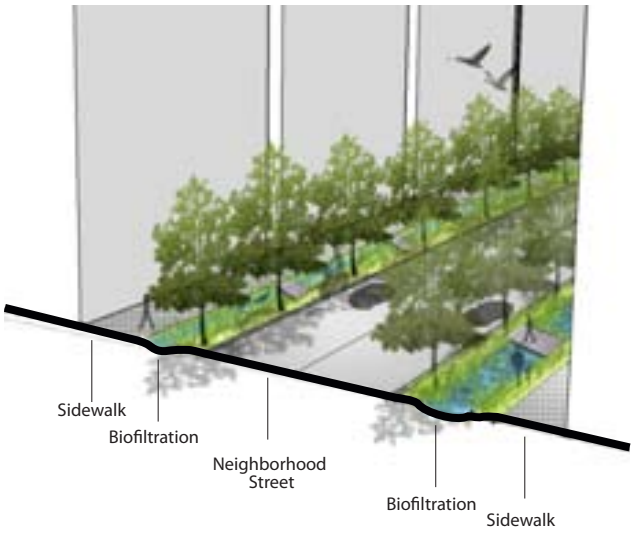
Finally, by siting open space and watercourses along the historical stream routes, the proposed plan will daylight and preserve as much of the natural landscape as possible. Not only will this minimize the impact of developing a dense urban district but it will represent an opportunity to maintain a past cultural heritage that is vital for cultivating a neighborhood sense of place that an "overnight city" will soon require.

Ensuring access to linear parks. 5- and 10-minute walk distances to linear parks extend beyond the site, and ensure that most locations within have access to these spaces.

Section of an Eco-Boulevard



Section of an Eco-Drive



Eco-Arterials

In converting major streets in the site to connecting links in the open space network, these traffic carrying roads have been designated as "eco-arterials". These streets are very nearly highways -2 to 4 lane streets - that would instead use part of their right-of-way for a linear park. Intelligently designing the street sections in conjunction with other public transportation initiatives like biking, e-biking, rapid bus and rail transit would yield usable park space with minimal impact on traffic.

Many of the planned eco-arterials would incorporate wetland watercourses or swales along them, forming an integral piece of the water management network. Constructed wetlands and landscaping would apply purification and filtering treatment to the water flowing through and simultaneously provide open space ornamentation. If exposed streams are not desirable in certain locations, an alternative is to use underwater streams teeming with submerged plantlife.

Wide streetscapes with streams potentially comprise impermeable barriers for pedestrians. There will be a need for properly designed bridges and crossings. It should be noted that watercourses pose an easier problem than designing crossings of large, impenetrable highways.

Current landscape

The Eco-Boulevard is a functional symbol of sustainability, interconnection and memory. As its Level 2 water treatment facilitates the natural processing of greywater and runoff, native plants also return to the site, offering residents and passers-by an aesthetic reminder of sustainable practices and the uniqueness of the site. The Eco-Boulevard encourages accessiblity: in addition to providing bridges and boardwalks that span the reintroduced stream, at a base level the open space offers an attractive walking and cycling route.

Location within the site

Proposed landscape

Ensuring access to Wetland Parks. 5- and 10-minute walk distances ensure that many core neighborhoods have walkable access to Neighborhood/Wetland Parks.

Wetland Parks

Wetland parks are be located in larger neighborhood or regional open spaces where adequate area exists for storing sizeable amounts of water (whether in reservoirs or wetland basins). Using these larger parcels of land would enable the reintroduction of the natural floodplains into the landscape and provide for areas for a slower flow of water, necessary for certain aspects of water treatment.

Larger neighborhood wetlands areas also provide spaces for programmed recreation within the park -- for example tai chi on boardwalk crossings. Hiking trails could be blazed through the surrounding hills of the regional park, and urban agriculture and fishing could take place in appropriate basins.

Like the Hong Kong Wetland Park (see case study), such neighborhood wetland parks offer pedagogical functions for the community by educating residents on local natural systems like hydrology, wildlife habitats and environmental protection. Related informational centers could be located near nearby schools or community centers.

Current landscape

While Level 3 water treatment occurs in its ponds and streams, residents and visitors alike enjoy a variety of recreational uses in the Wetland Park. Grassy areas afford kite-playing, while water bodies allow for certain varieties of urban agriculture, as well as fishing and bird-watching. Boardwalks and paths allow enjoyable hikes, and periodic placards offer reminders of the area's past. Overall, the park is a pedagogical resource: it cultivates and celebrates a living past, as well as a sustainable future

Location within the site

Proposed landscape

CASE STUDY > Hong Kong Wetland Park

A successful urban Wetland Park. In Hong Kong, the Park is not only a vehicle for ecological preservation and treatment, but has also become a local attraction and popular destination. Source: Hong Kong Wetland Park <http://www.wetlandpark.com/images/photo_aboutus_overview.jpg>

The Hong Kong Wetland Park is an ecological mitigation area formed in response to the development of Tin Shui Wai New Town in Hong Kong's northwestern New Territories. These wetlands serve conservation purposes and educate tourists and residents on the importance of environmental protection.

Developed in 1996, the 61-hectare wetlands abuts the dense urban development of Tin Shui Wai. The park contains numerous native species of flora and fauna and represent the area's biodiversity. Many of the plants serve the purpose of both ornamentation and the function of providing an environment to naturally filter and clean the urban runoff.

The water levels in the different parts of the wetlands are controlled by gates and pumps, necessary for certain species of plants to grow properly. In the winter, when the natural rainfall is much lower, water levels in the wetland marshes are lowered to provide areas for migratory birds.

Such parks provide local examples of what is possible with indigenous species and local development practices, can represent models that Shenzhen and Bantian can use to similarly develop wetlands in dense urban areas.

Conclusions

Successful, attractive and responsible public systems systems need not be disparate; in fact, in rapidly developing urban areas like Bantian, Shenzhen (and our site), combining local water treatment with recreational open space can result in a system that is greater than the sum of its parts. We hope that our integrated systems proposal, built from a series of responsible and responsive planning tools, can be replicated throughout the district and beyond.

In many ways, our proposal for a sustainable future is an informed (and technologically updated) reclamation of the site's hydrological and cultural history. In other words, a better future for Shenzhen can be found simply by looking to the past.

REFERENCES

The Boston Foundation. "A Time Like No Other: Charting the Course of the Next Revolution: A Summary of the Boston Indicators Report 2004-2006." (2007) <http://www.bostonindicators.org/indicatorsproject/environment/indicator.aspx?id=1696&sc=554&sct=Sustainable%20Development>

City of Los Angeles, Department of Public Works, Bureau of Engineering, Environmental Management Division. "Initial Study for the South Los Angeles Wetlands Park Project." May 17, 2007. <http://eng.lacity.org/techdocs/emg/South_LA_Wetlands_Park_IS.pdf>

Ipsen, Detlev; Li, Yongning; and Weichler, Holger. The Genesis of Urban Landscape: The Pearl River Delta in South China. University of Kassel. (2005).

Ministry of Environmental Protection, People's Republic of China. "Policies and Regulations." <http://english.mep.gov.cn/Policies_Regulations/>

Ministry of Environmental Protection, People's Republic of China. "The National Eleventh Five-year Plan for Environmental Protection (2006-2010)" 5 Mar 2008. <http://english.mep.gov.cn/Plans_Reports/11th_five_year_plan/200803/t20080305_119001.htm>

Ministry of Water Resources, People's Republic of China. "Before we run dry." 28 Feb 2007. <http://www.mwr.gov.cn/english1/20070228/82467.asp>

Ministry of Water Resources, People's Republic of China. "Shenzhen plans to raise water charges." 28 Sep 2007. <http://www.mwr.gov.cn/english/20070928/87015.asp>

Ministry of Water Resources, People's Republic of China. "Guangzhou opens new wastewater plant." 14 Nov 2007. <http://www.mwr.gov.cn/english/20071114/87947.asp>

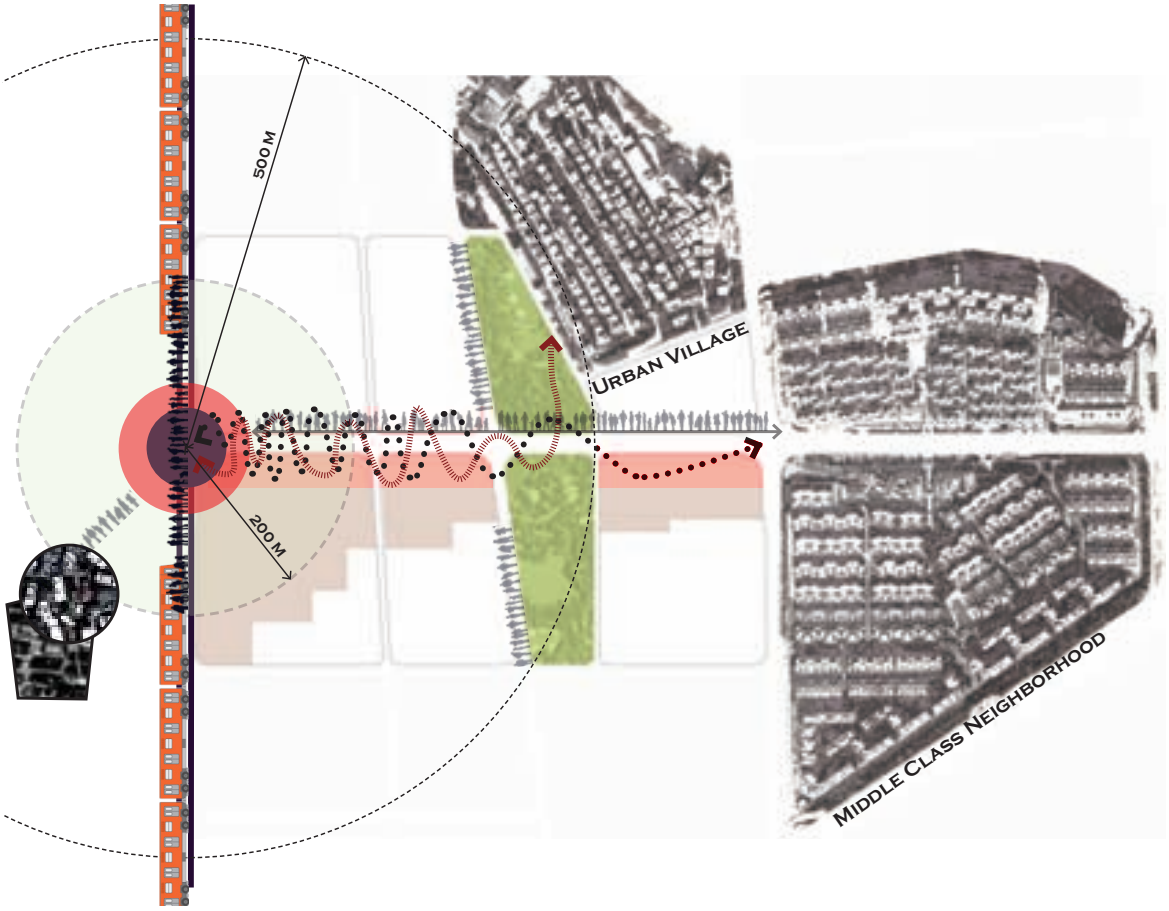
Ministry of Water Resources, People's Republic of China. "User pays, that's the price of wastage." 27 Feb 2007. <http://www.mwr.gov.cn/english1/20070227/82453.asp>

Qian, Wang. "Water price 'needs to shoot up'." China Daily. 10 Mar 2009. <http://www.chinadaily.com.cn/china/2009-03/10/content_7557856.htm>

Reuters. "Average U.S. Water Costs Increase by 7.3%" 24 Sept 2008. <http://www.reuters.com/article/pressRelease/idUS163067+24-Sep-2008+MW20080924>

Wai, Ken. "Hong Kong is lagging behind China & global cities in green policy." Hong Kong Alternatives. (2006) < http://www.legco.gov.hk/yr04-05/english/hc/sub_com/hs02/papers/hs02cb1-wkcd292-e.pdf>

Windham, Lisamarie; Laska, Mark S.; and Wollenberg, Jennifer. "Evaluating Urban Wetland Restorations: Case Studies for Assessing Connectivity and Function." December 30, 2004. Urban Habitats, Volume 2, Number 1. <http://www.urbanhabitats.org/v02n01/evaluating_abs.html>



[COVERGING SPACES]

Yang Liu
James Madden
Aditi Mehta

ASSUMPTIONS

Population / Density
Bantian has an approximate population of 320,000 people (Bantian Street Branch Office 2008). According to the Shenzhen Central Sub-District Planning, the population will increase approximately 1.71 times in the next 20 years.

Demographic Structure
In 20 years, there will be more families in Shenzhen and less single workers. Intergenerational families will become less common. There will be an increase in the elderly population. Hence, there will be a greater demand on all types of community facilities suitable for children, adolescents, adults, and the elderly.

Land Use
The Longhua District (2005-2020) Plan projects that 22% of build-able land will be devoted for residential development. In our projections, we assume that 25% of build-able land will be reserved for the development of community facilities.

Income
Shenzhen, the former Special Economic Zone will continue to grow at a rate of 10%. Accordingly, household income will continue to grow steadily. Also the large disparity between low-income migrant workers and higher-income professionals will begin to decrease.

Education
The educational opportunities for youth, adults, and even the elderly will increase. As Shenzhen's economy shifts from manufacturing to high-tech and service-oriented, there will be a greater demand for higher education among the population.

Healthcare
The healthcare sector in Shenzhen is also expected to improve its services. Based on the existing system, the reform plans and projected population trends, health care in Shenzhen in 2030 will include universal access to care, a medical clinic in every village and neighborhood, and a rational payment system.

With these assumptions in mind, we devised a formula for planners in Shenzhen to determine where different types of community facilities should be located.

Study Area *Source: Google Earth*

GOALS

Defining Community Facility Goals

The underlying goal of this work is to utilize the planning of community facilities to create a sustainable society. The type of community facilities analyzed in this report include education, health care, open space, recreation, and retail. In a sustainable society, these facilities adhere to the following principles:

EQUALITY: All residents have equal access to desired amenities

OPENNESS: Residents feel comfortable interacting with one another and their surroundings

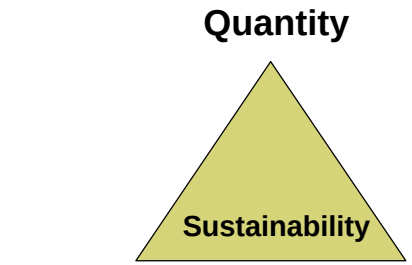
STABILITY: By fulfilling people's needs, society functions peacefully

This chapter builds upon the 2008 Shenzhen studio group's work on community facilities. Last year's report used case study analyses and planning guidelines to determine appropriate standards for the size and location of community facilites in the Bantian district. These standards are applied to our study area to form a baseline framework for planning the layout and interactions of facilities.

In this chapter, we will:

- Propose our concept of converging spaces in the Bantian district
- Review our framework methodology
- Present site plan typologies for planning a sustainable community facility network

Assessing Community Facility Goals



Quality	Does the facility meet the needs of users?
Quantity	Are there enough facilities in a given area to meet demand?
Access	Can the user afford, conveniently travel to, and feel comfortable in the facility?

ACCESS

Social	Physical	Economic
Acceptance Safety	Proximity Connectivity	Affordability
- Welcoming to people of all socioeconomic backgrounds - Comfortable to all residents	- Connecting diverse areas - Adjacent to Public Transit - Pedestrian Friendly	- Funded and maintained by government or PPP - Self-sustaining

Converging Spaces in Bantian through Compact Development

During interviews with Fifth Garden residents, participants stated that the number of community facilities at the site were insufficient to meet their needs, and that they had to travel to access education, employment, shopping, entertainment, or healthcare. We also learned that the Fifth Garden residents rarely interacted with neighboring communities different from their own. With this insight, we developed our proposal for community facility planning.

We recommend converging spaces through compact development. Converging spaces means weaving low-income and high-income areas together by clustering needed facilities in midpoint locations that bridge neighborhoods. By converging spaces, we remove social barriers that prevent people from interacting with one another. This builds social capital which allows people to network with one another and gain access to resources and information to solve problems and improve their quality of life.

Fifth Garden Residential Development *Source: Madden*

Compact development and mixed-use building are the crux of three major movements in planning: sustainable development, smart growth, and new urbanism. This type of development aims to preserve open space, contain new growth, and revitalize existing areas. Compact development is primarily used to describe efficient use of land and shortened distance between urban venues. According to Yizhao Yang, "the discourse on new urbanism and smart growth focuses both on functions and the aesthetics of how physical elements, such as buildings, streets, and public space are arranged and connected." In this way, smart growth and new urbanism are concerned not only with the densities of people and activities, but also with the manner in which people and activities are connected. It is these principles that guide our proposal for the hierarchical community facility networks in the district.

These characteristics can be assessed at multiple spatial scales. Each scale has planning implications. For example, at the district level, compactness allows effective green space and farmland protection, efficient use of land and infrastructure, and equitable allocation of public investment. At finer spatial scales, like those of the neighborhood or small community, compact development and mixed uses are frequently linked to quality of life. At smaller scales, characteristics of urban form are thought to affect the ease with which people perform daily activities such as socializing and accessing services and employment.

Urban Village Mixed-Use Development *Source: Madden*

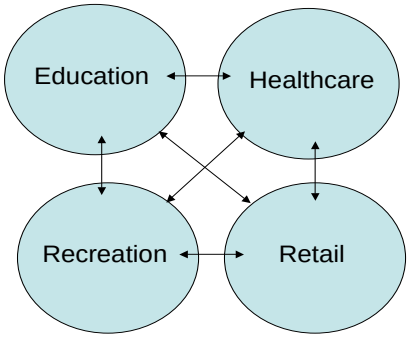
Concept: Converging Spaces

Compact Development

District Level	Neighborhood Level
Allows for effective green space protection, efficient use of land and infrastructure, and equitable allocation of public investment	Affects the ease with which people perform daily activities such as socializing and accessing services and employment

Converging Spaces

Creating shared spaces by improving and combining everyday destinations



- Facilitating and maintaining diversity
- Benefitting the disadvantaged by providing them with better conditions and opportunities
- Increasing social capital
- Using land efficiently and shortening the distances between urban venue

Proposal Framework

There are three major components to our planning methodology for community facilities: people, facilities, and location.

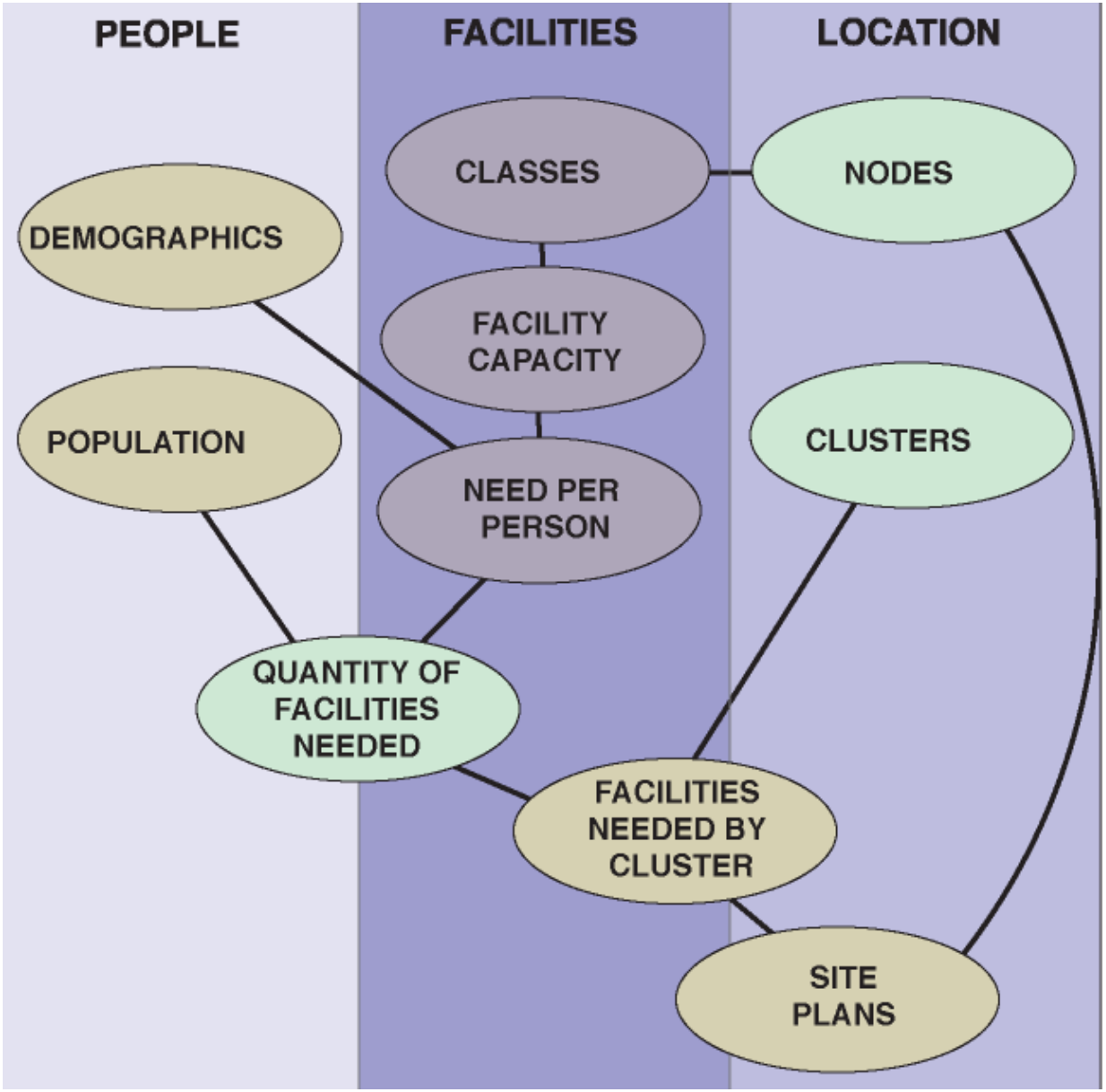
People – Population estimates created from the housing systems chapter's proposed densities drive the number of facilities needed. The aging dempgraphic drives the estimated need for specific facilities.

Facilities – Facilities are classified into five categories based upon the size of the catchment area and the intensity of use. The facilities' capacities are based upon PRC Ministry of Construction guidelines and assumptions about facility size. The need for each type of facility is based upon guidelines from last year's studio report, which were derived from case studies in Hong Kong and Singapore as well as assumptions about demographics in Shenzhen.

Location – Nodes of interaction were classified into five categories based on proposed density, street types, and transit access to match facility categories. These nodes are identified throughout the study area. The study area was then divided into community clusters based upon transportation access and population density.

People x Facilities – The need per person by facility multiplied by the population determined the overall number of facilities needed by type.

People x Facilities x Location – The facilities needed calculation was completed for each community cluster to determine the number and level of facilities each area could support. This calculation placed on top of the identified nodes provides a guideline for siting facilities. Prototypical site plans for building facilities in appropriate compact developments in these areas are then provided.

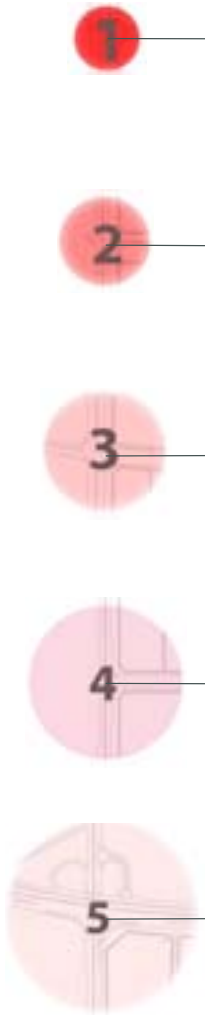


This section outlines the different type of facilities in each category, as well as the appropriate location node for that facility.

Facility Categories

Schools	Healthcare Facilities
> Kindergarten > Primary School > Secondary School > Vocational School > College	> Health Worker > Community Health Center > Clinic > Nursing Home >Tertiary Hospital

Open Space	Retail
> Pocket Park > Neighborhood Park > Green Network	> Neighborhood > Sub District > District > Destination



Nodes of Interaction and Facility Classifications

Level	Appropriate Node	Facility	Type
1	Pedestrian Road Intersection	Community Health Worker	Healthcare
		Kindergarten (幼儿园)	Education
		Pocket Park ~100 m2	Open Space
		Neighborhood retail (日常品)	Retail
2	Local Road Intersection	Primary School (小学)	Education
		Open space corridor / Green Boulevard	Open Space
		Neighborhood Park	Open Space
		Neighborhood Center	Retail
3	Collector Road Intersection	Community Health Center (市区健康服务中心)	Healthcare
		Clinic (门诊部)	Healthcare
		Secondary School (中学)	Education
		Specialty Retail (District Sub-Center)	Retail
4	Transit Stop	Nursing Home	Healthcare
		Community Hospital (医院) - 200 Beds	Healthcare
		Vocational School	Education
		Destination Park	Open Space
		Large Shopping Center (购物园)	Retail
5	Transit / Arterial Road Intersection	Tertiary Hospital (医院)	Healthcare
		College (大学)	Education

Nodes of Interaction

The node classifications are based upon the activity a location attracts and generates. The arrows in the charts to the right symbolize flows of people.

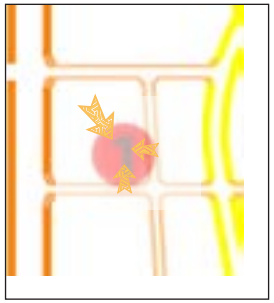
Level 1, the smallest node, exists inside a mostly residential block or group of small blocks. It attracts traffic only from the local area.

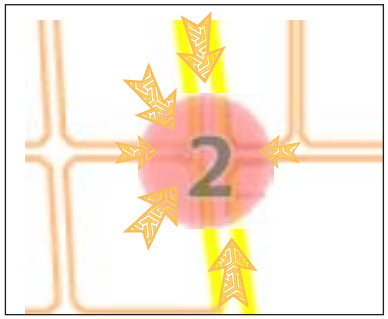
Level 2 nodes exist where local roads or pathways meet a collector road. It attracts people from several nearby residential areas and receives some traffic from outsiders.

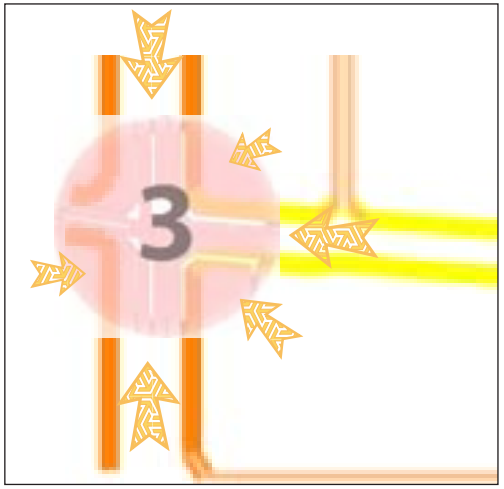
Level 3 nodes exist where a collector road meets an arterial. This area's residential blocks will likely have higher density. Residents from many areas outside the immediate locale also travel to and through the node.

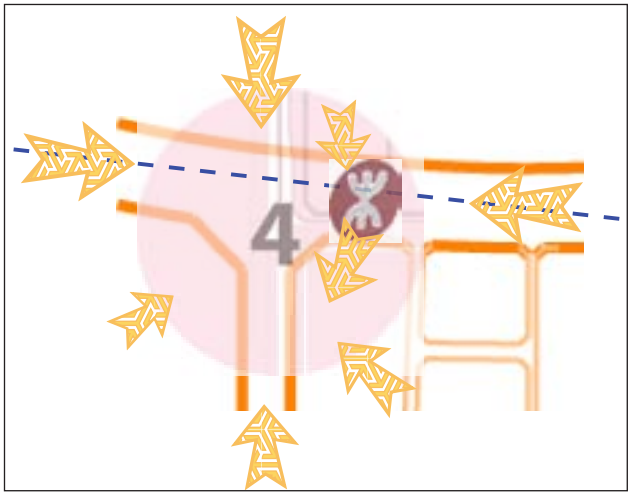
Level 4 nodes exist around a mass transit stop. The immediate area will have a higher residential density if it follows smart growth principles. Additionally, residents of other nearby residential areas will travel through the node to reach transit. Residents from all around the city have access to the node via transit.

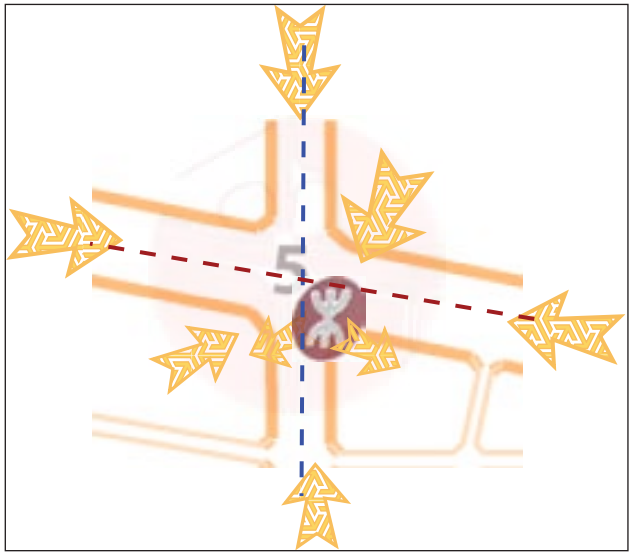
Level 5 nodes exist where transit lines intersect. The node has all of the characteristics of a level 4 node with the added activity generated by the transit intersection and a larger citywide catchment area.











Identifying Nodes and Community Clusters

Nodes were identified across the study area by examining planned public transit stops, the planned road hiearchy, and proposed residential densities.

We then created Community Clusters by grouping adjacent parcels together based on their distance from MTR stations. One cluster has limited accessibility from MTR stations, and this characteristic dictates which type and level of facility is able to locate within those boundaries.

Road Hierarchy
and
Transit Stops

↓

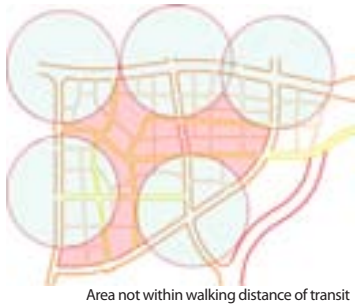
Proposed Density

↓

Facility Hierarchy
and
Nodes

↓

Community Clusters



Area not within walking distance of transit

Calculating Community Needs

The location and size of community facilities is based on the demography of an area and the intended user population. The age, sex, incomes, and addresses of the user population ultimately determine the appropriate type of facility and its geographic placement. We have created a model for the area of interest in the Bantian district to establish what type of community facilities are needed and where those facilities should be located.

First, we calculated the approximate total population for each parcel based on a set of assumptions from the housing systems chapter's research. The assumptions are as follows:

Assumptions	
Market-Rate Unit Size	90 Sq. Meters
Affordable Unit Size	50 Sq. Meters
Weighted Average Unit Size	84 Sq. Meters
Affordable Housing Required per Parcel	15%
% Builable Area for Other Uses	25%
% of Buildable Area for Housing	75%
Number of People per Household	3

Next, the following formula was employed to each parcel :

(Amount of Buildable Land) -
(25% of Buildable Land for Other Uses) x
(3 People per Household) /
(84 Sq. Meters)

The table to the night summarizes the estimated number of units and number of people per parcel in the planning area.

Population & Unit Counts				
Parcel	Builadable Area	Affordability	Number of Units	Number of People
1	132,466	Inclusionary	1,183	3,548
2	70,295	Inclusionary	628	1,883
3	0	n/a	0	0
4	68,099	Inclusionary	608	1,824
5	147,128	Inclusionary	1,314	3,941
6	170,525	Inclusionary	1,523	4,568
7	75,717	Inclusionary	676	2,028
8	0	n/a	0	0
9	70,952	Inclusionary	634	1,901
10	0	n/a	0	0
11	35,489	Inclusionary	317	951
12	53,017	Inclusionary	473	1,420
13	70,495	Inclusionary	629	1,888
14	53,024	Inclusionary	473	1,420
15	0	n/a	0	0
16	98,888	Inclusionary	883	2,649
17	0	n/a	0	0
18	0	n/a	0	0
19	22,791	Inclusionary	203	610
20	60,874	AF	913	2,739
21	86,835	Inclusionary	775	2,326
22	60,923	Inclusionary	544	1,632
23	179,901	Inclusionary	1,606	4,819
24	0	n/a	0	0
25	0	n/a	0	0
26	0	n/a	0	0
27	37,603	Inclusionary	336	1,007
28	170,141	Inclusionary	1,519	4,557
29	106,146	Inclusionary	948	2,843
30	78,046	Inclusionary	697	2,091
31	45,695	AF	685	2,056
32	51,666	Inclusionary	461	1,384
33	0	n/a	0	0
34	54,082	Inclusionary	483	1,449
35	197,548	Inclusionary	1,764	5,291
36	104,843	Inclusionary	936	2,808
37	47,437	Inclusionary	424	1,271
38	38,786	Inclusionary	346	1,039
39	37,076	Inclusionary	331	993
40	60,812	Inclusionary	543	1,629
41	67,658	AF	1,015	3,045
42	175,673	Inclusionary	1,569	4,706
43	74,516	Inclusionary	665	1,996
44	56,050	Inclusionary	500	1,501
45	0	n/a	0	0
46	41,945	Inclusionary	375	1,124
47	35,504	Inclusionary	317	951
48	39,930	AF	599	1,797
49	51,867	Inclusionary	463	1,389
50	74,875	Inclusionary	669	2,006
51	142,207	Inclusionary	1,270	3,809
52	0	n/a	0	0
53	52,432	Inclusionary	468	1,404
54	57,357	Inclusionary	512	1,536
55	77,004	Inclusionary	688	2,063
56	71,024	Inclusionary	634	1,902
57	59,153	AF	887	2,662
58	53,948	Inclusionary	482	1,445
59	0	n/a	0	0
60	13,912	Inclusionary	124	373
61	37,603	Inclusionary	336	1,007
62	37,603	AF	564	1,692
TOTAL	3,707,556	n/a	34,991	104,973

After aggregating estimated parcel populations, we found the number of people that would be living in each Community Cluster. Using our community facility standard guide, this information allows us to determine which facilities are needed and can actually be supported by the number of users present in that area. The table below displays the total population for each community cluster.

Community Cluster Population	
Cluster 1	9,980
Cluster 2	18,961
Cluster 3	20,455
Cluster 4	8,746
Cluster 5	14,970
Cluster 6	18,702
Cluster 7	13,159
Total Population	104,973

Measurement Standard & Catchment Population

Standards for the amount of each facility needed per person taken from the 2008 Studio Report are based upon Hong Kong and Singapore case studies and Shenzhen age and family composition demographics. For example, roughly one in twelve people in Shenzhen is likely to be a primary school student. Using these standards, we were able to determine how many seats, beds, or square meters of each particular facility was needed in each community cluster.

Community Facility Standard	
Educational Facilities - By Seat	Amount per Person
Kindergarten	0.026
Primary School	0.08
Secondary School	0.055
Vocational School	0.023
College	0.023
Healthcare Facilities - By Bed	Amount per Person
Health Worker	n/a
Community Health Center	0.002
Nursing Home	0.002
Community Hospital	0.02
Tertiary Hospital	0.0033
Recreation (By Sq. Meters)	Amount per Person
Pocket Park	
Neighborhood Park	
Green Network	.6 - .94
Commercial (By Sq. Meters)	Amount per Person
Neighborhood Retail	
Sub-District	
District	
Destination	.7 - .91

Community Facility Needs by Cluster							
Facility Type	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Cluster 7
Educational Facilities - By Seat							
Kindergarten	259	493	532	227	389	486	342
Primary School	798	1,517	1,636	700	1,198	1,496	1,053
Secondary School	1,125	1,043	1,125	481	823	1,029	724
Vocational School	230	436	470	201	344	430	303
College	230	436	470	201	344	430	303
Healthcare Facilities - By Bed							
Health Worker	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Community Health Center	20	38	41	17	30	37	26
Nursing Home	20	38	41	17	30	37	26
Community Hospital	200	379	409	175	299	374	263
Tertiary Hospital	33	63	68	29	49	62	43
Recreation (By Sq. Meters)							
Pocket Park							
Neighborhood Park		11,377-	11,273-		8,982-	112,212-	
Green Network	5,988-9,381	17,823	19,228	5,248-8,221	14,0718	17,580	7,895-17,580
Commercial (By Sq. Meters)							
Neighborhood Retail							
Sub-District							
District		13,273-	14,319-		10,479-	13,091-	
Destination	6,986-9,082	17,255	18,614	6,122-7,959	14,072	17,019	9,211-11,975

Number of Facilities

Similarly, we identified the approximate catchment population for each type of facility and used our projections to figure out how many of each facility could be supported in the district as a whole, as well as in each community cluster. Note that health care and education facilities are measured by bed and seat while retail and open space are measured in area. (See Table Below)

Level	Appropriate Node	Facility	Type	Lot Size (Sq. Meters)	Catchment Population (People Directly Served / Amount per Person Standard)	Number of Facilities	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Cluster 7
1	Pedestrian Road Intersection	Community Health Worker	Healthcare	n/a	1,500	70	7	13	14	6	10	12	9
		Kindergarten (幼儿园)	Education	n/a	7,692	14	1	2	3	1	2	2	2
		Pocket Park ~100 m2	Open Space	100	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		Neighborhood retail (日常品)	Retail	1,500	1,000	105	10	19	20	9	15	19	13
2	Local Road Intersection	Primary School (小学)	Education	n/a	18,750	6	1	1	1	0	1	1	1
		Open Space Corridor / Green Boulevard	Open Space	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		Neighborhood Park	Open Space	500 - 800	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		Neighborhood Center	Retail	5,680	10,000	10	1	2	2	1	1	2	1
3	Collector Road Intersection	Community Health Center (市区健康服务中心)	Healthcare	n/a	20,000	5	0	1	1	0	1	1	1
		Clinic (门诊部)	Healthcare	n/a	20,000	5	0	1	1	0	1	0	1
		Secondary School (中学)	Education	n/a	65,455	2	0	0	0	0	0	0	0
		Specialty Retail (District Sub-Center)	Retail	14,200	40,000	3	0	0	1	0	0	0	0
4	Transit Stop	Nursing Home	Healthcare	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		Community Hospital (医院) - 200 Beds	Healthcare	n/a	60,606	2	0	0	0	0	0	0	0
		Vocational School	Education	n/a	347,826	0	0	0	0	0	0	0	0
		Destination Park	Open Space	90,000	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		Large Shopping Center (购物园)	Retail	19,880	70,000	1	0	0	0	0	0	0	0
5	Transit / Arterial Road	Tertiary Hospital (医院)	Healthcare	n/a	121,212	1	0	0	0	0	0	0	0
		College (大学)	Education	n/a	347,826	0	0	0	0	0	0	0	0

Amount Per Node

Node Level	Number of Facilities	Population Served through Facilities
1	189	10,192
2	16	28,750
3	15	145,455
4	3	478,432
5	1	121,212

Amount per Type

Facility Type	Number of Facilities	Population Served through Facilities
Healthcare	78	203,318
Education	21	787,549
Recreation	n/a	n/a
Commercial	120	121,000

Converging Spaces through Community Facility Development

The nodes present a guideline for siting facilities strategically. This graphic displays an area including a range of nodes in an area that will be heavily trafficked from a proposed MRT stop to the Fifth Garden and adjacent to a large urban village area. It is a corridor that converges spaces and would be ideal for compact development.

Developing Along Nodes

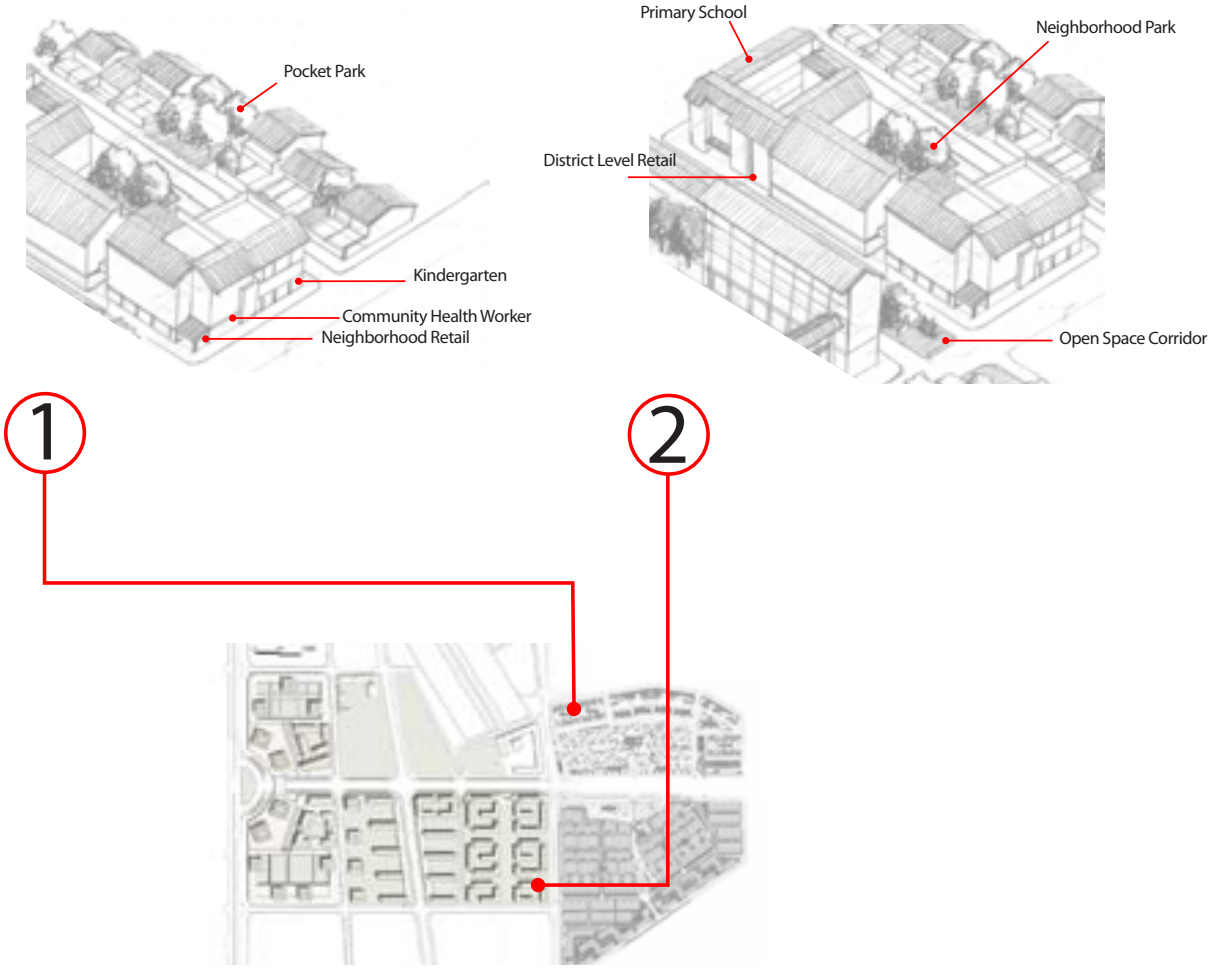
This area site plan demonstrates the different uses appropriate to the areas nodes and serves as an example of strategic siting of facilities to achieve community facility network sustainability.

The development density is declining as the development gets further away from public transit nodes. Similarly, the community facility level range becomes lower as the development density declines. A Main Street is envisioned as a public corridor which connects the proposed subway station. Most of the public facilities are organized along this public corridor.

A destination park is proposed which can engage people of different social class in both active and passive recreational activities.

Integrated Public Spaces

These site plans correspond to the hierarchical location nodes. They are presented to illustrate an archetypical development. Facilities are clustered together in the nodes.



Facility (Level 1)	Type	Lot Size (m2)	Catchment Population
Community Health Worker	Health	n/a	1,500
Kindergarden	Education	n/a	7,962
Pocket Park (100 Sq. M.)	Recreation	100	n/a
Neighborhood Retail	Retail	1,500	1,000

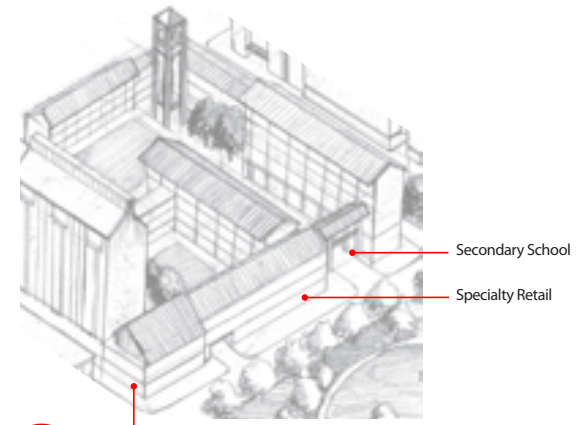
Facility (Level 2)	Type	Lot Size (m2)	Catchment Population
Primary School	Education	n/a	18,750
Open Space Corridor	Recreation	n/a	n/a
Neighborhood Park (500 Sq. M.)	Recreation	500-800	na/
Neighborhood Center Retail	Retail	5,680	10,000

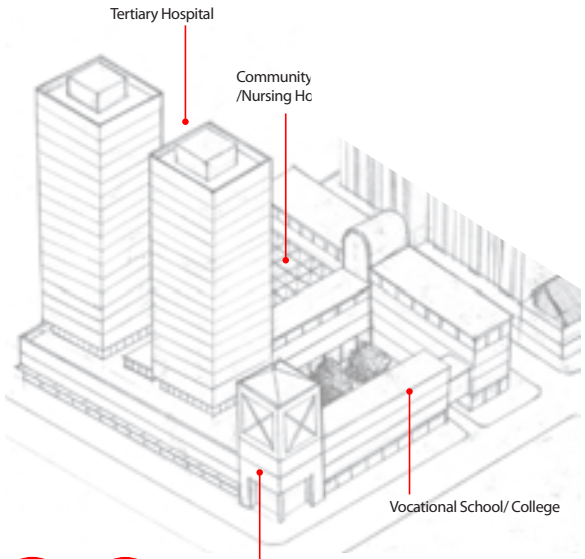
Level 1 Vignette

An open space created within urban villages around which community facilities can be clustered.

Level 2 Vignette

A public market can converge spaces and bring together different types of people





3

4/5

Integrated Public Spaces

These site plans correspond to the highest level nodes. They may also include facilities, such as a clinic or specialty retail, that are associated with lower level nodes. Higher level nodes can additionally support these more intensive uses.

Facility (Level 3)	Type	Lot Size (m2)	Catchment Population
Community Health Center	Health	n/a	20,000
Clinic	Health	n/a	20,000
Secondary School	Education	n/a	65,455
Specialty Retail	Retail	14,200	40,000

Facility (Level 4)	Type	Lot Size (m2)	Catchment Population
Nursing Home	Health	n/a	n/a
Community Hospital	Health	n/a	60,606
Vocational School	Education	n/a	347,826
Destination Park	Recreation	90,000	n/a
Large Shopping Center	Retail	19,880	70,000

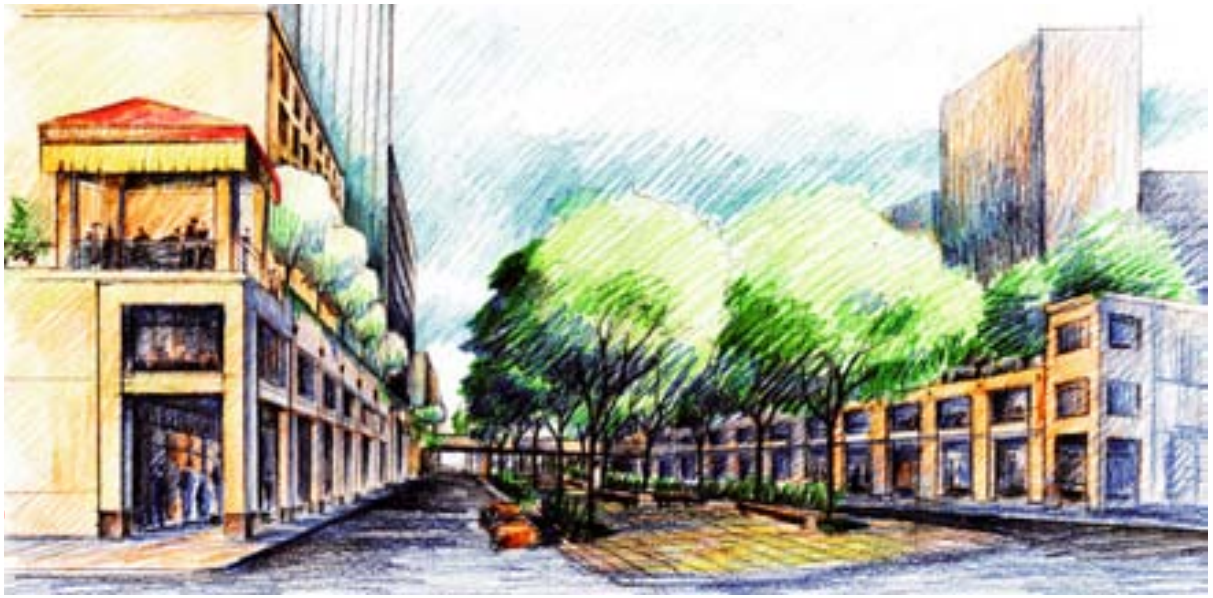
Facility (Level 5)	Type	Lot Size (m2)	Catchment Population
Tertiary Hospital	Health	n/a	121,212
College	Education	n/a	652,175

Level 3 Vignette

Open space is crucial to the vitality of community hubs

Level 4 Vignette

Main streets tend to support level four community facilities because of the corridor's density and scale.



Spatial Distribution of Facilities

The maps below compare the Longhua Planning Bureau's proposal (left) for community facilities planning with our proposal (right). Note that our proposal places greater importance on:

1) Siting facilities near transportation

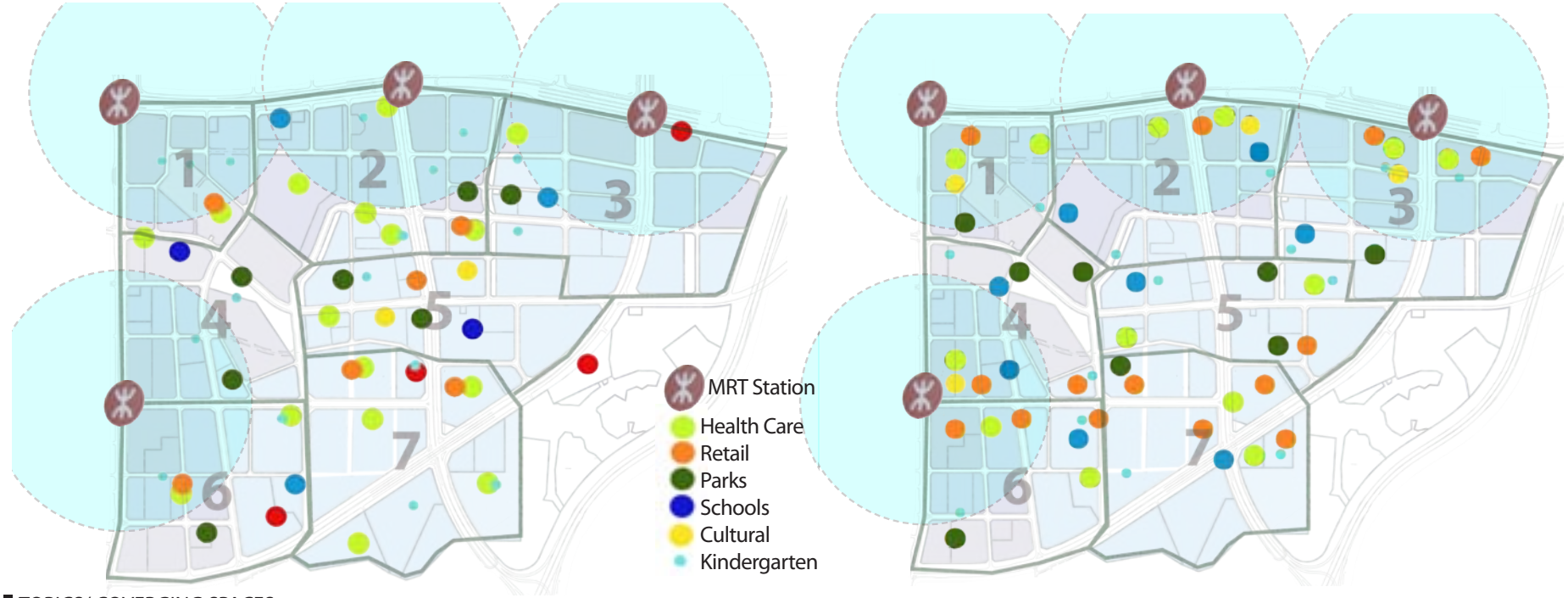
2) Siting facilities appropriately based on residential density

3) Clustering facilities

These maps are only valid for comparing spatial distribution. They do not reflect the exact location or number of different types of facilities proposed. This is because the specific facilities proposed do not match perfectly.

Longhua Planning Bureau Proposal

Studio Proposal



CASE STUDY > Tuanjiehu

The Tuanjiehu area provides a vibrant example of what we have described as a level 4 node. This area is an ideal example of converging spaces in the following ways:

- It clusters education, healthcare, retail, and recreational facilities together through compact development
- It bridges neighborhoods, creating a shared space among areas with different socioeconomic status
- It is accessible by public transit, as well as by automobile
- It lures visitors and is welcoming to users of all ages
- The area was developed through both public and private development

Tuanjiehu is located just outside the 3rd Ring Road in the Chaoyang district of Beijing. It is anchored by a neighborhood level destination park, Tuanjiehu Park. A new subway stop opened in 2008 to service the rapidly developing area. Office space and high level retail lie south of the subway, while the streets north and east are lined with neighborhood level retail. A public food market on a pedestrian only street leads east from the park into a residential area. The neighborhood also boasts several medical centers and a college. The housing stock in the area includes older, government-built apartment blocks, newer luxury apartment towers, school dormitories, and a few remaining hutongs.

Tuanjiehu shares many similarities with our study area in Bantian. Both districts are outside of the city center. The mix of housing stock is similar, with a mix old and new, working and upper class. A subway station opened near Tuanjiehu in 2008, and several are planned for Bantian. Both sites are located along major surface roads. Both contain a mix of neighborhood level retail as well as employment centers.

Tuanjiehu - Level 4 Node in Beijing

Artificial Beach in summer
Source: James Madden

Lake in Spring, stocked with fish
Source: James Madden

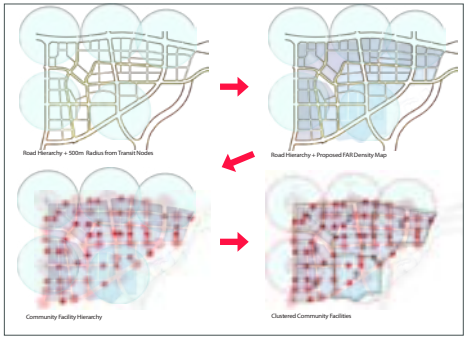
Bikes at Tuanjiehu West Gate
Source: James Madden

CONCLUSION

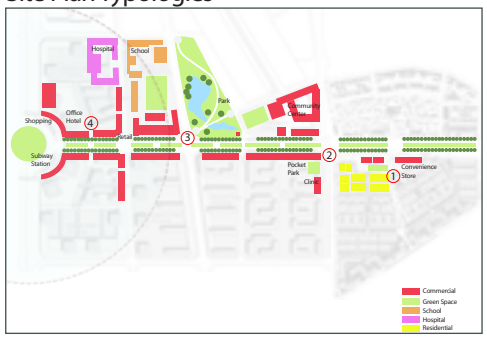
What Tools can be used to Build Community Facilities?

- The government needs to offer private developers financial incentives such as affordable construction loans to build these facilities
- Tax incremental financing is a useful way tool to leverage public spending on community facilities. For example, the development of a luxury hotel will increase the value of property tax in the surrounding area. The expected increase in revenue can back a private loan for the construction of a new park.

Location Scheme



Site Plan Typologies



Why Invest in Community Facilities?

Build Communities

Community facilities promote interactions among residents from the same and different neighborhoods

Increase Property Values

Civic centers generate investment in and around the district

Increase Commercial Activity

By clustering different types of facilities together, we lure more people to certain locations, which will help businesses in those locations thrive

Create an Identity

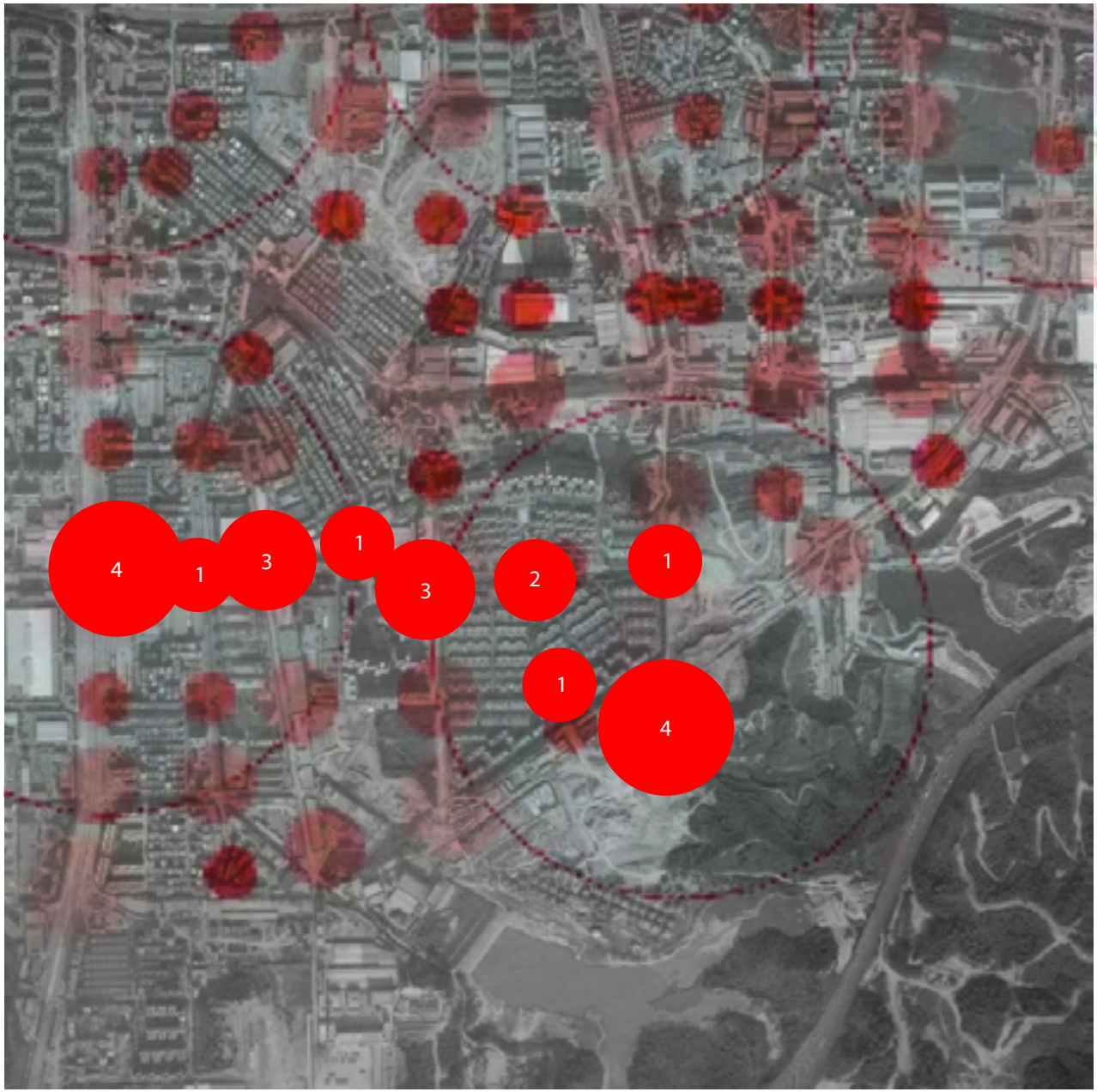
Community clusters foster placemaking, which increases the marketability of the City

Increase Accessibility

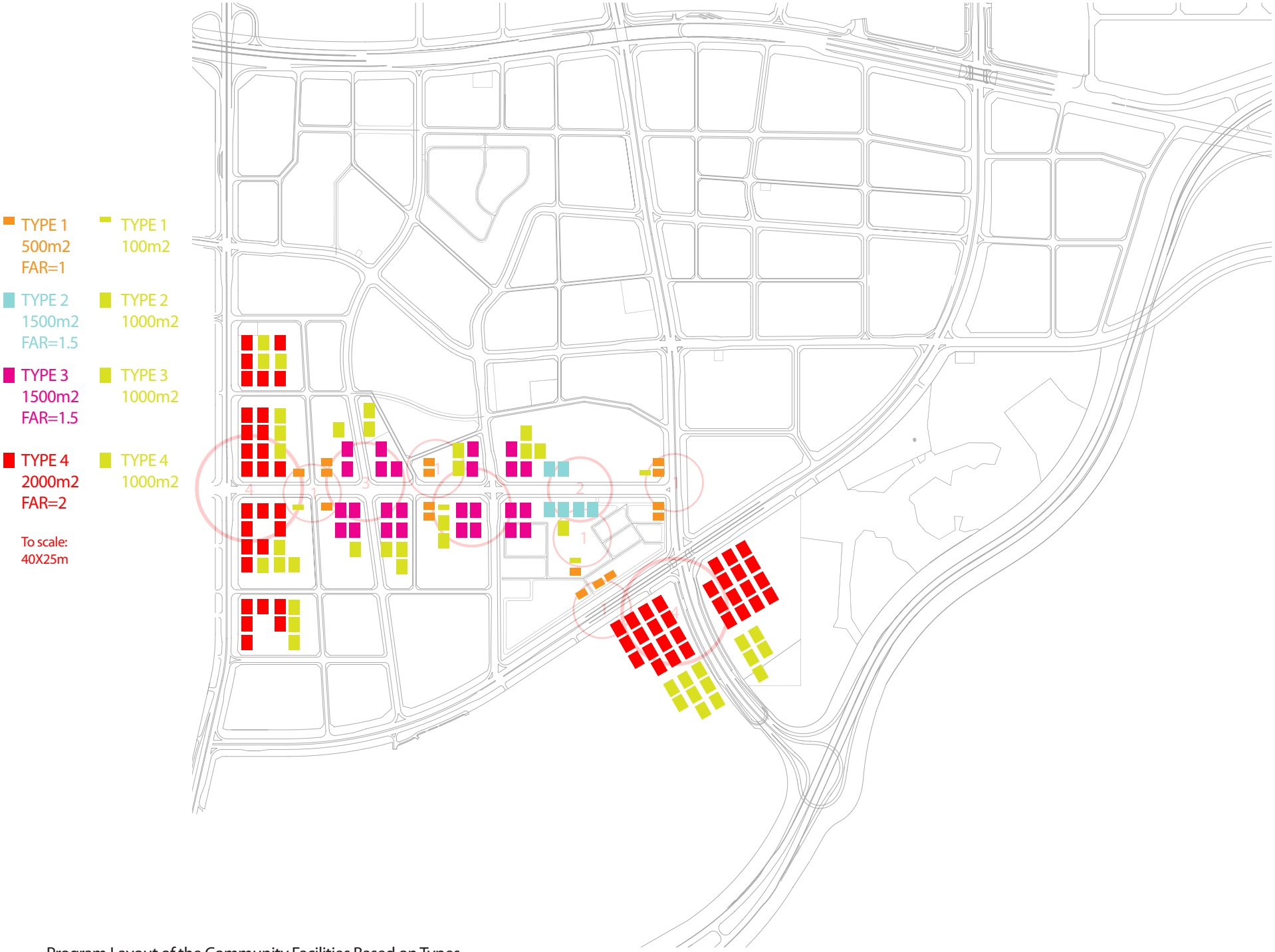
Community facility clusters remove social and physical barriers and invite all individuals to visit the destinations, which are appropriately located with regard to transit

APPENDIX > An Interweaving Pattern

To respond to Vanke's suggestion after the mid-term review, as well as trying to identify the very potential of the specific area around the Fifthe Garden. The following proposal aims to establish an interweaving pattern based on the proposed data set/spatial layout by Group Community Facilities and Natural Systems.



Research Area



Program Layout of the Community Facilities Based on Types

TYPE 1
500m2
FAR=1

TYPE 1
100m2

TYPE 2
1500m2
FAR=1.5

TYPE 2
1000m2

TYPE 3
1500m2
FAR=1.5

TYPE 3
1000m2

TYPE 4
2000m2
FAR=2

TYPE 4
1000m2

To scale:
40X25m

Retail

Open Space

Healthcare

Education

Kindergarten
Pocket Park
Open space corridor
Neighborhood Park
Destination Park

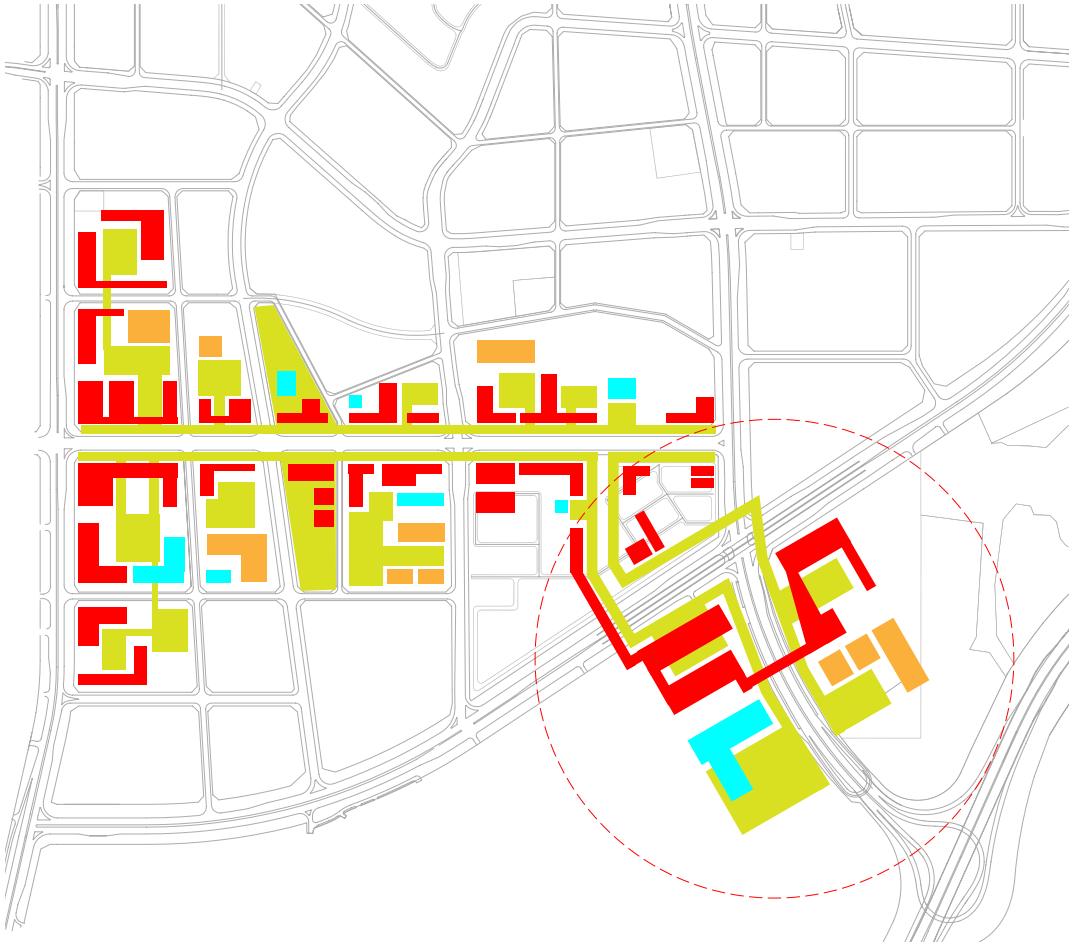
Neighborhood retail
Neighborhood Center
Specialty Retail
Large Shopping Center

Community Health Worker
Community Health Center
Clinic
Nursing Home Healthcare
Tertiary Hospital

Primary School
Secondary School
Community Hospital
Vocational School
College

3 Methods to strengthen the linkages and cultivate the sense of communities:

1. Use open spaces to create a pedestrian-friendly environment.
2. Use linear building types/commercial blocks to maintain the visual continuation.
3. Incorporate the existing urban patterns into the proposed fabric.



An Approximte Spatial Layout of the Community Facilities Based on Programs

PROPOSAL > Projection of Program Layout

Focusing on the south part of the research area, which is categoried as Type 4, we feel like there is the tendency to elevate this area to a more prominent position, visually and functionally. However, considering the significant elevation difference, the former spatial layout that is established on a 2D dimension needs to be reconsidered.

The masses somehow follow the contours, while maintaining a certain degree of functional shape to hold commercial/educational/hospital functions. The landscape interweaves with the buildings to create a more desirable artifical environment.

Programmatic Siteplan adjusted based on Elevation Difference

REFERENCES

Sennett, Richard. (1998) 1998 Raoul Wallenberg Lecture. University of Michigan, College of Architecture & Urban Planning.

Public Markets as a Vehicle for Social Integration and Upward Mobility. (September 2003) Prepared by The Project for Public Spaces for The Ford Foundation.

Project for Public Spaces. (2009). http://www.pps.org/

Yang, Yizhao. (Summer 2008) A Tale of Two Cities: Physical Form and Neighborhood Satisfaction in Metropolitan Portland and Charlotte. Journal of the American Planning Association, Vol. 74, No.3, P. 307-321.

Baldassare, M.(1982). The Effects of Neighborhood Density and Social Control on Resident Satisfaction. Sociological Quarterly, 23(1), 95–105.

Forsyth, A., Oakes, M., Schmitz, K., & Hearst, M. (2007). Does Residential Density Increase Walking and Other Physical Activity? Urban Studies, 44(4), 679–697.

Reinventing Streets as Places. (2009) Project for Public Spaces. http://www.pps.org/info/newsletter/great_streets/reinventing_streets_as_places

[ACCESSIBILITY]

Eric Minikel
Kristin Simonson
Ruifeng Tian

INSPIRATION

When Fifth Garden residents were surveyed as to what they liked about living there, a variety of answers emerged. Most mentioned the ability to afford a larger home than they could downtown, but some also cited the Chinese architecture, while others wanted to live closer to a workplace such as Huawei. But when asked what they disliked about Fifth Garden, the answer was near unanimous: the location is "inconvenient"—too far from good schools, large parks, good grocery stores or vegetable markets and so forth.

City planners tend to assume that as a society gets richer, people's demand for mobility increases: people need to take more trips longer distances, and faster. Cars are considered the ultimate tool for mobility, and so new infrastructure should support more car use.

Fifth Garden residents are some of Shenzhen's wealthier people—almost 100% of households own cars, compared to about 10% city-wide, and around 2% in all of China . Clearly, it's true that as people get wealthier they demand more mobility. But the fact that Fifth Garden residents, for all their above-average mobility, still find south Bantian "inconvenient" shows us that mobility is not enough. For this reason, we introduce the concept of accessibility.

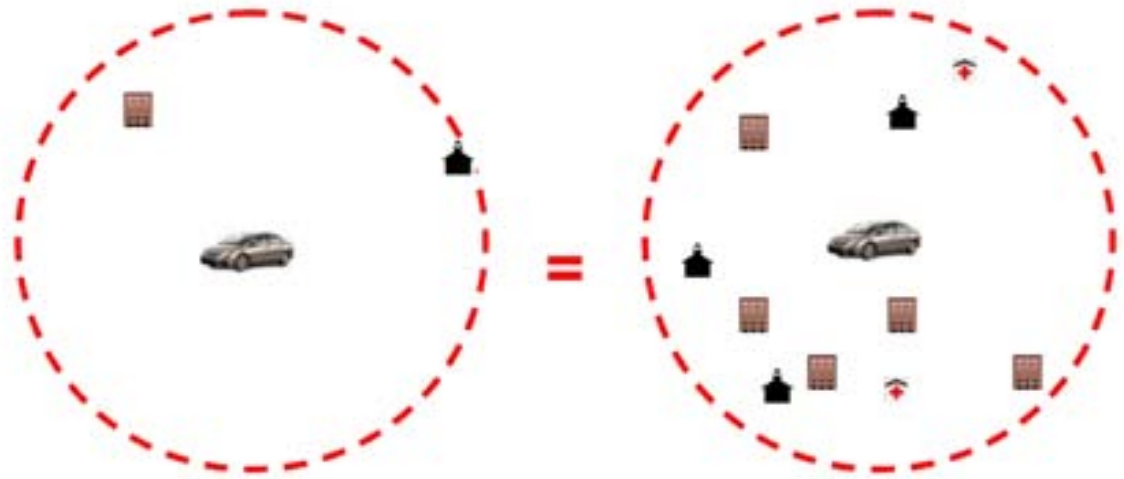
Top: Fifth Garden residents. (L to R) Lei Ling, Liu Yuansheng and Cai Bing. Sources: Kristin Simonson and Eric Minikel

Right: Fifth Garden is designed for universal car ownership. Source: Eric Minikel

MOBILITY

Mobility is a measure of how far one can travel in a given amount of time. With the same transportation tools—say, a car, as pictured—one can go an equal distance, and so one has equal mobility, regardless of how many destinations are within that distance.

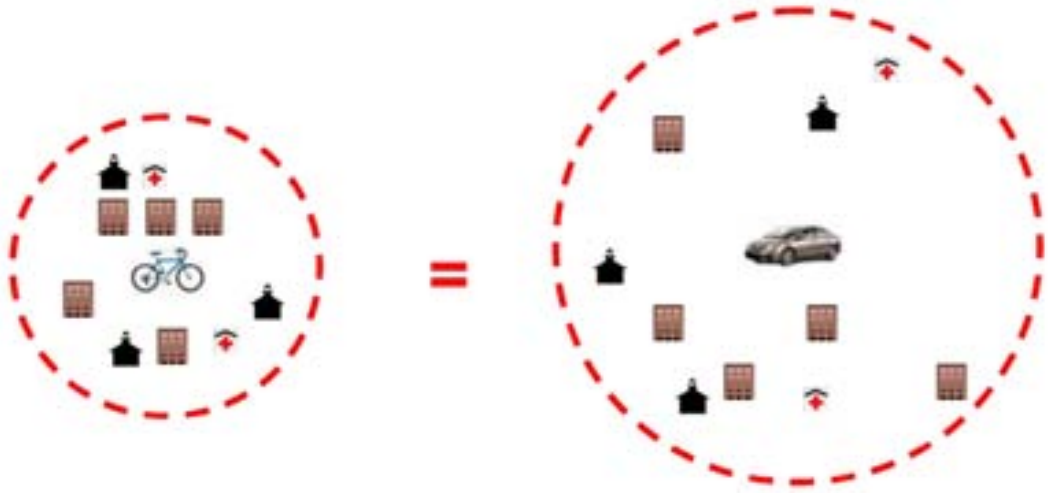
Mobility = f(transportation tools, ex. car, bicycle, walking, public transit)



ACCESSIBILITY

Accessibility, on the other hand, is a measure of how many destinations one can reach in a given amount of time, regardless of how far away they are. So a person with just a bicycle in a very dense area full of schools, hospitals, jobs and stores can have accessibility equal to a car owner in a more disperse area.

Accessibility = f(Mobility, Network, Density, Safety, Security, Comfort, Integration...)



CONCEPTS > FROM MOBILITY TO ACCESSIBILITY

Accessibility is a function of mobility, to be sure, but also of many other things: density, for example, because a more densely populated area can support more services and amenities in a given area. Security from crime and safety from traffic accidents both matter, because destinations are useless unless a person feels safe getting to them. Comfortable, aesthetically pleasing streets and a street network of human scale both allow people to enjoy walking—or cycling—and thus make reaching nearby destinations less of a chore. And finally, integration between modes—for example, bike parking and efficient bus transfers at a metro station—makes it easier for people to combine modes to reach further destinations.

Accessibility is a more complex notion than mobility, but it's also a better reflection of what people really want and need: most transportation trips are taken not for their own sake but to reach a destination. And what's more, accessibility can be achieved more sustainably than mobility. Whereas increasing mobility—taking people farther faster—inevitably means using more energy and emitting more CO2, increasing accessibility can mean, for example, increasing density so that people actually make shorter trips. People tend to walk and bike more in highly accessible areas, and those modes use less than a tenth of the street space of a passenger car, so high accessibility need not put the same strain on road capacity—and therefore on taxpayers—that high mobility must. And finally, accessibility is an amenity enjoyable by all, whether or not one has the financial resources to own a car—and so it contributes to social equity and the Chinese government's goal of a harmonious society.

GOALS

In keeping with the overarching goal of this project, we take our goal to be sustainability. Sustainability is often defined in terms of the "three Es": environment, economy and equity. All three of these subgoals can be met through improved accessibility.

Improved accessibility, in turn, must come from improvements in the many factors of which accesibility is a function. In this chapter we will focus on comfort, safety, and network through a new street plan and street designs.

ASSUMPTIONS

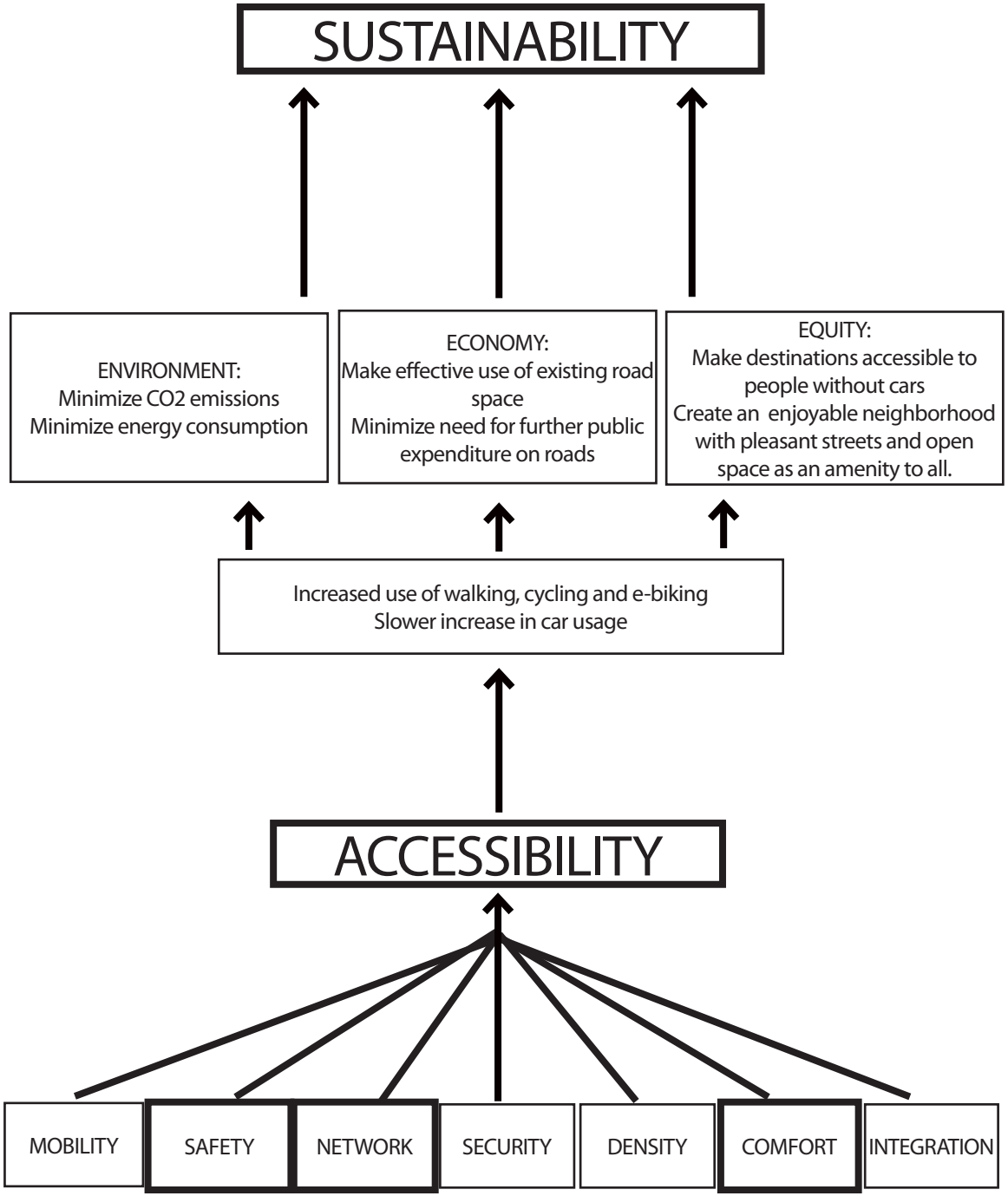
In addition to the assumptions outlined in the scenarios presented at the beginning of the report, there are several mobility related assumptions:.

First, car ownership inShenzhen will continue to increase with personal wealth. However, car use will be limited by road network capacity and increasingly supplemented by use of alternate mobility modes: walking, biking, e-bikes, buses and subway.

Second, the design for the network must accomodate all modes of mobility, either together or separated.

Third, an increase in leisure time will be accompanied by increased recreational walking and biking and desire for access to open space and parks.

Finally, the accessibility network must be coordinated with land use and open space planning.



EXISTING CONDITIONS

BLOCK SIZE & PERMEABILITY

Given the complaints of the Fifth Garden residents, it is not surprising to find that there are a number of problems with accessibility in South Bantian. Even from an aerial view, it is evident that the blocks are enormous. On the ground, one can also see that many of the blocks are impermeable—new developments are hidden behind a perimeter wall, and even the urban villages are sometimes hidden behind a berm without easy access. While passengers in a vehicle may scarcely notice, this sense of exclusion and distance is tiresome to pedestrians and cyclists, and makes walks feel even longer than they are. The perimeter walls also objectively lengthen walks, as one must walk from home to the gate of the development and then around the edge, instead of going somewhere directly.

Boston

Amsterdam

Barcelona

Viena

Above: Compared at identical scale, South Bantian's blocks-- defined by public, paved streets-- appear far larger than those in Boston, Amsterdam, Barcelona or Vienna. Of course, this isn't quite a fair comparison because many of South Bantian's blocks are actually permeated by footpaths, informal streets or private drives, making the effective block size smaller for residents. Yet on the other hand, many compounds *are* walled off to non-residents or non-employees. All told, it is difficult to make a quantitative comparison with the other cities, but qualitiatively, it is clear that South Bantian's blocks are very large. Sources: Michael Dennis (Boston, Amsterdam, Barcelona and Vienna), Ruifeng Tian and Eric Minikel (South Bantian).

PEDESTRIANS

The pedestrian environment in South Bantian is not one to encourage recreational walking. Sidewalks are often invaded by parking or by leisure activities. Where roads or buildings are under construction, sidewalks are simply removed, forcing pedestrians to walk in traffic with no barrier. On major roads, bridges are provided to help pedestrians circumvent aggressive traffic, but climbing so many steps can be tiresome, particularly in Shenzhen's warm climate.

BICYCLES

The cycling environment is no better, and helps to explain why there are almost no cyclists. No bike lanes are provided, and the sharing of right-of-way both endangers the cyclists and slows down the automotive traffic. At destinations, too, no secure bicycle parking is offered.

E-BIKES

With longer range, higher speeds and requiring less exertion, e-bikes might offer a tempting alternative to bicycles, particularly in Shenzhen's warm climate. City policy has been lukewarm toward e-bikes, however. By official policy, e-bikes must fall below certain weight and maximum speed limits to be street legal, and even then are only allowed in certain parts of the city. Since, like bicycles, they would have to share right-of-way with cars, they are fairly unsafe. In practice, e-bikes are nearly nonexistent in Shenzhen.

Clockwise from upper left: parked cars invading the sidewalk; recreational uses blocking the sidewalk; pedestrian bridges needed to avoid aggressive traffic; traffic lane blocked by cycles; cyclist endangered by cars in shared right-of-way; sidewalks removed during construction. Sources: Kristin Simonson and Eric Minikel

Existing Streets	Modes	Adjacent Uses	Section	Pros	Cons
Urban Village 				> De facto shared street is relatively pleasant and safe for all modes	> Vulnerable to aggressive drivers > Inconsistency of sidewalks irritating to pedestrians
Fifth Garden 				> Pleasant green boulevard Ample space for both pedestrians and cars	> Wide relative to low volumes handled > Businesses are isolated from street by multiple buffers
Wonderland 				> Aesthetically pleasing > Safe, quiet and comfortable for pedestrians > Wide enough for emergency access	> Alternate route needed for deliveries > Motorized users may be deterred
Local Street 				> Parking provides buffer between pedestrians and traffic > Easy motorized access to businesses	> Some sidewalk space taken up by perpendicular parking > Shared right-of-way is unsafe for bikes/e-bikes and inefficient for cars > Fence makes it impossible for pedestrians to cross at most points
Existing Arterial 				> High motorized traffic volume	> Shared right-of-way is unsafe for bikes/e-bikes and inefficient for cars > Pedestrians squeezed between wall and fence > Sidewalk space taken up by perpendicular parking > Pedestrians must cross by bridge or by running during a gap in traffic
New Arterial 				> High motorized traffic volume > Green strips > Wide sidewalks	> Shared right-of-way is unsafe for bikes/e-bikes and inefficient for cars > Pedestrians must cross by bridge

Sources: Kristin Simonson and Eric Minikel

PLANNING BUREAU'S PLAN

The Longgang District Planning Bureau has proposed a long-term plan for land use and street network on the site. Its plan makes inroads at addressing some of the site's problems.

> Newly added streets break up some of the site's super-blocks.

> A good deal of open space is added, some in the form of linear parks.

However, the plan leaves other questions unanswered.

> Density. Allowable FARs are not listed. The probable clearing of buildings to pave new streets will lower density somewhat, while the infill of new Vanke developments carved out of the hillside at the southern edge of the district will contribute to increasing site density. It is unclear what the net effect on density will be.

> Street Design. While new streets are proposed, and width appears to vary, the design of the streets is not included, and no clear hierarchy emerges (see opposite page).

> Continuity of Open Space. The site still fails to capitalize on its proximity to a large swath of open space in the hills. While steep, this space could accomodate a variety of leisure activities if only it were reachable.

> Land Uses. The planning bureau says that the colors on its map indicate projected land use, not regulatory zoning. It seems logical that office and industrial uses will migrate toward MTR stations, as pictured, while housing will fill the interior of the site, but one hopes that some retail and institutional uses will remain in the site center as well, shortening non-work trips and increasing accessibility for residents.

Above: Longgang District Planning Bureau's plan for the site. Source: Longgang District Planning Bureau

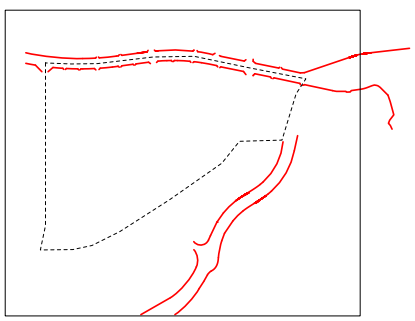
ANALYSIS: PLANNING BUREAU'S PROPOSED STREET NETWORK

This analysis separates the planning bureau's proposed streets into eight categories by width of right-of-way. One would expect a coarse grid of major streets filled in with a finer grid of minor streets. Instead, when the streets are separated out, what emerges is a somewhat random pattern, where some street types are found only in one region of the site and none of them neatly subdivide the site's area, with the possible exception of the 30m boulevards.

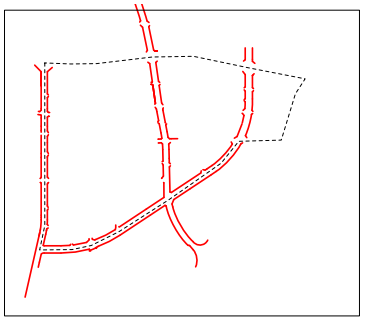
This variation may stem in part from the Planning Bureau's local knowledge of the site, for example, what size of right-of-way it is possible to acquire in different parts of the site.

Out of respect for the Planning Bureau's site-specific knowledge, we use their street network as a starting point for ours.

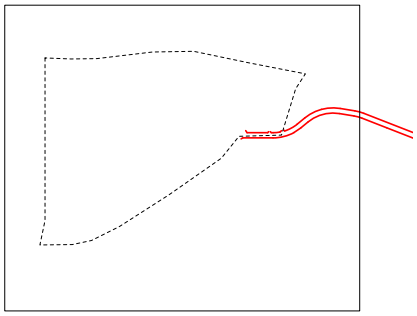
The Planning Bureau does not indicate proposed designs for its streets, and it is possible to imagine that all the streets will give priority to autos, missing a valuable opportunity to increase accessibility by creating a true street hierarchy. In the next section we diagram a concept for such a hierarchy in which a course grid of major streets handles most of the auto traffic and a finer grid of minor streets gives priority to non-motorized modes.



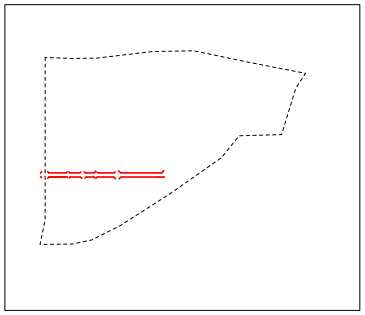
100-120m



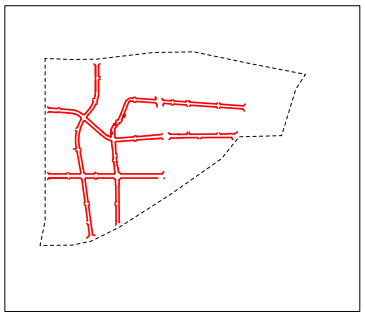
60m



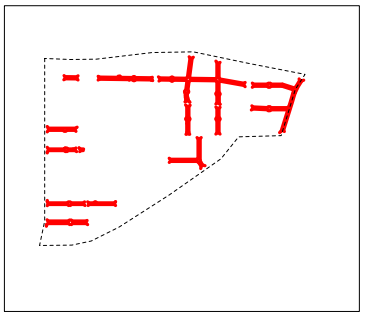
50m



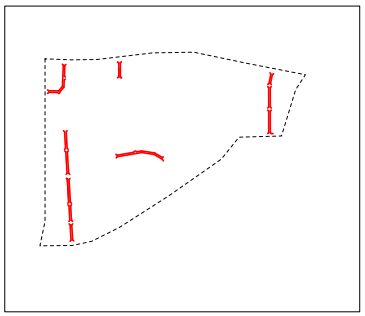
40m



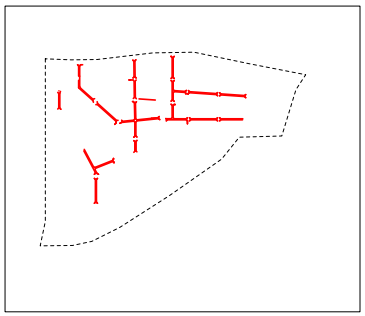
30m



20m



15m



10m

PROPOSAL

We believe that we can improve upon the Planning Bureau's plan. Central to our strategy is our new concept of accessibility. At right is a list of measures that can impact each of the parameters of accessibility.

The most important measure is to create a new street grid based on a clear hierarchy and best street design practices. A hierarchy can improve efficiency by shunting most car traffic onto arterials where cars have priority, and diverting cycle and pedestrian traffic to smaller streets where those modes have priority. Good street design can actively accomodate and encourage pedestrians and cyclists by improving comfort and safety.

The bulk of this chapter will focus on street network, street design and density, but many of the other items listed at right are addressed in other parts of this book. For more information, please see:

> [TRF's tool] - E-Bikes

> [K's tool] - Xiang

> [E's tool] - Bicycle-Friendly Street Design

> [Pedram and Feifei's chapter] - Selectively increasing density.

> [James, Aditi and Liu Yang's chapter] - Bringing community facilities to the neighborhood level.

Accessibility = f(Mobility, Safety, Network, Security, Density, Comfort, Integration)

Mobility:
- Implement policies to allow and encourage e-bikes
- Complete and add MTR stations and lines
- Additional bus routes and stations
- Improve intracity bus and train access from district

Safety:
- Add pedestrian- and bike-oriented streets and paths
- Promote helmet use with bikes and e-bikes

Network
- Finer street grid
- Street hierarchy with somewhat separated modes
- Major streets connect to adjoining neighborhoods

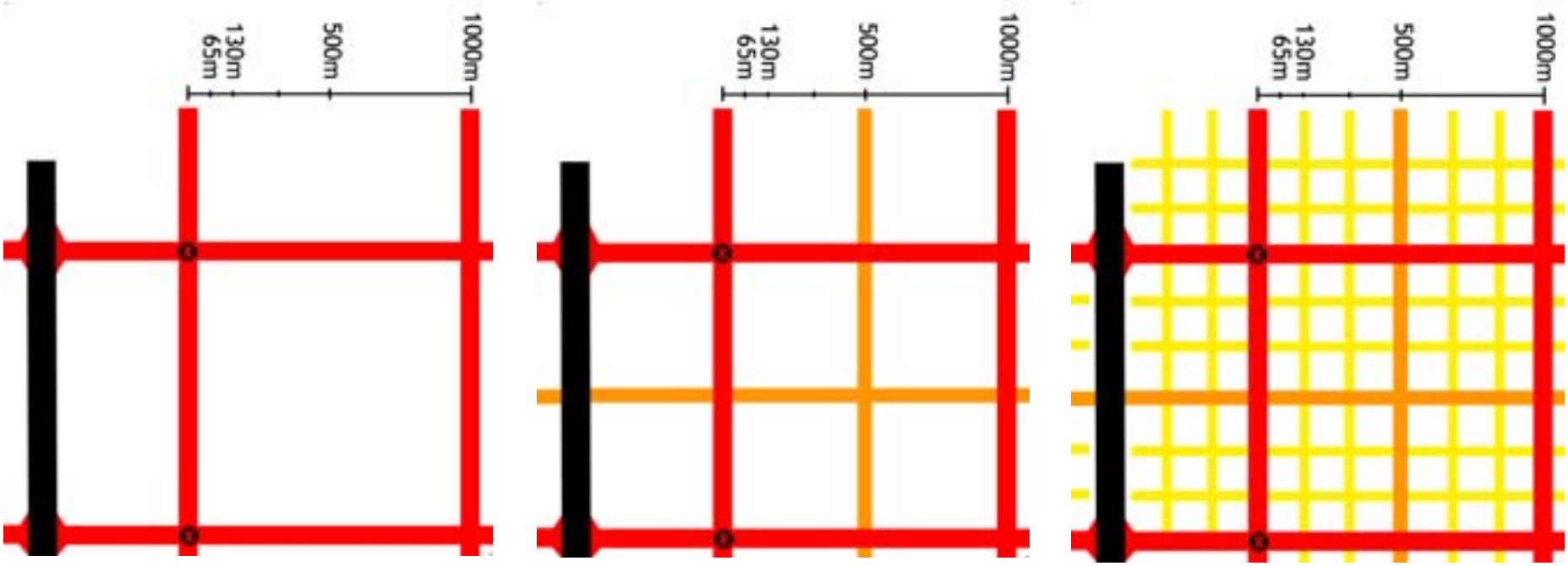
Security:
- Provide secure bike and e-bike parking at destinations

Density:
- Selectively increase FAR limits across site
- Transit-oriented development around MTR stations
- Increased population will mean increased density of community facilities

Comfort:
- Human scale for streets, blocks, buildings
- Street trees
- Aesthetically appealing

Integration:
- Smooth transfers between modes
- Disabled accessibility
- Transport should suit land use
- Access to open space and community facilities

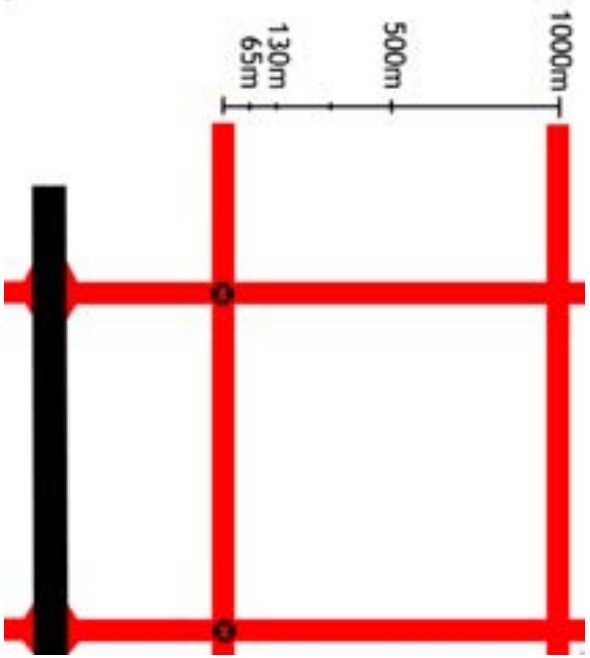
STREET HIERARCHY
IT'S AS EASY AS A, B, C... X!

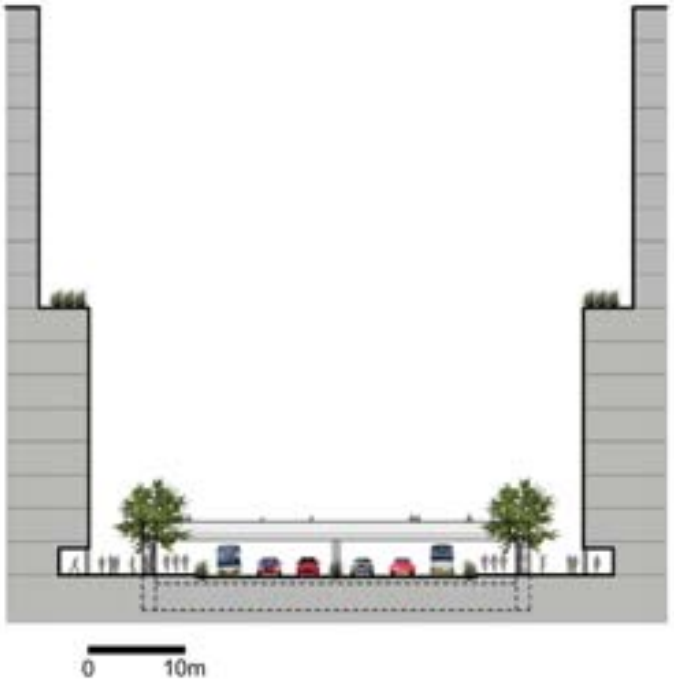


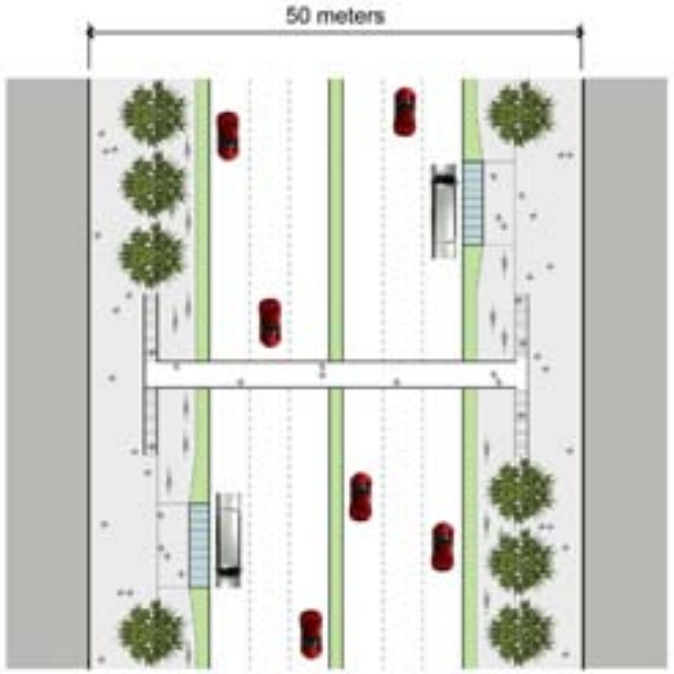
A proper street hierarchy should accomodate multiple modes at (nearly) all levels yet provide enough modal segregation to significantly improve safety and efficiency. Motorized traffic has priority on larger streets, where curb cuts and intersections are strictly limited, speed limits are high, pedestrians must cross by bridge and cyclists are separate. Non-motorized modes enjoy safety benefits from their separated rights-of-way, and take priority over cars on the smallest streets..

In the next several pages, we develop in detail an abstract diagram of this hierarchy, along with specific street designs for each of the levels. Next we explore the connection between this hierarchy and built density, and finally we will apply these concepts to our specific site in South Bantian.

MTR Station
Freeway
Arterial
Boulevard
Community Street
Shared Xiang
Ped/Bike-Only Xiang
High Density
Medium Density
Low Density
Park





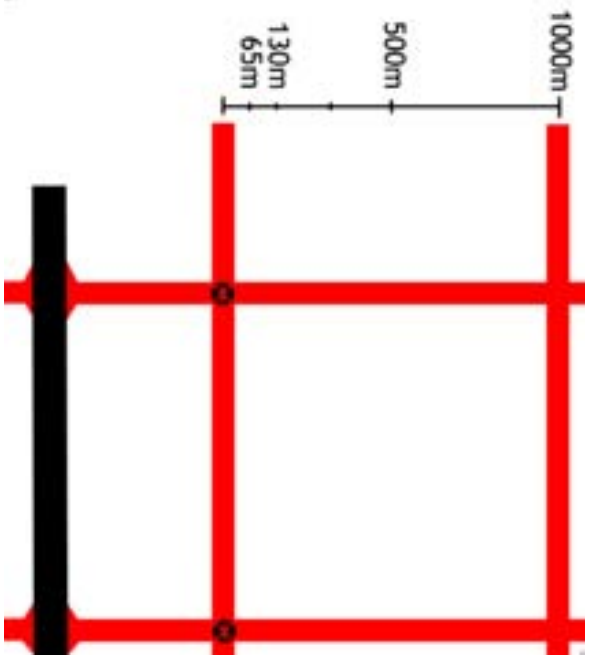


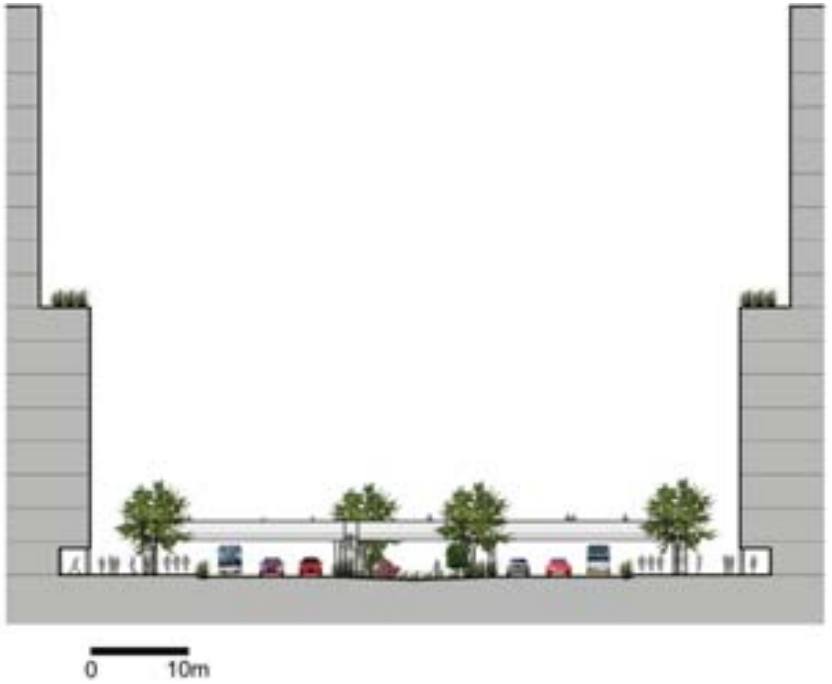
A is for Arterial

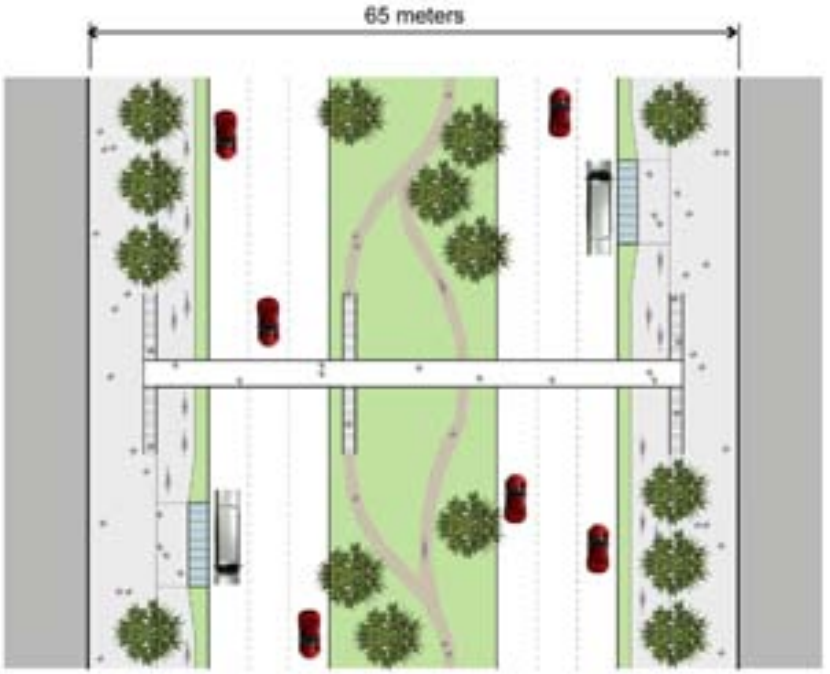
Arterials are spaced about every kilometer and link up to the freeway. Metro stations are located at their intersections.

Arterials handle the bulk of motorized traffic at high speeds with minimal intersections and curb cuts. There is no on-street parking, and motorists must turn onto a boulevard or community street to access a parking garage. Buses operate in the right lane.

Above: An arterial in Wudaokou, Beijing, China. Cyclists are separated from traffic by a planting strip. Source: Eric Minikel.

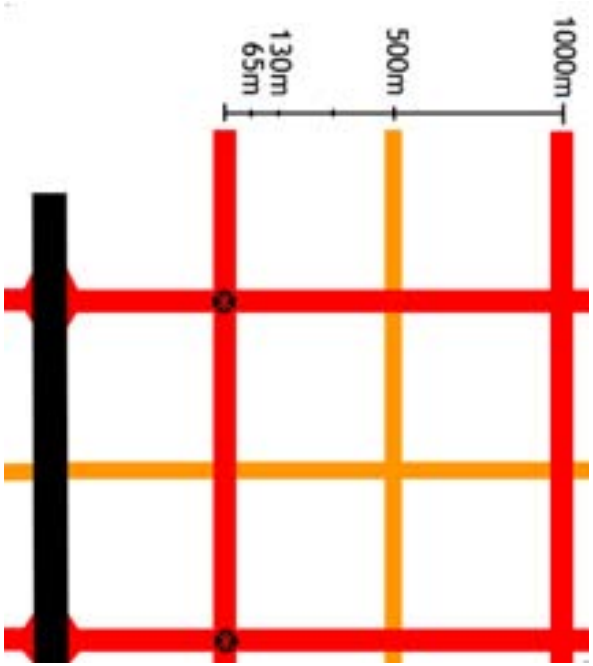


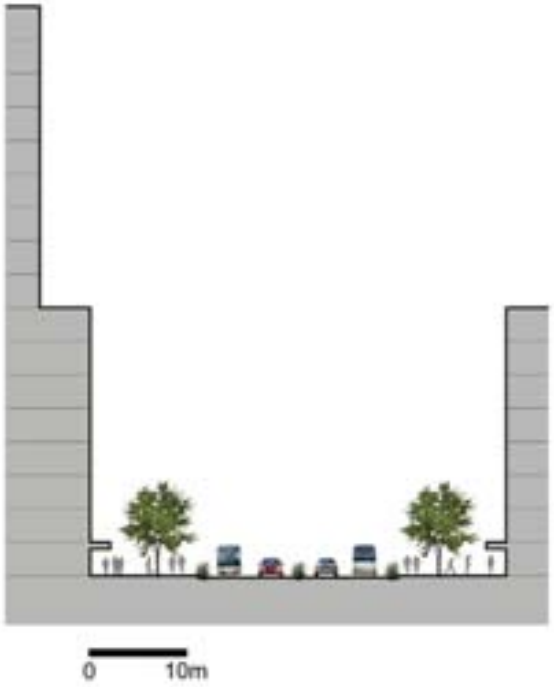


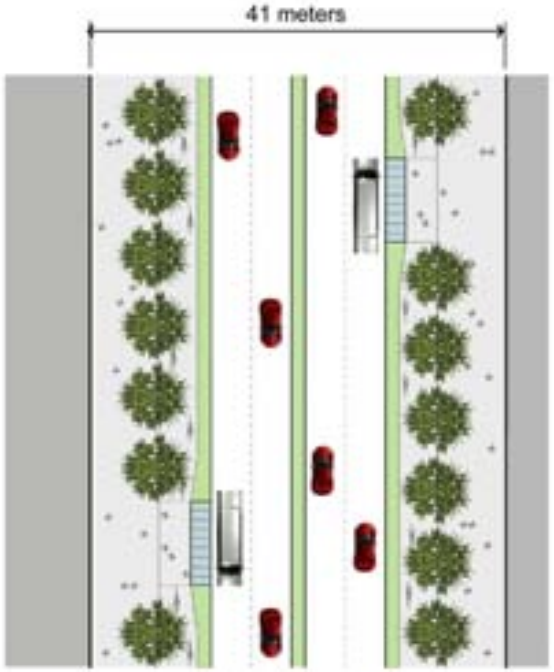


A is for (Eco) Arterial

A subset of arterials can be designed as eco-arterials, allowing a generous swath of linear open space in the median, useful for handling and cleaning stormwater runoff with constructed wetlands. [See Natural Systems chapter] This space also accomodates recreational uses and provides linear open space continuity for wildlife.







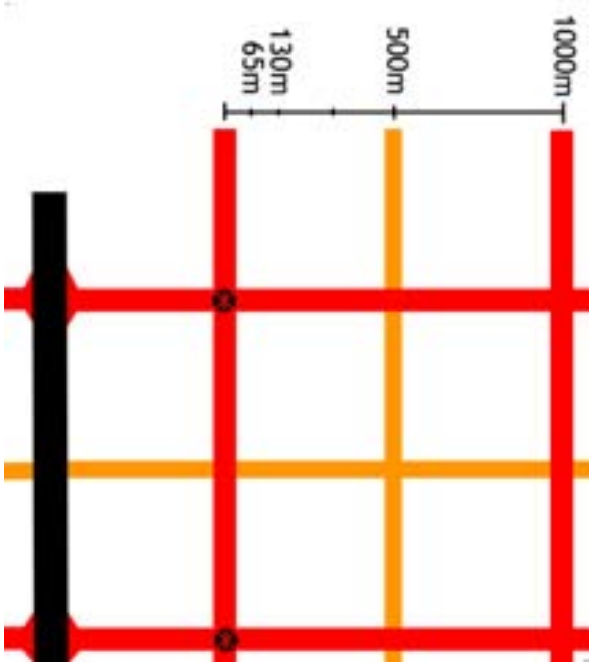
Top: New York's Park Avenue, a boulevard lined with high-density development. Source: Google Streetview

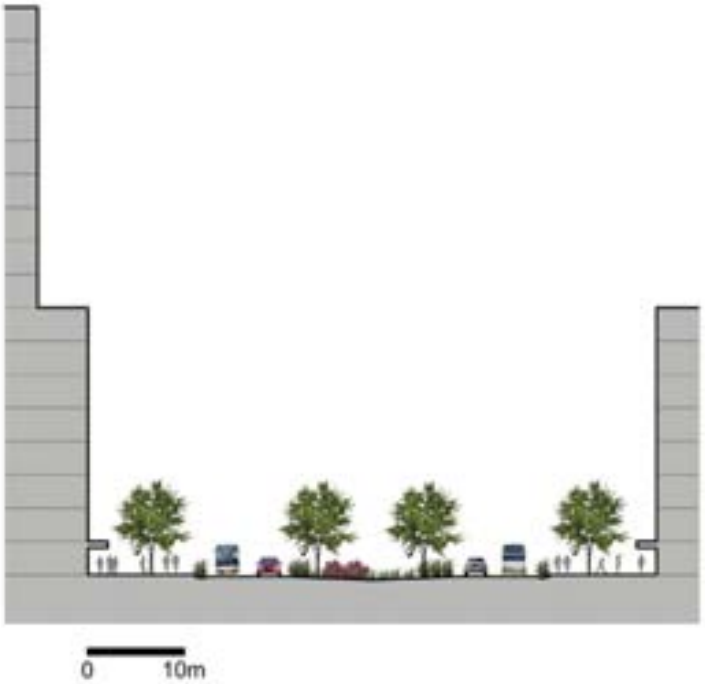
Above: Boston's Commonweatlh Ave is comparable to the eco-boulevard proposed opposite, with a wide strip of greenery in the median. Source: Google Streetview

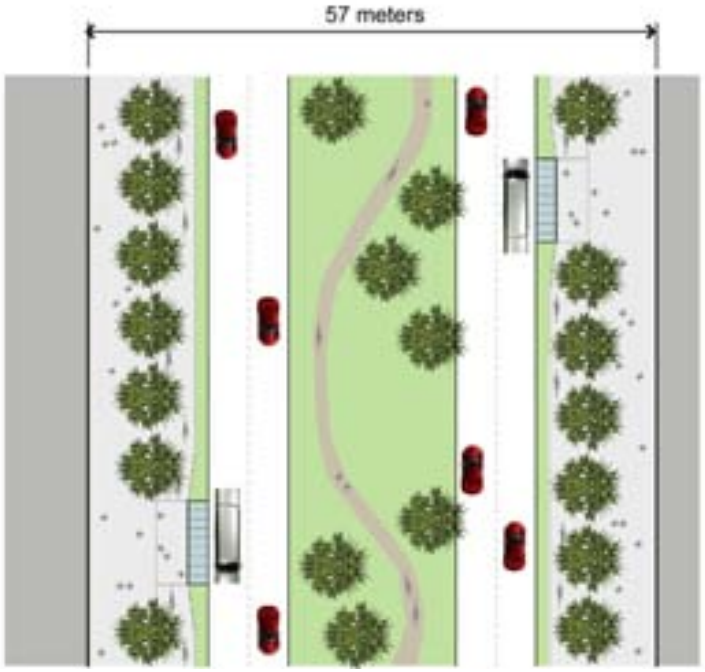
B is for Boulevard

Boulevards break up the arterial superblocks into quarters, handling moderate volumes of auto traffic at moderate speeds. They might cross the freeway by underpass, if needed, but do not have onramps or offramps.

Boulevards have somewhat limited curb cuts, but do allow access to parking garages. Buses operate here as well.

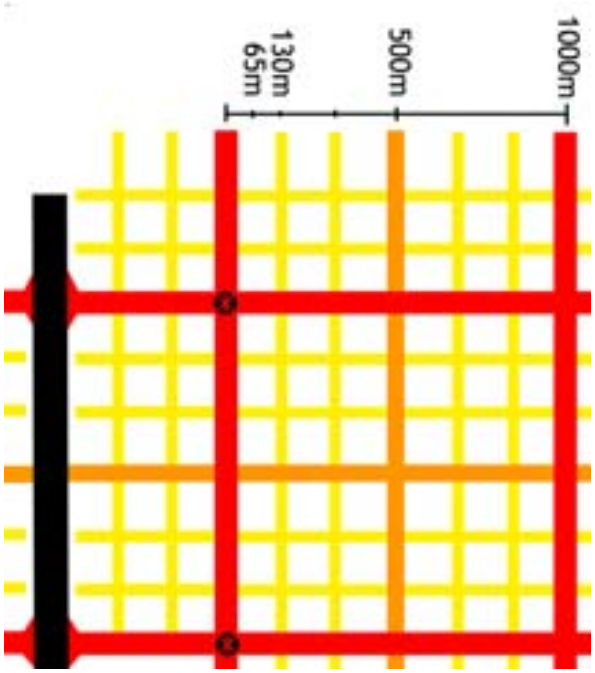






B is for (Eco) Boulevard

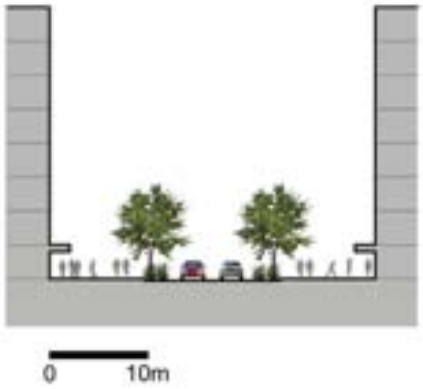
A subset of the boulevards can be designated as eco-boulevards, accomodating a linear green space like the eco-arterials.

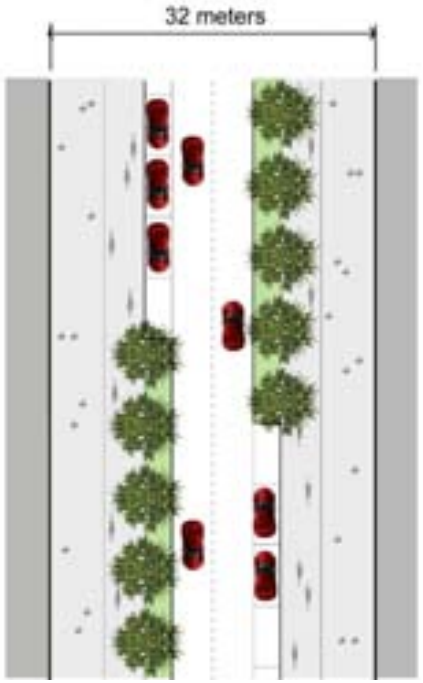


C is for Community Street

Community streets break up the boulevard-level blocks into ninths, bringing the grid size down to 130m on a side, comparable (if a bit large) to some of the world's most walkable cities.

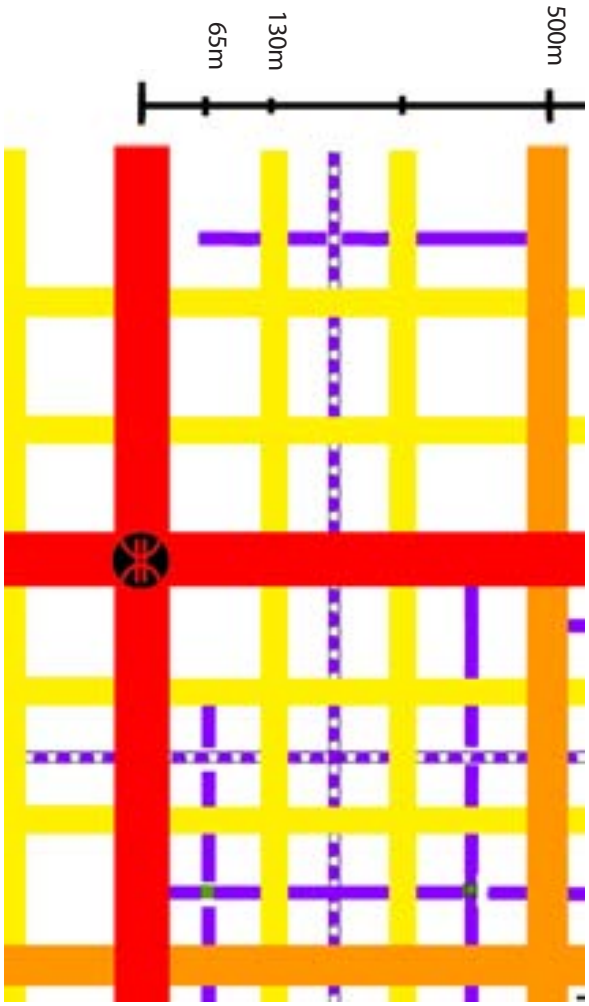
For motorized traffic, community streets provide the access that arterials and boulevards do not, reaching the interior of the block and providing entrances to parking garages and delivery bays. With numerous curb cuts, however, traffic is slow and low-volume, and buses do not operate. Limited-time parallel parking is offered at needed locations.





Top: College Avenue in Oakland, CA, United States. Cars stop for pedestrians in the crosswalk. Traffic moves very slowly due to parallel parking, the large number of destinations on the street and the constant presence of pedestrians and cyclists. Source: Google Streetview

Above: Vassar Street on M.I.T.'s campus in Cambridge, MA, United States. Here, bike lanes are elevated to the sidewalk level and painted blue at curb cuts to alert turning drivers to the possible presence of cyclists.
Source: Eric Minikel



X is for Xiang

Zooming in, many of the community street blocks are subdivided yet further by *xiang*, which are very narrow streets with a single right-of-way for multiple modes.

In the shared xiang, indicated by solid lines, pedestrians and cyclists have priority, as signaled by the narrowness of the lane, the surface of the street and possibly signage. However, auto access is also permitted. Due to low speeds, drivers will generally avoid these streets, but delivery and emergency access are preserved.

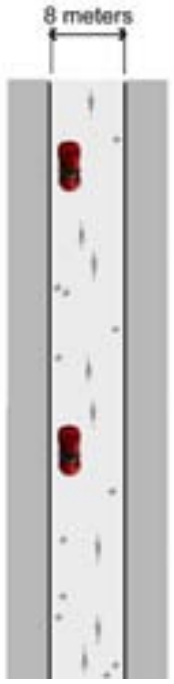
In some cases, these shared xiang may terminate at the center of the block in a park or plaza which pedestrians and cyclists can cross but where cars must turn around. Thus, non-motorized modes can safely and comfortably use these as through streets, while motorized modes will use them only for occasional critical needs. They generally terminate at arterials and boulevards.

Other xiang, indicated by dotted lines, are pedestrian and bike only, and may have street trees or other landscaping taking up some of the right-of-way. Whenever possible, these are long and continuous, so that they provide a viable alternate route for cycling and walking. At arterials, an overpass or underpass is provided to facilitate crossing.

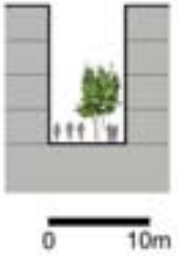
Right:: A shared street in the Netherlands known as a *woonerf*. Cycles take priority. Source: Wikimedia Commons (user Erauch, GFDL)

Left: A narrow shared street in Itabashi, Tokyo, Japan. Source: Google Streetview

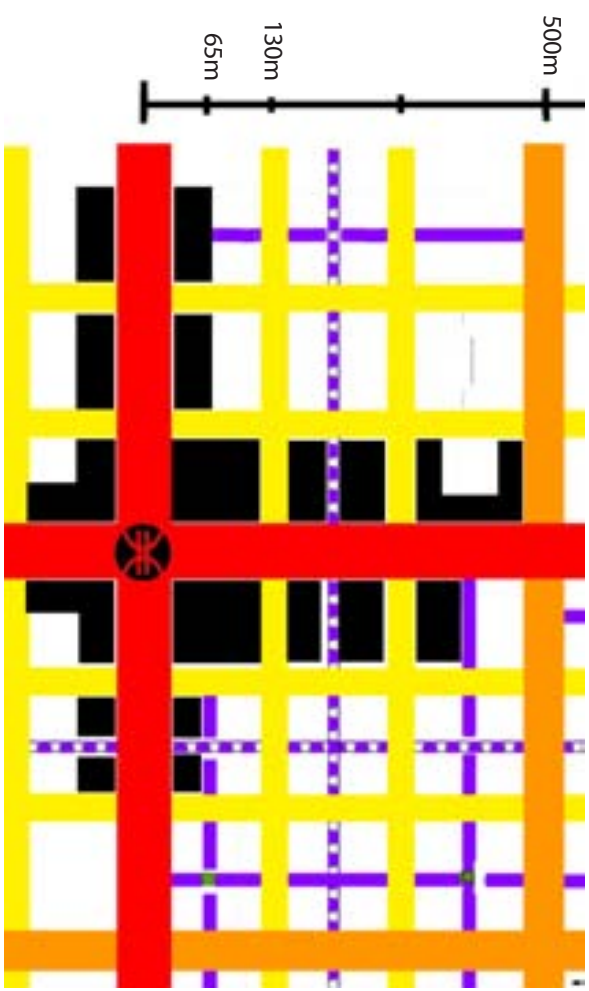
Shared Xiang



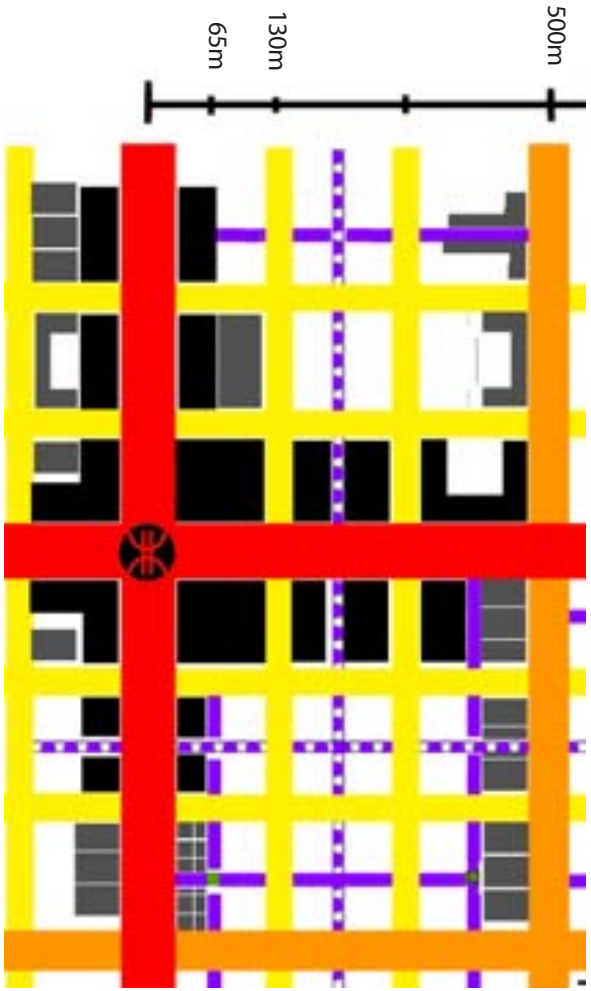
Ped/Bike-Only Xiang



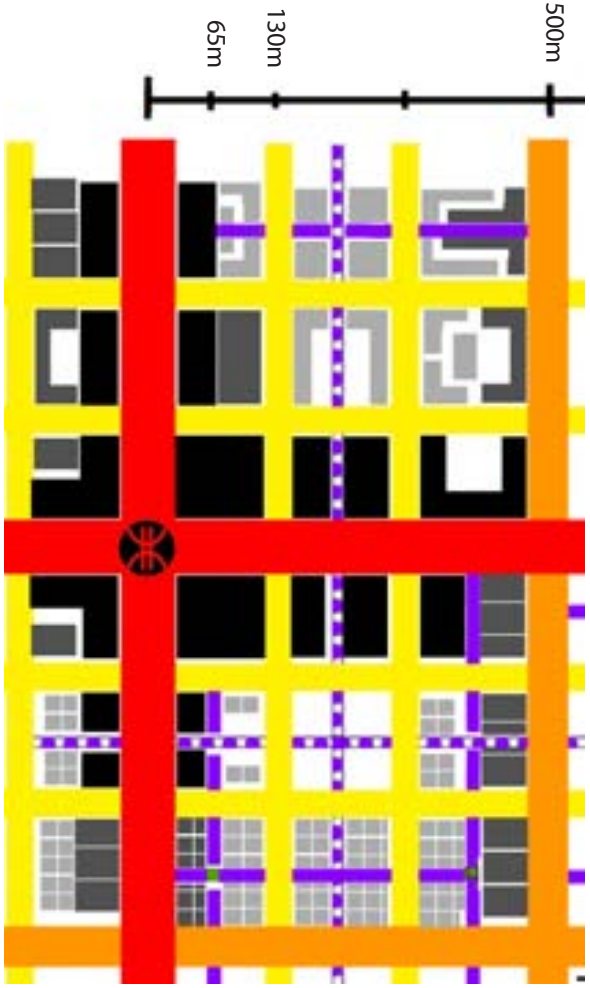
DENSITY



High FAR, large footprint developments radiate from metro stations along arterials.

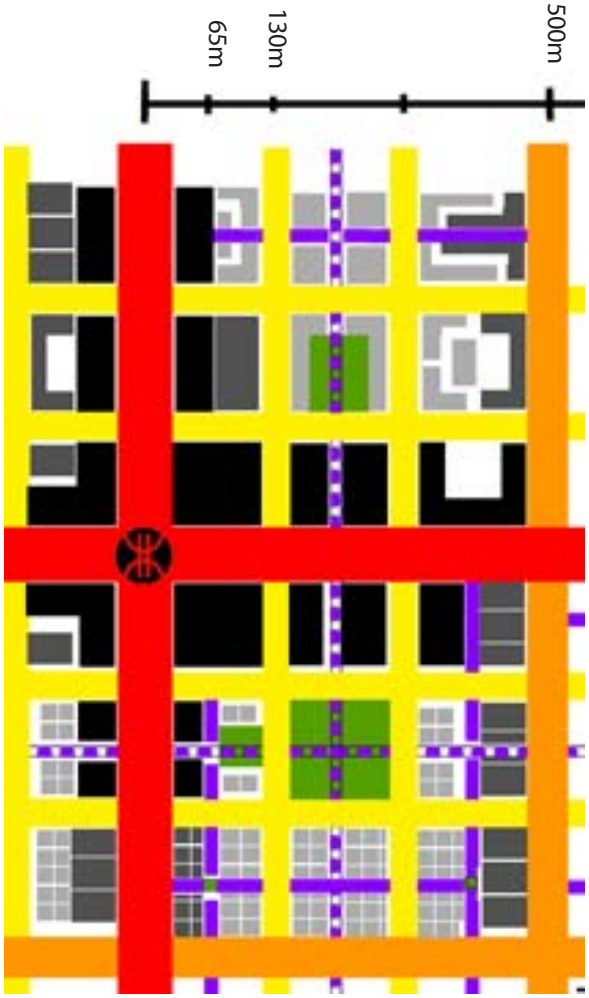


Medium density development fills in locations further along the arterials, behind the frontage of arterials, and along boulevards.



Low density, small footprint development fills the less accessible interiors of the blocks.

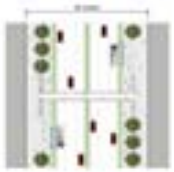
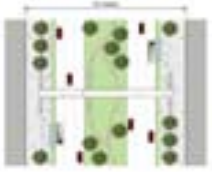
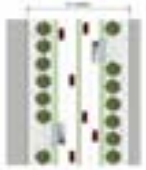
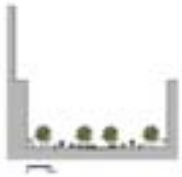
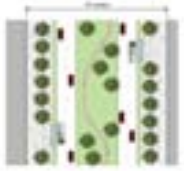
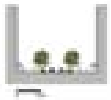
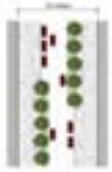
EXAMPLE: ROSSLYN-BALLSTON CORRIDOR



Parks and open space are located in the center of the superblocks and lining pedestrian and bike paths.

Below: The Rosslyn-Ballston corridor in Arlington, VA, United States. Higher densities and larger footprints surround metro stations and radiate along the central corridor. Source: Google Earth.

STREET TYPOLOGIES

				CAR LANES	BUS	BIKES	PARKING	CURB CUTS	LANDSCAPE	WIDTH
A	ARTERIAL			6	●	separated lanes at sidewalk level 4m wide	X	X	street trees edge swales median swale	50m
	ECO - ARTERIAL			6	●	separated lanes at sidewalk level 4m wide paths through park	X	X	street trees edge swales median park	65m
B	BOULEVARD			4	●	separated lanes at sidewalk level 3m wide	garage access	infrequent	street trees edge swales median swale	41m
	ECO - BOULEVARD			4	●	separated lanes at sidewalk level 3m wide paths through park	garage access	infrequent	street trees edge swales median park	57m
C	COMMUNITY			2	X	marked lanes at sidewalk level 2m wide	parallel garage access	frequent	street trees edge swales	32m
X	XIANG - SHARED			1	X	whole street	garage access	frequent	X	8m
	XIANG - BIKE & PED			0	X	whole street	X	X	street trees	8m

STREET HIERARCHY: SUMMARY

The matrix on the opposite page summarizes the characteristics of the seven types of streets that we propose to form a street hierarchy benefitting all users.

These street types and their arrangement in a network of successively finer grids have the power to improve accessibility compared to the status quo in South Bantian. By separating modes to a degree, they improve safety and efficiency; yet by accomodating multiple modes at each level, they also make it possible to reach destinations in multiple ways. The landscaping and sidewalk space, combined with the smaller block size, make the streets comfortable and pleasant to use as a pedestrian or cyclist.

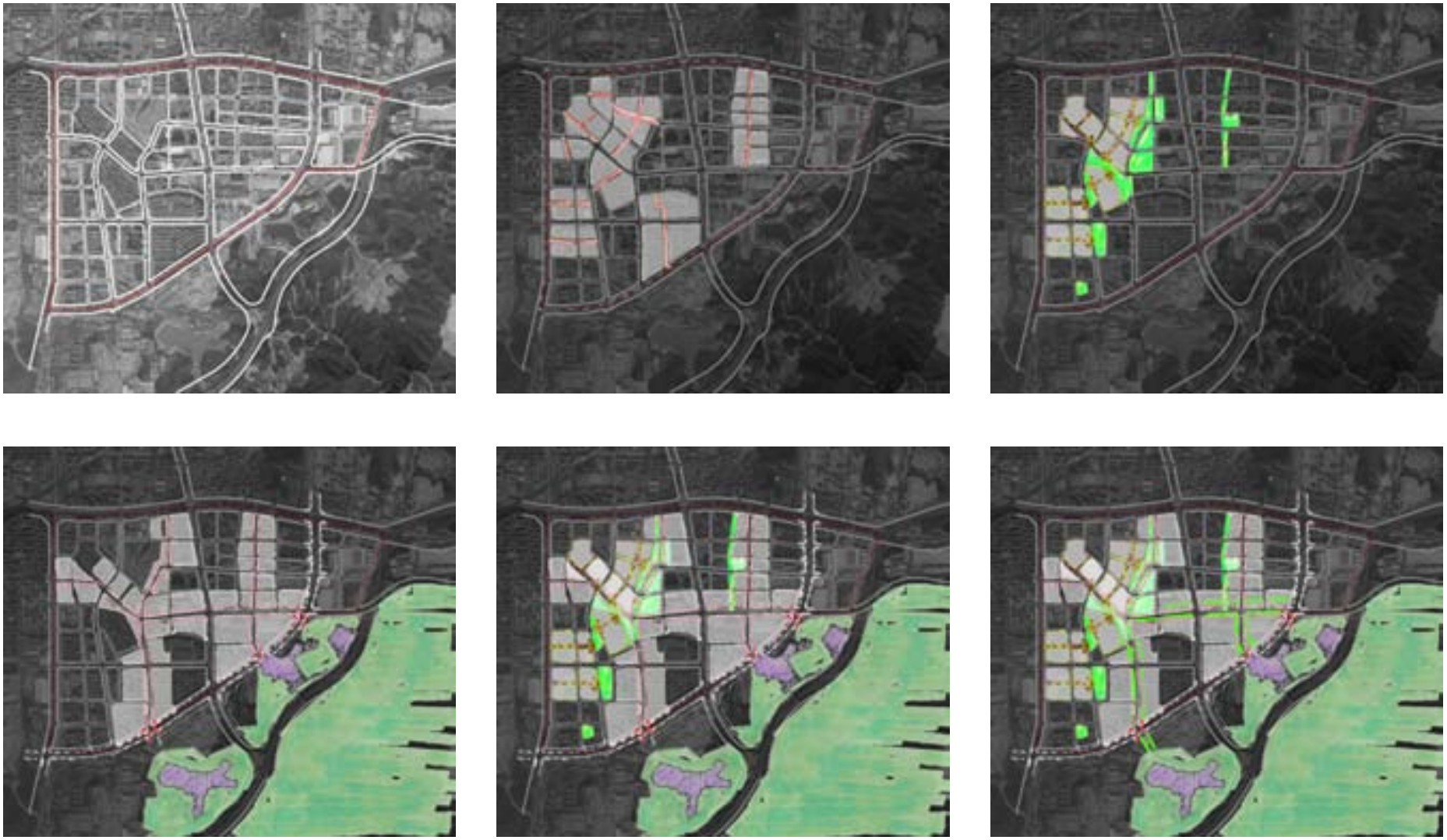
When combined with the density proposal outlined on the preceding pages, this street hierarchy can be quite powerful.

What we have presented so far, however, is an abstract diagram of the network. In the next section, we explore an application of these concepts to the specific site and its unique challenges.

SITE-SPECIFIC CONSIDERATIONS

EARLY PLANNING/DESIGNING PROCESS

We begin our site redesign process from the Planning Bureau's proposed street network (upper left), laid over an aerial image of the site. The proposal fits well into existing developments and shows a respect for the local cnoditions on the site, so we take it as a starting point while seeking to subdivide the blocks further and impose an implementation of our street hierarchy. These hand sketches show explorations of ways to divide blocks and add linear open space.



URBAN VILLAGES

We assume that the urban villages in our site will still exist, possibly in a redeveloped form, in 20 years, and that our plans must be sensitive to local conditions there. We begin with the Planning Bureau's street plan and subdivide blocks by adding bike paths and xiang in places where the least demolition would be necessary.

Planning Bureau's Street Plan

0 100m

Existing Urban Village Buildings

Proposed Subdivisions

0 100m

Proposed Subdivision and Changing of the Street/Road Network

Above left: The Planning Bureau's proposed streets are clearly sensitive to the current locations of urban village residential structures, cutting through the corridors where the fewest (in many cases, none) would have to be demolished.
Above right: In our own planning process, we strove to exercise the same level of consideration for village conditions, adding in xiang at the most useful and least destructive locations.

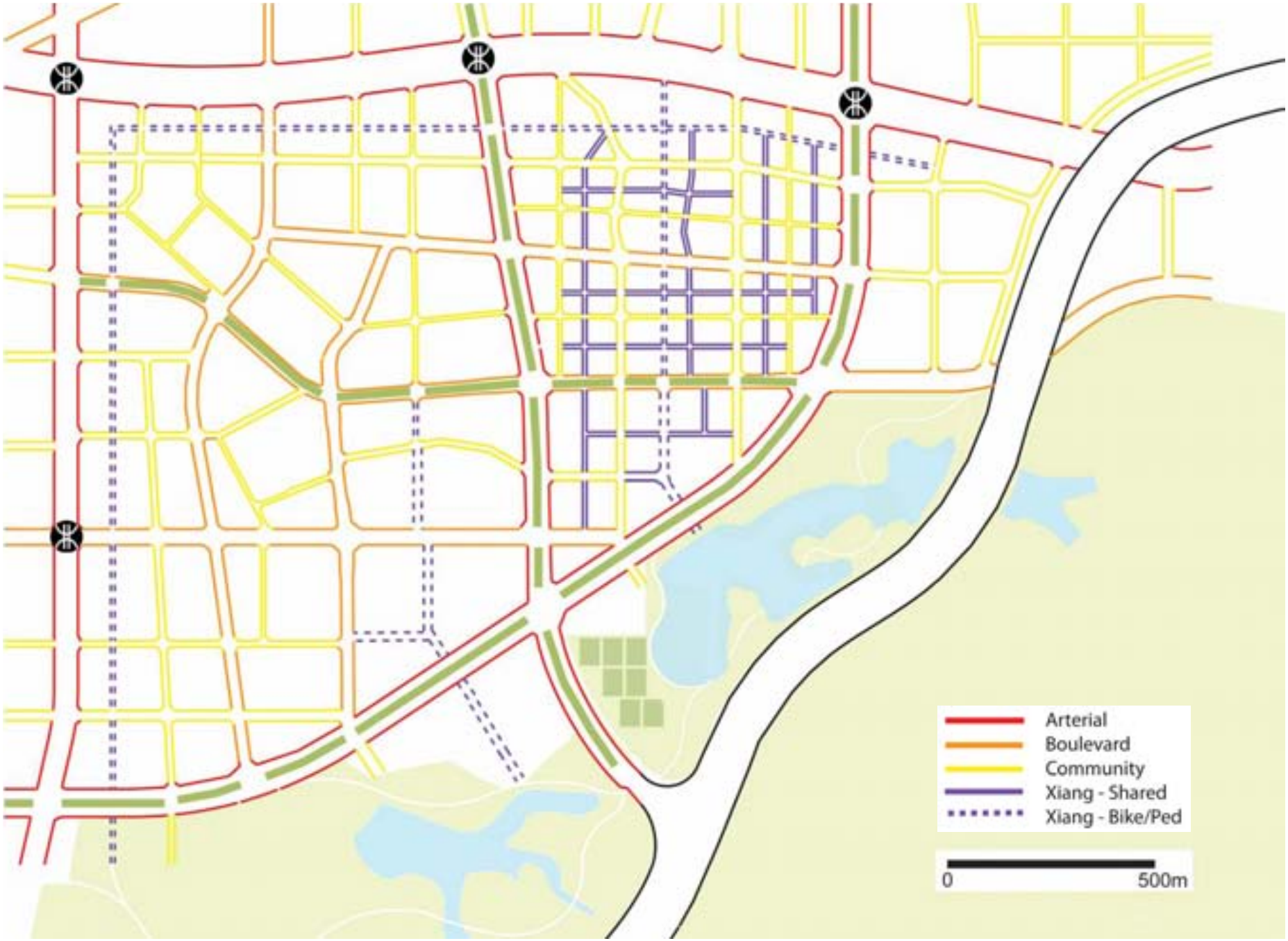
SITE PLAN PROPOSAL

Building on the Planning Bureau's proposed street network, we applied our street types and hierarchy to South Bantian. In so doing, we took into account the specific site conditions such as the urban villages as described above. The results, overlaid on an aerial site image, are at right. The network alone without the aerial image is blown up on the opposite page.

We applied the arterials, boulevards, and community streets to the whole site. Recognizing that local knowledge is particularly important for decisions about more fine-grained pieces of the network, we only applied the xiang chiefly to the part of the site that we know best. The expectation, of course, is that xiang would be used in other parts of the site as well, but that those details are saved for a later stage in the planning process.

We did, however, add two long pedestrian/bike-only xiang at the perimeter of the site, parallel to the two largest arterials. This is intended to divert bicycle and e-bike through-traffic from the arterial. Cyclists headed for a nearby commercial destination on the arterial itself will likely want to use the bike lanes on the arterial. Cyclists traveling a longer distance, though, and headed to, for example, a metro station, may prefer the quieter, safer xiang as an alternative to the arterial.

Left: In Cambridge, MA, United States, the city provides bike lanes on Massachusetts Avenue (far left), a key arterial lined with commercial destinations and subway stops. However, many cyclists prefer to avoid the danger and noise of traffic by riding on quieter Green Street (near left), a parallel route one block south. Source: Sonia Vallabh.


Arterial
Boulevard
Community
Xiang - Shared
Xiang - Bike/Ped
0
500m

1. Aerial view of focus area. Source: Kristin Simonson

2. Aerial view of new arterial. Source: Kristin Simonson

Site photo locations

3. Difficulty accessing open space. Source: Feifei Zhao

4. Boulevard under construction. Source: Kristin Simonson

5. Existing factories. Source: Kristin Simonson

6. Existing street. Source: Kristin Simonson

FOCUS AREA

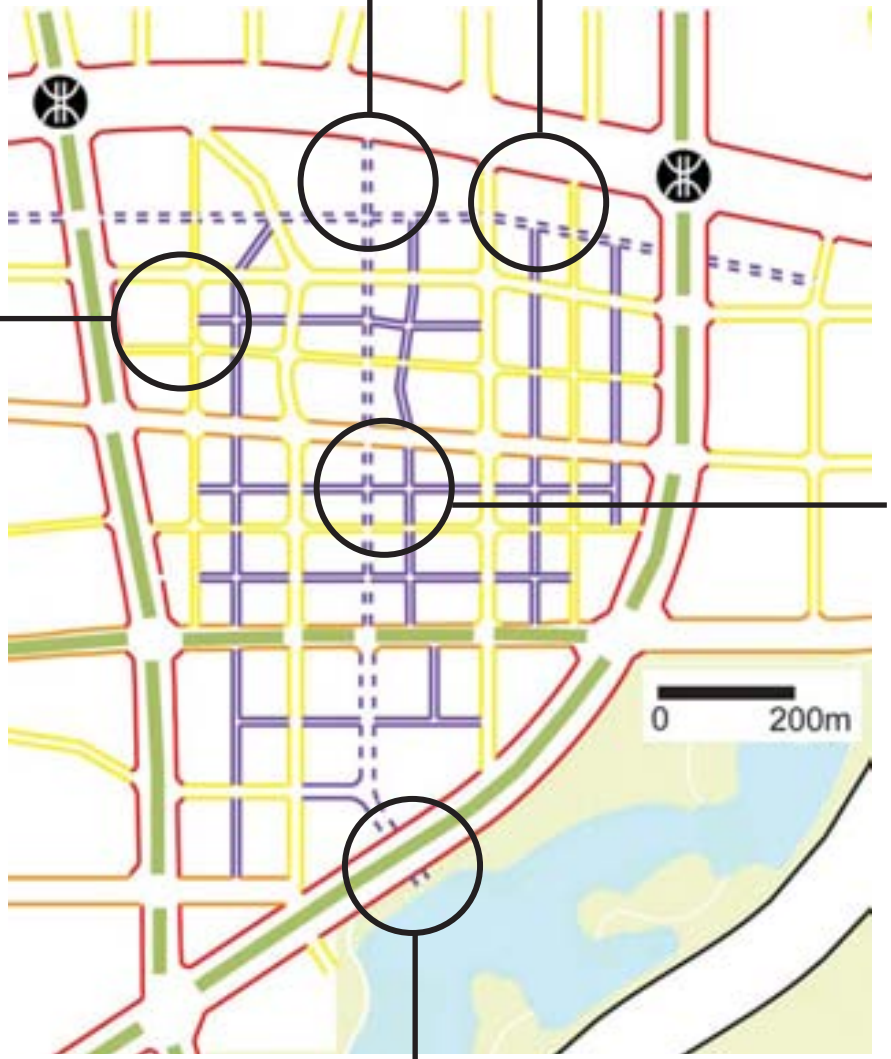
To apply our ideas in more detail down to the xiang level, we zoomed in on the part of the site that we know best (photos opposite).

Arterial
Boulevard
Community
Xiang - Shared
Xiang - Bike/Ped

This ped/bike xiang, intended as an alternative route to the east-west arterial, crosses the north-south arterial by underpass or bridge.

Larger block sizes are left near the arterials to accomodate larger building footprints and eventual higher densities.

Most xiang end before reaching the arterial, so as to minimize curb cuts and maximize efficiency on the arterial.



Multiple xiang are used to break up this particularly wide block.

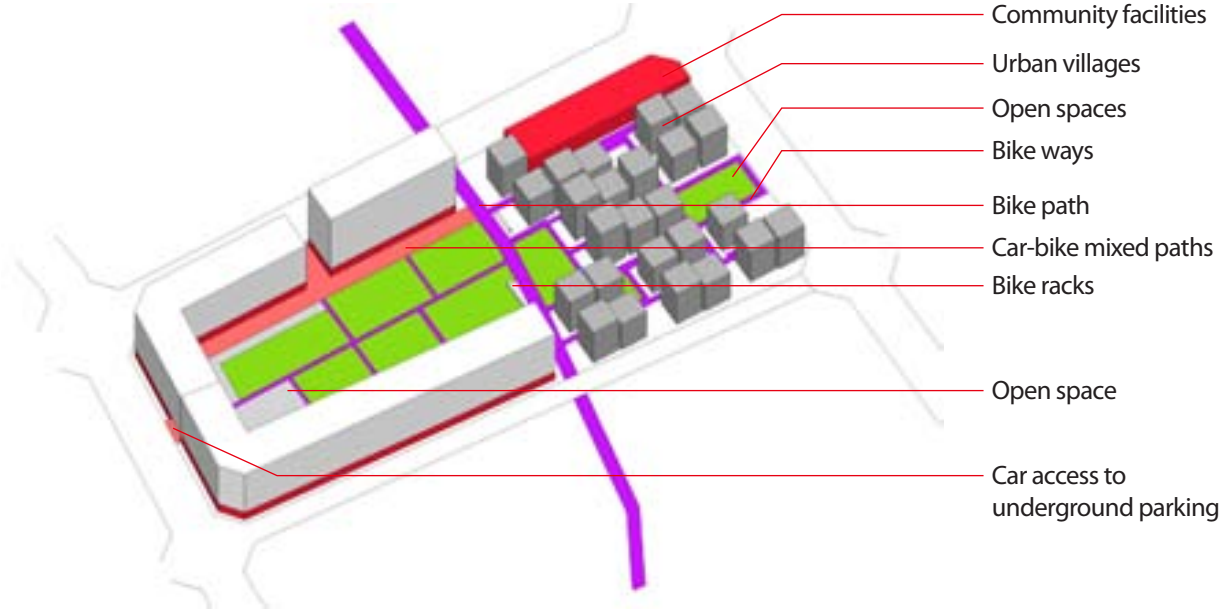
This ped/bike xiang crosses the arterial by underpass to provide access to hillside open space.

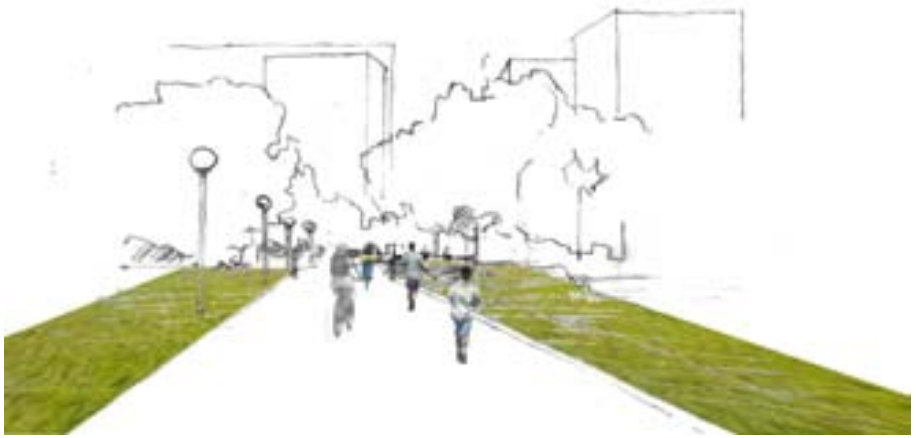
DETAIL: BIKE/PEDESTRIAN PATHS

The goal of the bike/pedestrian paths is to provide cyclists and pedestrians a safe, friendly, and consistent environment that links their travel origins and destinations. The diagram on the right illustrates the detailed planning of bike/pedestrian paths which follows several principles:

Bike/pedestrian paths should be planned at different levels of a street hierarchy.
In arterials, community streets, bike/pedestrian lanes are designed in paralell with car lanes. In lower level streets, bike/pedestrian paths are designed to be only accessible to cyclists and pedestrians. This makes biking and walking safer and allows these modes even greater access than cars have.

Bike/pedestrian paths planning should incooperate both existing urban villages and future new development.
In urban villages, these paths penetrate into buildings, providing accessibility; in new developments, these paths can also combined with open space and green space planning.



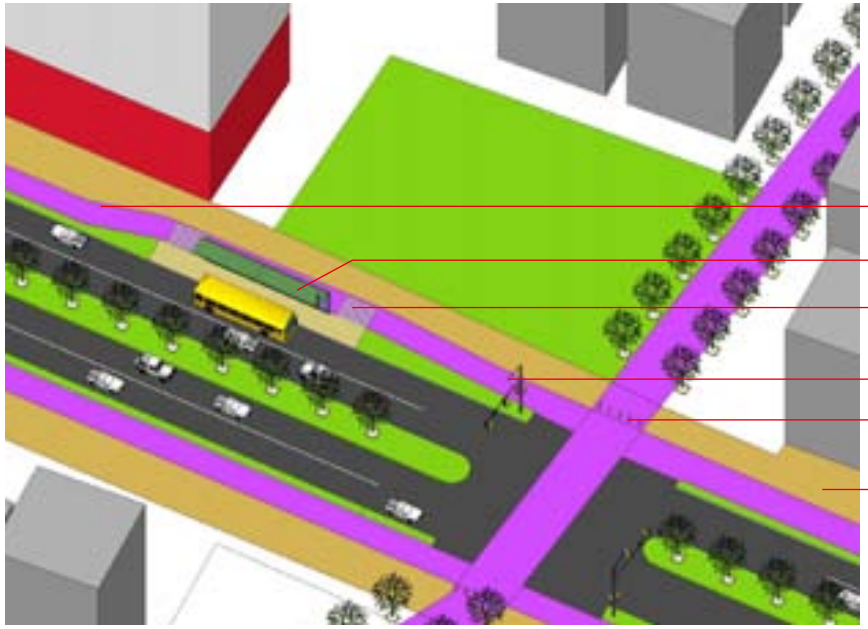


The Interconnected Relationships of the Four Categories of Community Facilities

Bike/pedestrian paths should be linked with popular destinations.
Bike paths should link residential areas with metro stations. This not only provides the metro station with more biking commuters, but also promotes biking transportation.

Biking/walking should be prioritized at intersections.
Bike/pedestrian traffic lights are installed at intersections to allow nonmotorized modes to cross community streets, and in some cases boulevards, with priority. Bollards prevent cars from entering bike/pedestrian paths. These policies ensure people walk and bike in a safe envirnonment.

Biking facilities should be provided along bike paths and travel destinations.
Both metro stations and bus stops should provide enough bike parking racks to prevent bikes from being stolen.



REFLECTIONS

Planners usually attempt to list their assumptions up front, as we did early in this chapter. The planning process, however, often reveals hidden assumptions that must then be acknowledged and questioned.

> Metro stations on arterials

In diagramming an ideal street network, we assumed that metro stations would be located at arterial intersections, since this is the norm in Shenzhen, as well as most cities in the world. But it is unclear whether this is really an ideal configuration. If a self-sufficient network of xiang and community streets could really be created, in which bicycles and pedestrians feel completely comfortable, then it would follow that transit stations should be located in the midst of those networks, at the core of the blocks, far from the arterials.

> Coordination with destinations

As was discussed at the outset, the perceived lack of convenience in getting to destintions was part of our inspiration. Convenience is related to accessibility, and accessibility is related to destinations. While we believe this circulation network has the flexibility and capacity to connect any two points on the site, it would need to be matched with a proposal for land use and the location of key destinations (schools, shopping, and civic buildings) to truly test accessibility.

REFERENCES AND ACKNOWLEDGEMENTS

References

The Economist. "A global love affair: a special report on cars in emerging markets." 15 November 2008.

The Economist. "Rushing on by road, rail and air." 14 February 2008.

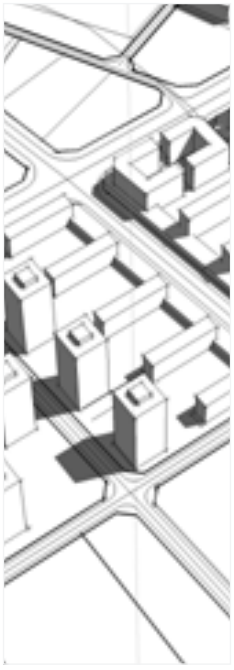
Gan, Lin. "Globalization of the automobile industry in China: dynamics and barriers in greening of the road transportation." Energy Policy 31. 2003. pp 537-551.

Gakenheimer, Ralph and Zegras, Chris. "Personal mobility in the urbanized regions of the developing world." s.l.: World Business Council for Sustainable Development [WBCSD.org]. Mobility. 2001.

Sykes, R. D., & Driscoll, T. W. (1996). Creating bicycle transportation networks: A guidebook. St. Paul, Minn: Minnesota Dept. of Transportation, Office of Research Administration.

Acknowledgements

Aerial photos underlaid beneath site plans are from Google Earth Pro under license to M.I.T.



[HOUSING SYSTEMs]

Pedram Mahdavi
Feifei Zhao

GOALS

Our primary focus or goal is to outline a process that demonstrates how to use development tools to CREATE A VIBRANT MIXED INCOME COMMUNITY that meets three criteria:

Socially Sustainable
provides decent, safe and sanitary housing to all groups in a mixed income community to prevent social and economic segregation

Economically Beneficial
adequately supports the city's diverse and evolving workforce and promotes economic growth

Financially Feasible
developers should make a profit so they can continue to operate their business and produce high quality products.

To develop a proposal for income mixing we made several assumptions about the future of Shenzhen and our site's economy and housing market:

Economic Assumptions

>Transition from an export-based & industrial to a service-oriented & high tech economy bringing more moderate income residents to the site

>Rapid economic and income growth will stabilize and remain at the current rates (~10%)

Housing Assumptions

> Chinese citizens will continue to migrate from rural to urban areas putting pressure on housing demand.

>The shortage of land and demand for house will promote higher density residential and mixed-use developments.

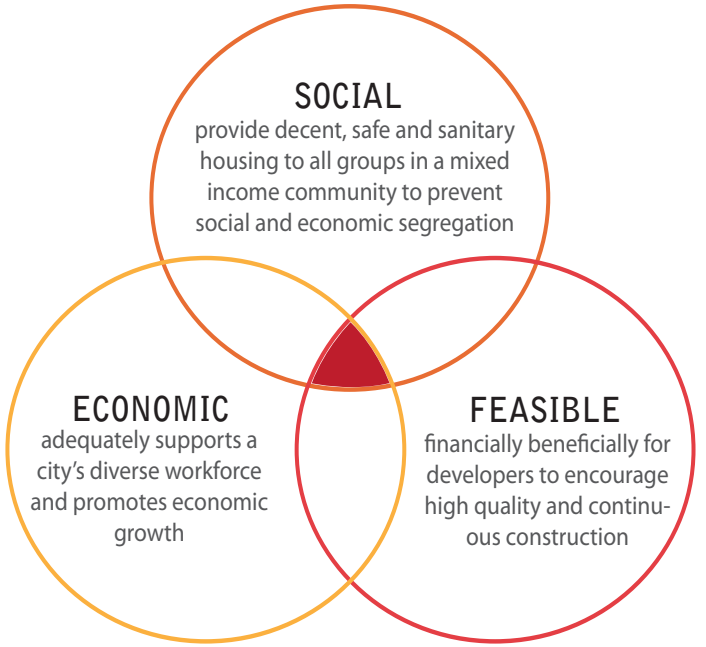
Site Assumptions

>At least four new transit stations will open around the site

>New commercial, retail and residential development will be attracted to the sites putting upward pressure on housing prices

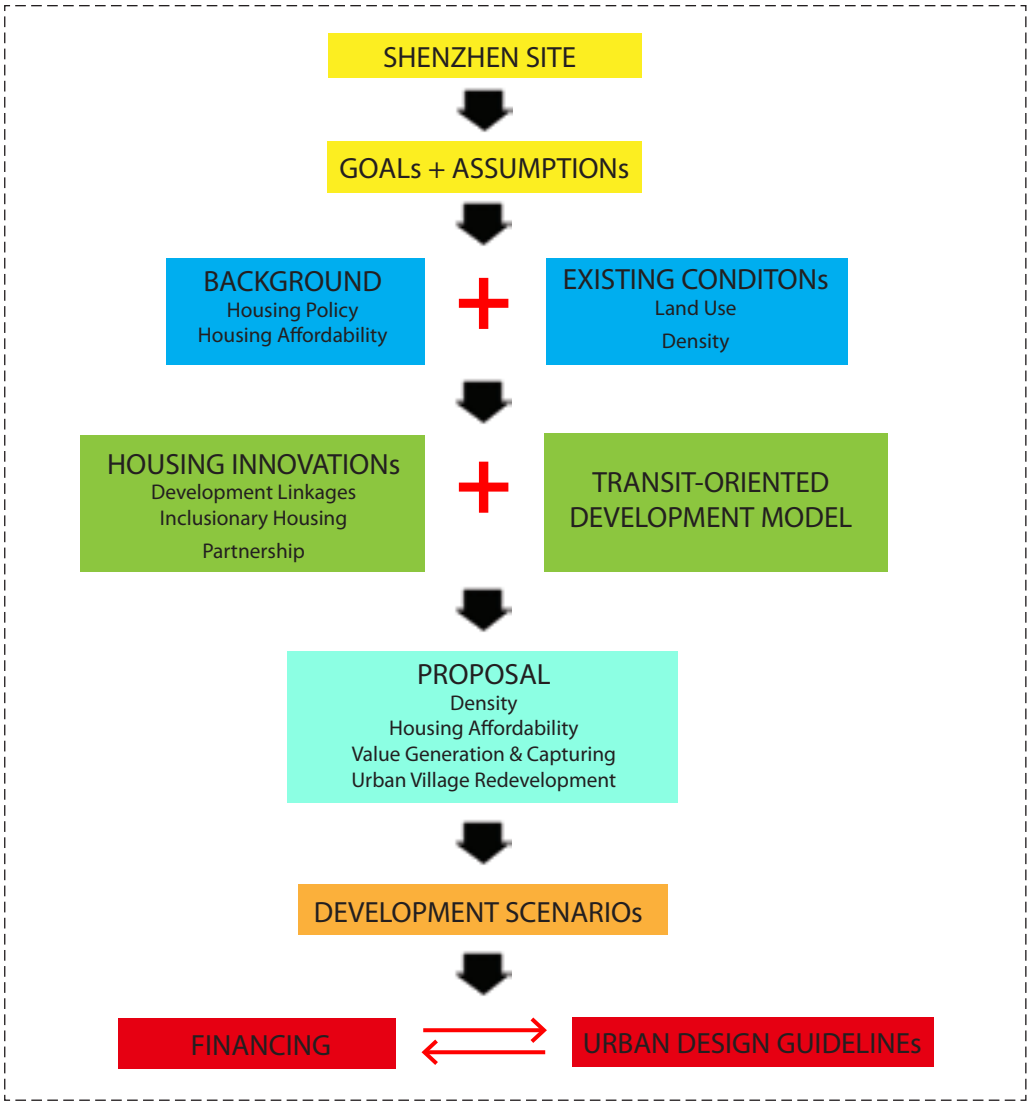
>Low- to moderate- income housing will decrease both in total numbers and relative to need while middle to upper-income housing will increase

>Market pressure on urban villages to redevelop into higher cost housing



The Interconnected Relationships of the Four Categories of Community Facilities

METHODOLOGY



Visualizing our Methodology

Planning Process

This section outlines our plannng process for sustainable housing systems.

Part 1> Background Investigation

we gathered information on economic and housing trends in Shenzhen including income growth, industry , unit size, and redevelopment processes. We paired the information with theories on affordable housing to understand the type and extent of intervention necessary.

Part 2> Outlining Scenarios

our scenarios, which emerged out of our background research, created the framework around which we built our proposal

Part 3> Investigating Policy Options

drawing from the "universe" of housing policies, we focus on three innovations for facilitating mixed-income development

Part 4> Developing a Proposal

we demonstrate how pairing our housing innovations with effective land use and development planning can stimulate sustainable housing development.

Social Housing in China

Housing prices and unit sizes in Shenzhen have been pushed up by a combination of rapid physical and economic growth and a privatized housing market. In order to maximize profits, private developers are targeting new developments to the emerging middle and upper class. Meanwhile, a significant portion of the population has been left without adequate housing because incomes growth has not kept pace with growth in housing prices.

Since market reforms in the 1970s the government has made various attempts to address the growing shortage of affordable housing for low to middle income workers. To date, policies include:

> Sale of public housing to sitting tenants

> Housing Provident Fund System that required compulsory savings to be used for purchasing a home

> Development of Social Housing System

Since 1998, the social housing system in China has come into the final shape. It consists of three programs: *the Public Rental Housing Program*, the *Economic Housing Program*, and the latest one, the *Limited-Price Housing Program*. There are also other housing programs and policies, such as the *79/90 policy* to regulate the unit sizes, and the *Housing Provident Fund Program* and its related discounted personal financing program.

All of the programs have had limited success for reasons including insufficient quantity, only being beneficial for "better off" households, and not being available to the million of "unofficial" residents (i.e. migrant workers).

Public Rental Housing

First launched in 1999, this program targets the lowest income households with the worst housing conditions. There are two forms of subsidies under this program: the provision of public rental housing, and the tenant based rent subsidies. For instance, in Beijing, the rent subsidy is 400 RMB/person/month. So a three-person family can get 1,200 RMB/month.

Since public rental housing was developed and funded by the government, the supply was limited. Less than 10% of the lowest income population was served by the Public Rental Housing Program.

In 2007, the state congress said that the public rental housing should become the focus of the social housing system.

Economic Housing

The Economic Housing Program started in 1998. It is commercialized housing sold at a limited price, averaging about 4,000 RMB/m^2. This program targets moderate income households.

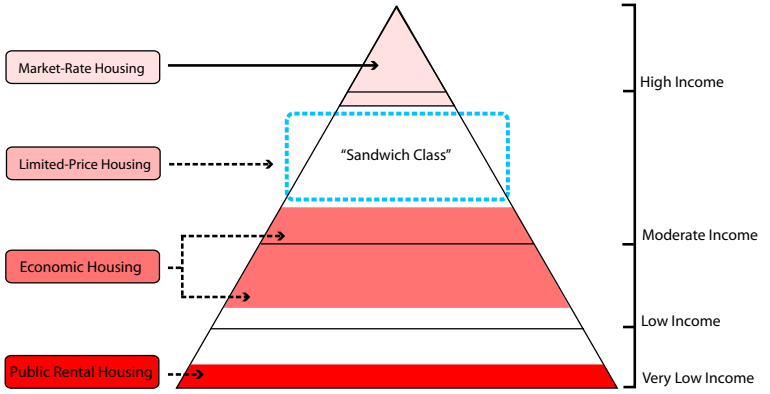
Limited-Price Housing

This program is designed to solve the housing problem of the *"sandwich class"* that are not served by the Public Rental Housing, the Economic Housing Program, and cannot afford the market rate housing.

It is only available in some cities in China. For instance, in Beijing, the first Limited-Price Housing was issued in 2008. The average price of the Limited-Price Housing in Beijing is about 6,350 RMB/m^2.

The 900 billion social housing stimulus package.

In the end of 2008, the Chinese government announced a 900 billion RMB housing package that will be conducted starting from 2009, with 215 billion RMB invested on Public Rental Housing, 101.5 billion RMB on slum redevelopment, 600 billion RMB on Economic Housing. This package will also bring other investment and create job opportunities (The Department of Construction, 2008).



The Social Housing Programs and Their Coverage

Affordability Gap

We used two methods to illustrate the current and emerging affordability gap in Shenzhen. The first model (top) correlates the housing market with distribution of household incomes in a given location.

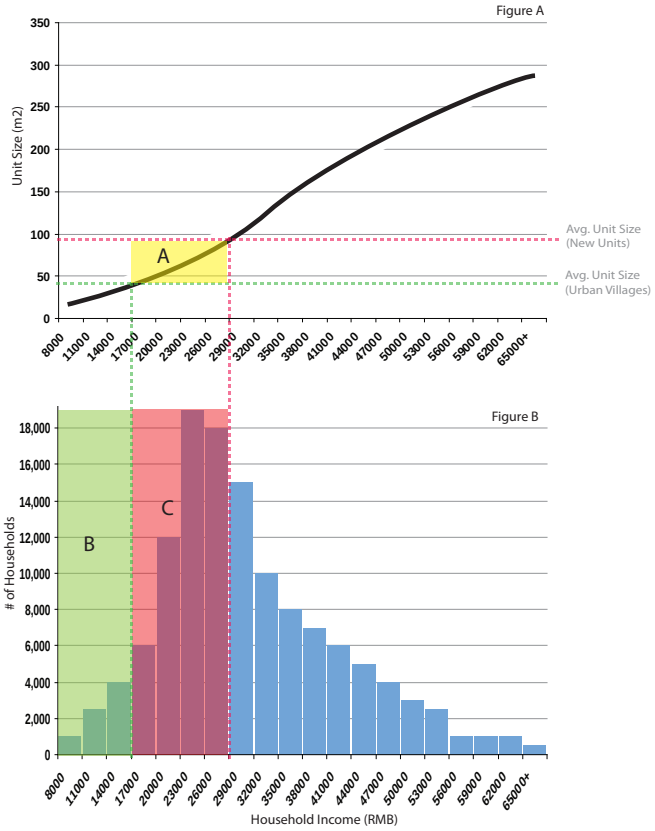
Figure A represents the relationship between unit size and income in a free market economy (while China is not a pure market economy it has moved in that direction with its housing privatization initiatives). Any point on the graph represents the unit size a particular income group can afford. We marked the points that represent Urban Village units and a typical new development Vanke would produce. *Figure B* represents a hypothetical income distribution in a given location. Correlating the two graphs shows the current gap in housing (Bertaud, 2007).

> The green area, labeled B, are residents who can only afford units that are available in Urban Villages.

> The red area, labeled C, are residents who demand better quality units than those in Urban Villages but cannot afford the new developements.

> The yellow area, labeled A, is the housing gap, which in this scenario are units between 40 and 90m^2.

The "Monthly Mortgage Payment for Market Rate Housing" chart (bottom) shows the "percentage of income" residents would have to pay for different unit sizes. The figures were obtain from the Shenzhen Statistics Bureau website and mortgages were calculated using an online calculation tool. In the United States, typical guidelines advise that a household pay about 30% of their income in rent. One can see that by the 30% standard new units in Shenzhen are oversized and unaffordable.



Identifying the Housing Affordability Gap> Correlating the two graphs allows one to see the unit size gap, "marked A" (Source: Adapted from Alain Bertaud)

Year	Average Monthly Household Income	Monthly Mortgage Payment	Average Housing Price	Average Unit Size	Average Unit Price	Mortgage Principal	Mortgage payment as % of Income
2007	6,784	5,411	13,370	90	1,203,300	842,310	80%
2007	6,784	3,607	13,370	60	802,200	561,540	53%
2007	6,784	7,214	13,370	120	1,604,400	1,123,080	106%
2007	6,784	2,035	13,370	34	452,571	316,800	30%

Monthly Mortgage Payment for Market Rate Housing> Using the current average income in Shenzhen one can see that new developments (90m^2) are unaffordable to most of the populatin.

EXISTING CONDITIONS> Fifth Garden Site

The area under consideration is a 300ha site in the Bhantian neighborhood. The area currently consists of a mix of new developments, including the Fifth Garden, several urban villages, retail areas and numerous factories. The area has undergone significant transition in the past decade and will likely see more change in the near future.

Less than a decade ago the site was predominantly vacant land with a few Urban Villages, which were relatively small. The vacant land has since be filled by expanded urban villages, new private developments and a proliferation of factories. The future plan proposes converting most of the factories to residential develompent with pockets of institutional and open space.

The illustrations below help visualize the past, present and proposed future of our study site.

The site is bound by major roads to the north and west and mountains and a highway running diagnol across the southern border. Four MTR transit stations are planned at various points around the site.

Future Housing Affordability

At the current pace of development and population, growth there is a high probability that housing prices will continue to increase as land becomes more scarce. Additionally, the future land use plan calls for FARs of 1.5 for most residential developments, which would severely limit the number of future units. Although we anticipate the government allowing some parcels to have slightly higher FARs (the average proposed FAR we use for later caluclations is 1.7).

Like most of Shenzhen, the Urban Villages are the only housing affordable to low and moderate income residents and migrant workers. If housing prices continue to rise there will be market pressure on the Urban Villages to redevelopment into "formal" residential areas that contain more expensive units.

Since the rise in housing prices in Shenzhen outpaces income growth the affordability gap will persist or expand.

Residential Developments in 2000> Only Urban Villages exist in the area (outlined in red). Source: Windows Live Maps

Existing Residential Developments> Yellow dotted line is Fifth Garden, Red outlines are Urban Villages and orange lines are other private residential developments. Source: Google Earth

Future Land Use Plan> Residential land use in yellow, Retail in red and institutional in purple. Source: Long Gang District Government

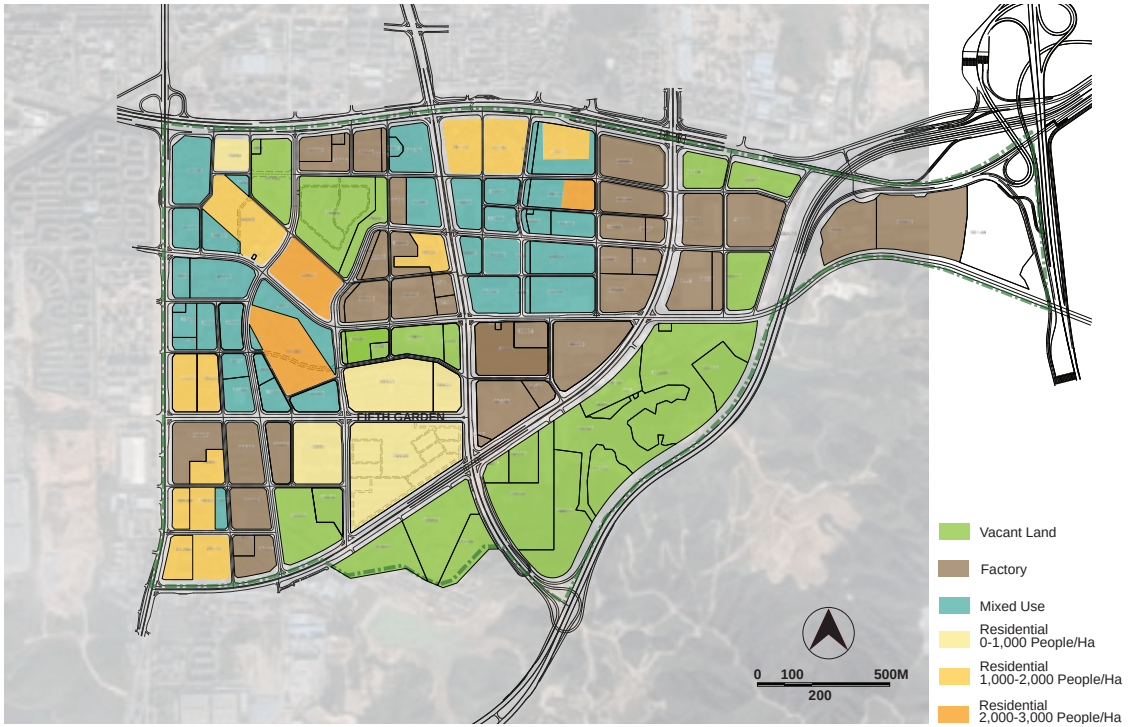
Residential Developments & Urban Villages

The Fifth Garden consists of 2690 units developed on approximately 22 hectares of land. The FAR is 1.5 and we estimate 8000 residents (~384 people/ha). Two other private developments have also been built on our study site directly west and north of the Fifth Garden. We estimate that these developments have a combined population of 7000 residents.

The Urban Villages occupy about 42ha of land and consist of 23,000 units. The FAR for the Urban Villages, which are traditionally more dense, is about 2.8 and we estimate 68,000 residents (~1600 people/ha).

One can see from these figures that the development trend is moving toward less dense housing with larger units; a pattern that does not bode well for the prospects of createing a sustainable mixed-income community.

The remainder of our section will outline housing innovations and policies that can be used to facilitate income mixing and minimize the affordability gap, followed by an example development proposal.



Existing Land Uses and Estimated Population Density Overlayed on the Proposed Land Use Map> The more dense residential areas are Urban Villages
Source: Long Gang District Government (original land use map)

Typical Urban Village Housing> Source: Pedram Mahdavi

Local Urban Village Retail Street> Source: Haley Heard

Fifth Garden (The Village)> Source: Pedram Mahdavi

Concept

There are many mechanisms by which the government can facilitate and stimulate affordable housing development, most of which where covered in reports from 2007 (Shenzhen Futures) and 2008 (Sustaining Shenzhen: Residential Development for Livable Futures). These include: tax exempt bond financing, mortgage subsidies, land subsidies, tax increment financing, inclusionary housing, cross-subsidizing (mixed-income), community land trusts and others.

Our proposal will focus on three housing innovations for mixed-income housing development:

> inclusionary housing

> development linkages

> public-private partnerships (ppps)

> transit-oriented development (tod)

Inclusionary Housing

Inclusionary housing requires new developments to make a certain percentage of their units affordable to low and moderate income households. Through development incentives, such as FAR bonuses, developers are encouraged to play an active role in producing mixed income communities and housing for a diverse labor pool. Any appropriate inclusionary housing policy is best created through consultation with all of the relevant stakeholders (e.g. government, citizens, developers, etc).

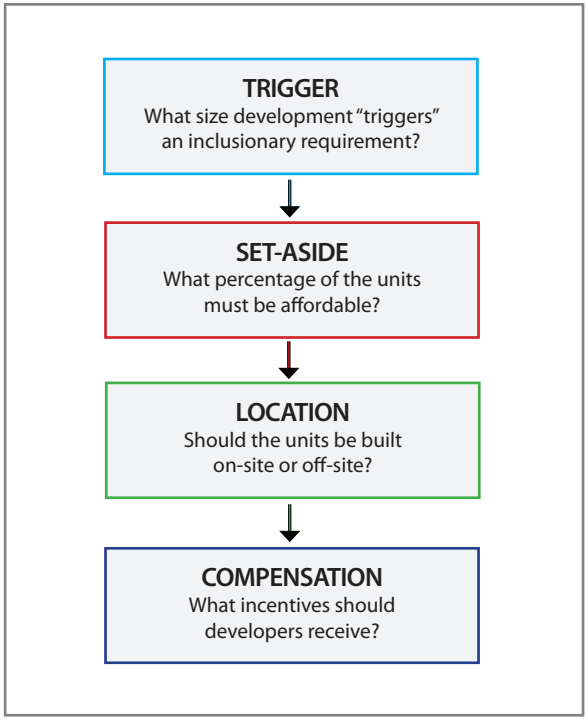


Figure A> Process for creating an inclusionary housing policy

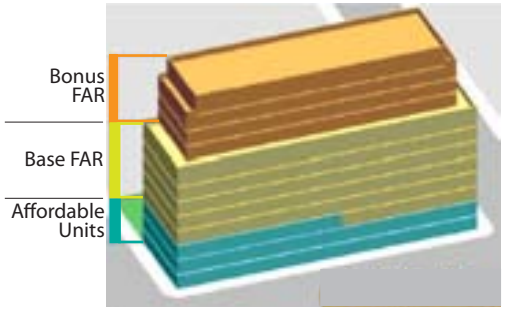


Figure B> Visualizing Inclusionary Housing
(Source: New York City Planning Department)

Best Practices

> *Boston, Massachusetts. USA*

Boston requires all new developments with more than 10 units to "set-aside" 10% of the units as affordable to low and moderate income families. As compensation developers receive tax breaks and FAR bonuses.

> *Montgomery County, Maryland, USA*

Montgomery County requires all new developments with more than 35 units to "set-aside" 15% of the units as affordable to low and moderate income families. As compensation developers receive reduced property taxes and FAR bonuses.

> *Sacramento, California, USA*

Sacramento requires all new developments with more than 10 units to "set-aside" 15% of the units as affordable to low and moderate income families. As compensation developers receive FAR bonuses, gap financing, and expedited reviews.

Development Linkages

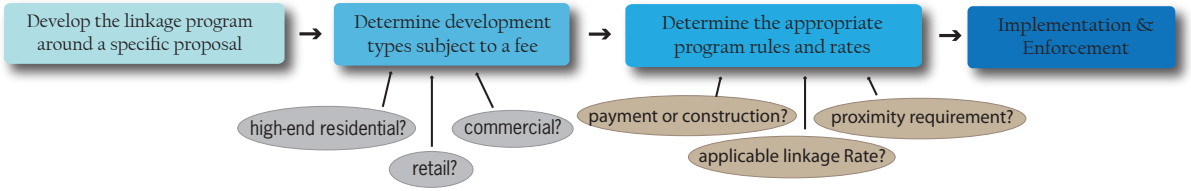
Linkage programs require that designated new construction contribute to the development of affordable housing and other services either through payments to a trust fund or by building units.

New commercial and high-end residential developments engender low to moderate income jobs at a rate that outpaces affordable housing development. Linkage programs are a tool to offset this imbalance in the housing market. Linkage programs are most effective in strong real estate markets and during times of economic growth.

The top diagram shows the process for developing a proper linkage policy, which includes developing the proposal, determining what type of development to charge a fee, program rules and implementation and enforcement. Similar to inclusionary housing, linkage policy should be determined through consultation with relevant stakeholders

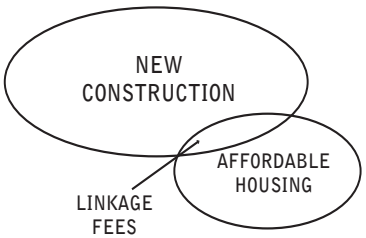
The bottom chart shows examples of how linkage programs have been used in the United States and the income they have generated for affordable housing.

Process for Creating a Linkage Program> Source: PolicyLink.org



City	Analysis Period	Development Type	Rates	Rules	Unique Feature	Estimated Revenue
BOSTON (Massachusetts)	1986-2000	Office Retail Hotels Institutions	$92.75/m^2 $92.75/m^2 $92.75/m^2 $92.75/m^2	Applies to developments over 9290m^2		$45,000,000
CAMBRIDGE (Massachusetts)	1988-2000	Commercial Retail Hotels Institutions	$35.29/m^2 $35.29/m^2 $35.29/m^2 $35.29/m^2	Applies to developments over 232m^2	Can build affordable housing instead of paying fee	$3,000,000
SAN DIEGO (California)	1990-2000	Office Hotel R&D Retail Manufacturing Warehouse	$11.41/m^2 $6.46/m^2 $8.07/m^2 $6.46/m^2 $6.46/m^2 $6.46/m^2			$33,000,000
SAN FRANCISCO (California)	1980-2000	Entertainment Hotel Office R&D Retail	$150.10/m^2 $120.62/m^2 $160.97/m^2 $107.28/m^2 $150.10/m^2	Applies to developments over 2323m^2		$38,000,000
SEATTLE (Washington)	1999-2000	Commercial	Developer gets an FAR bonus by either building affordable housing or paying $215.20/m^2 to a trust fund		Voluntary program (i.e. the developer only has to pay if they want an FAR bonus)	$5,000,000 + 166 units of affordable housing

Examples of Linkage Programs in the United States> Source: PolicyLink.org, Boston Redevelopment Authority, 2000



Visualizing Development Linkages>
The link between new construction and affordable housing.

HOUSING INNOVATIONS> Transit Oriented Development [TOD]

Concept

Transit-oriented development (TOD) is using existing or emerging transit stations as nodes for higher-density mixed-use development. The benefits of a TOD approach include:

> Stimulating mixed-income housing development (when paired with appropriate policies)

> Creating economic development opportunities through a rich mix of housing, shopping and transportation choices

> Environmental efficiency as residents use less private transportation

> Healthier pedestrian & bike-oriented communities

> Boosting transit ridership and minimize traffic

> Generate revenue for the public and private sectors and provide value for both new and existing residents

> More efficient use of land (a scarce commodity in Shenzhen) since TOD requires building at higher densities.

As the transit stations come into service land prices and real estate values immediately surrounding the stations will increase. This could lead to a large housing affordability gap as housing prices increase with land value. To protect against this the government should work with the community to create a set of policies that will retain housing options for different income groups. If executed correctly, the TOD scheme can produce more units of affordable housing overall, and greater profits for developers.

The following steps represent a guideline for using TOD to create a mixed-income community:

Step 1> Create a DEVELOPMENT PARTNERSHIP between the government, developers, MTR and village corporations. The partners will collaborate to insure that proper incentives and implementation strategy are in place to meet the demends of each group. The decision-makers must also take into account the needs of future residents and the community at large.

Step 2> Choose INCENTIVES that will make the project feasible and maximize benefits. A key incentive for TOD is Density Bonuses (i.e. FAR boosts) that allow for higher density development around transit stations. In this scenario, higher density development is the primary conduit for financing affordable housing.

Step 3> Choose the appropriate HOUSING INNOVATIONS to make cross-subsidy and mixed-income housing possible. We focus on development linkages and inclusionary housing.

Step 4> IMPLEMENTATION of the TOD scheme, which produces market-rate and affordable housing.

Transit Oriented Development> New Light Rail System in Charlotte, North Carolina, USA (Source: ReconnectingAmerica.org

TOD Proposal in Australia> Brisbane, Australia's Urban Renewal plans call for a TOD approach with increased FARs to boost commercial and residential development (Source: Brisbane City Council Website)

Transit Station> Bay Area Rapid Transit station in Northern California (Source: Thomas Hawk)

HOUSING INNOVATIONS> Transit Oriented Development [TOD] Case Studies

Case Number One: Hong Kong
Perhaps the most well-known case of building high-density mixed-use and mixed-income communities is Hong Kong. In Hong Kong, development around transit stations occurs through an innovative partnership between the Hong Kong Housing Authority, MTR and private developers.

As one can see from the diagram (right), MTR stations in Hong Kong are surrounded directly by private market rate developments and mixed-use commercial and retail. Private developments receive the most premium land in order to maximize profits and meet client demand.

Set further back but within 1km of the stations are public and affordable housing developments. While these developments are not as well situated as the private housing, residents still have excellent access to mixed-use areas and public transit.

Benefits of this model include:

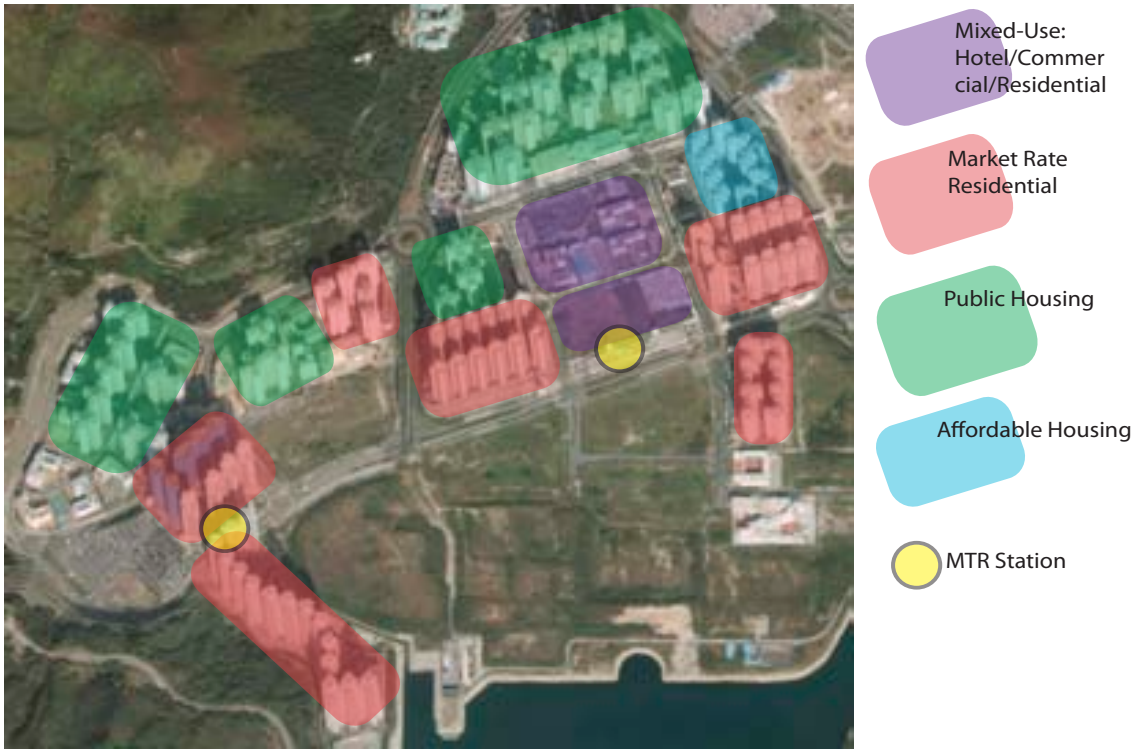
> More efficient land use

> Higher MTR ridership and profits

> Maximizes use of public transit and decreases traffic congestion and pollution

> Larger market for commerical and retail development

The FARs for this site are between 5 and 8 with the higher FARs being private developments surrounding the MTR stations because of the profit potential. These are higher than appropriate FARs for our site but still demonstrate the benefits of using transit stations as nodes for high density development.



Hong Kong Transit Oriented Development Model> Tiu Keng Leng & Tsueng Kwan O Stations (Source: Google Earth)

Tsueng Kwan O> Tsueng Kwan O development area with the MTR station on the lower right (Source: AaverageJoe)

Case Number Two: Arlington, Virginia, USA

An example of the same principle being implemented in the United States is Arlington, Virginia's transit corridor. The design and implementation of their transit-oriented development received an award for "Excellence in Smart Growth" from the United States Environmental Protection Agency.

Arlington's planning approach places dense, mixed-use, infill development at five Metro stations and tapers it down to residential neighborhoods. Through this approach Arlington has facilitating the development of:

> 2 million m^2 of retail/commercial space

> 3,000+ hotel rooms

> 22,500 residential units

> Implemented a 25% density bonus to develop mixed-income housing.

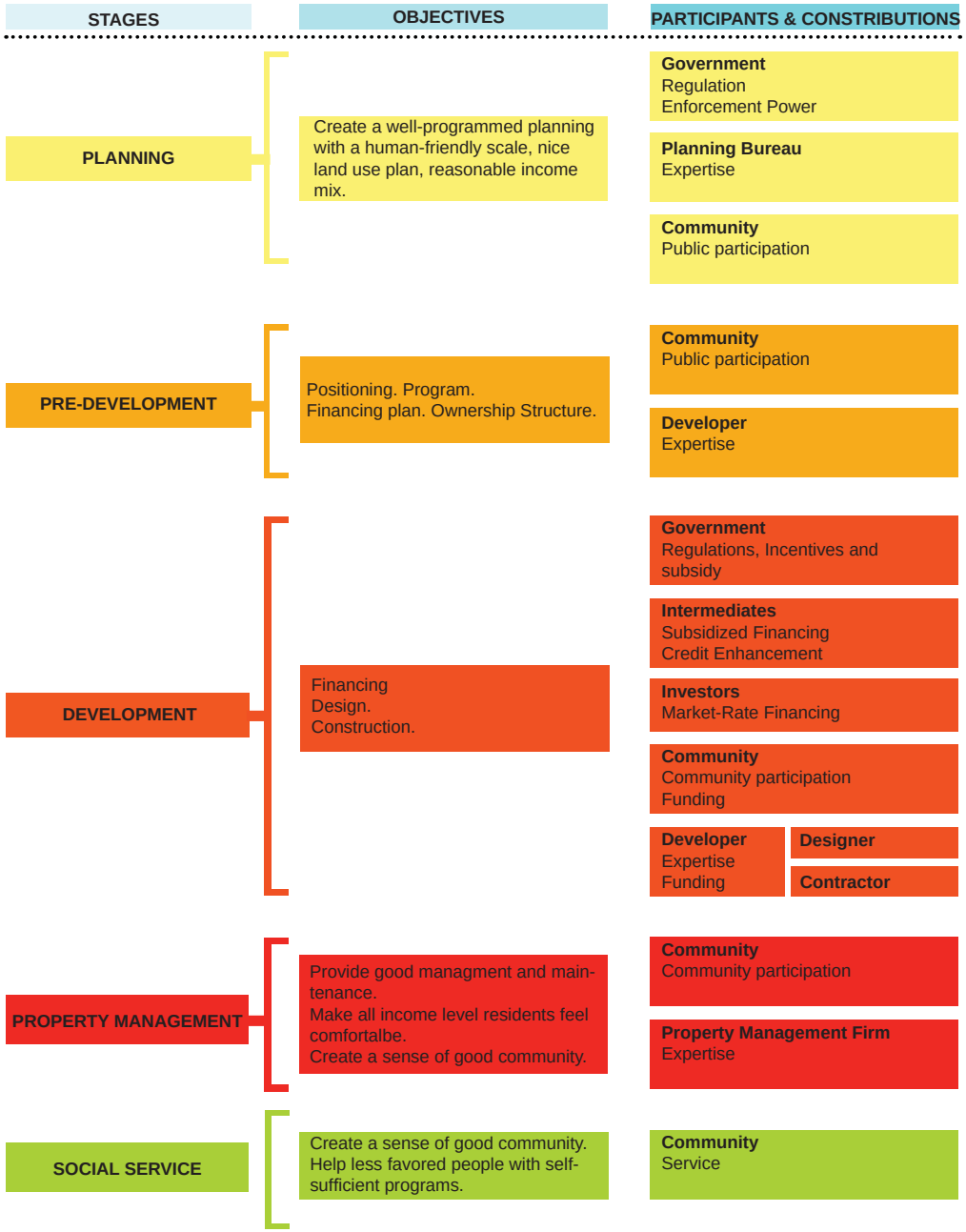
> Increased ridership on the subway by 50%

FARs around the transit stations in Arlington are 3.8 for retail/commercial and 4.8 for residential and hotels. Through this higher density scheme, development consumed only $5km^2$ rather than the $30km^2$ it would have taken under their previous plan.

Arlington, Virginia Transit Corridor> 3-D model of the developmet along Virginia's transit corridor. The developments around the transit nodes (yellow) are FAR 3.8-4.8 (Source: Google Earth)

Ballston Metro Station> Transit-oriented mixed-use development above a metro station in Arlington, VA (Source: Faceless B)

HOUSING INNOVATIONS> The Partnership Approach



The Ideal Partnership System Suggestion> learning from the partnership system in the United States

Concept

A public-private parnership (PPP) is a joint effort between the public and private sector where both parties contribute their expertise and resources to the proposed development. Both public and private sectors share risks and responsibilities.

Why PPP?

This innovations brings a diversity of approaches and resources to the process. Additionally, it is an effective tool for building trust and support among stakeholders. The partners each contribute in various ways:

> *Funding* - Partnerships help secure financing from different sources. For example, in the US the public sector will contribute land and gap financing and the private sector contributes equity.

> *Expertise* - Partnership helps to utilize exptertise from both sectors. The participation of community-based organization helps to better fullfil the needs of local residents.

Who Participates?

> *Public Sector* - all levels of government

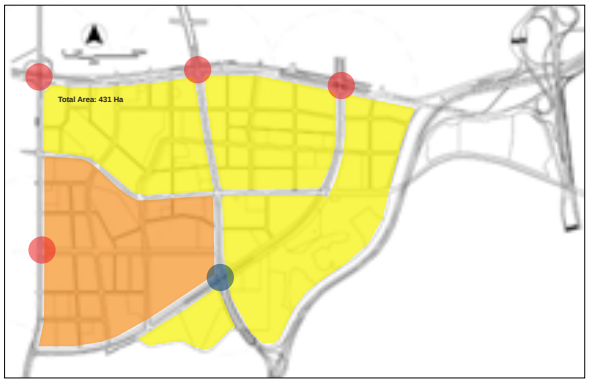
> *Private Sector* - developer, financial institution, investors. In the US, the private sector also include "not-for-profit" or community-based organizations such as Community Development Corporations (CDCs).

> *Community* - the community-at-large can also be included in the process to gain more support.

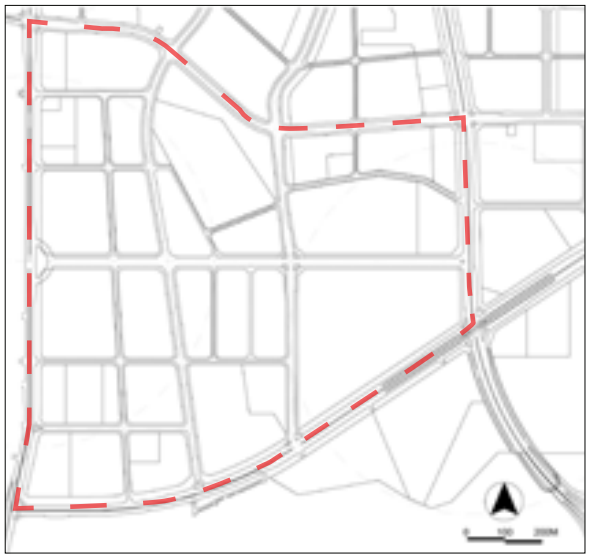
(REFERENCE INDIVIDUAL TOOL SECTION)

LAND USE + DEVELOPMENT PROPOSAL> Site Breakdown

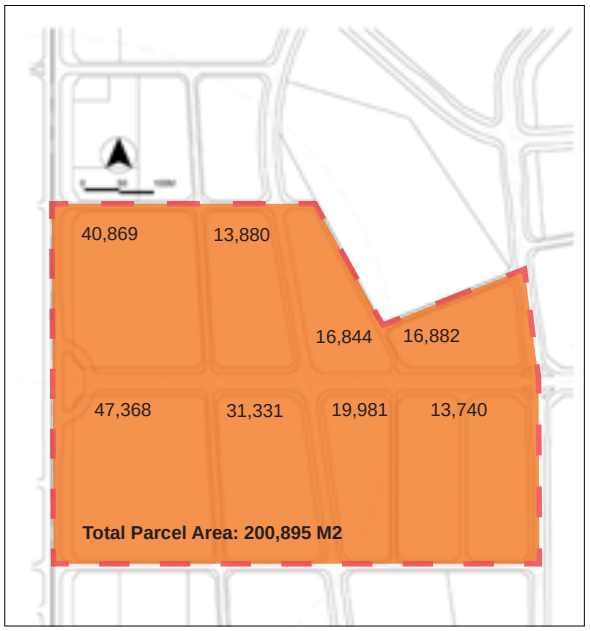
Study Area: about 300 Ha



Area for TOD Financials: about 45 Ha (excluding the 2 urban villages and tree parcels of land)



Illustrative Urban Design Area: about 20 Ha



Site Breakdown

In order to visually explain our proposal and provide financial projections and design guidelines, we break down the study area into three scales:

> The study area (about 300 Ha)

> The area for the financial analysis (about 120 Ha)

>The illustrative urban design area (abut 20 Ha)

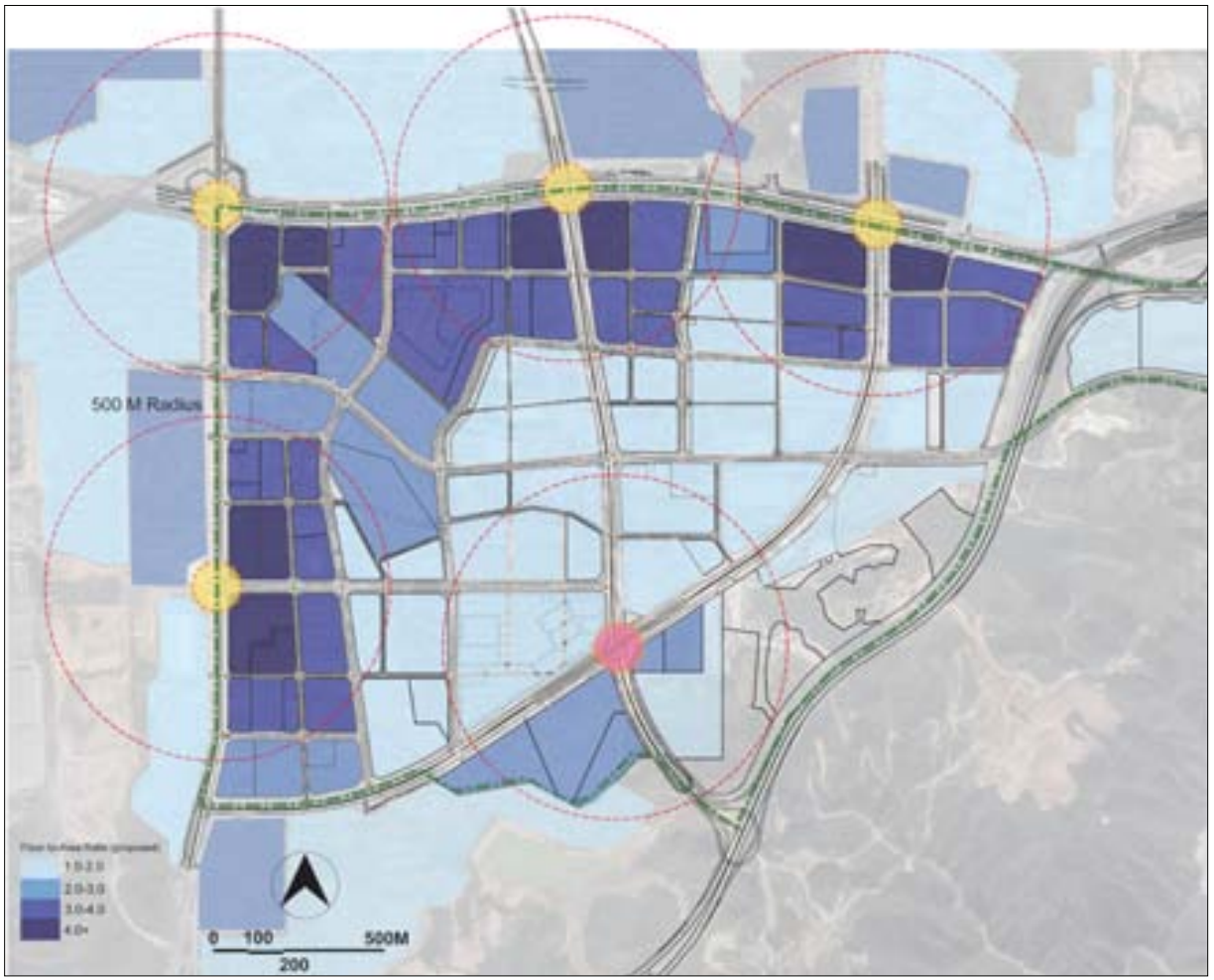
It should be noted that our proposal assumes the Fifth Garden has not been constructed and we further breakdown those parcels into smaller lots.

Area for TOD Financial Analysis

The land area for our financial analysis consists of a transit station, urban villages that will have to be acquired, open spaces, institutional uses, and what is currently the Fifth Garden.

The Illustrative Urban Design Area

The illustrative urban design area is located to the west of the land that is currently the Fifth Garden. It connects that land area with the subway station to its west. This area and urban design proposal is representative of how the whole site should be planned because it consists of all the core components of the TOD model: mixed-use transit oriented development, market-rate and affordable housing, open space, a community center, and a school.



Transit-Oriented Development FAR Proposal> Overlaying FAR bonuses on the Long Gang District government's proposed land use map

Concept

Following the Transit-oriented development model, we propose taking advantage of the emerging transit stations to faciliate mixed-income development. To this end, our proposal recommends an FAR boost for areas located within a 500m radius of transit stops (what we consider "walkable") combined with appropriate inclusionary housing and development linkage policies. The additional value (i.e. profits) created through the FAR bonuses will be sufficient to either cross-subsidize affordable housing or pay into a linkage fund.

Our FARs were determined based on proximity to transit stations:

> Adjacent to transit stations (with ~250m): **4.0+**

> Second ring parcels (with ~500m): **3.0-4.0**

> Other areas: **1.0-2.0**

We anticipate the areas adjacent to transit stations will have the greatest potential for value creation because of their proximity to transit and should be prdemoinantly private residential, retail and commercial development.

LAND USE + DEVELOPMENT PROPOSAL> Affordability

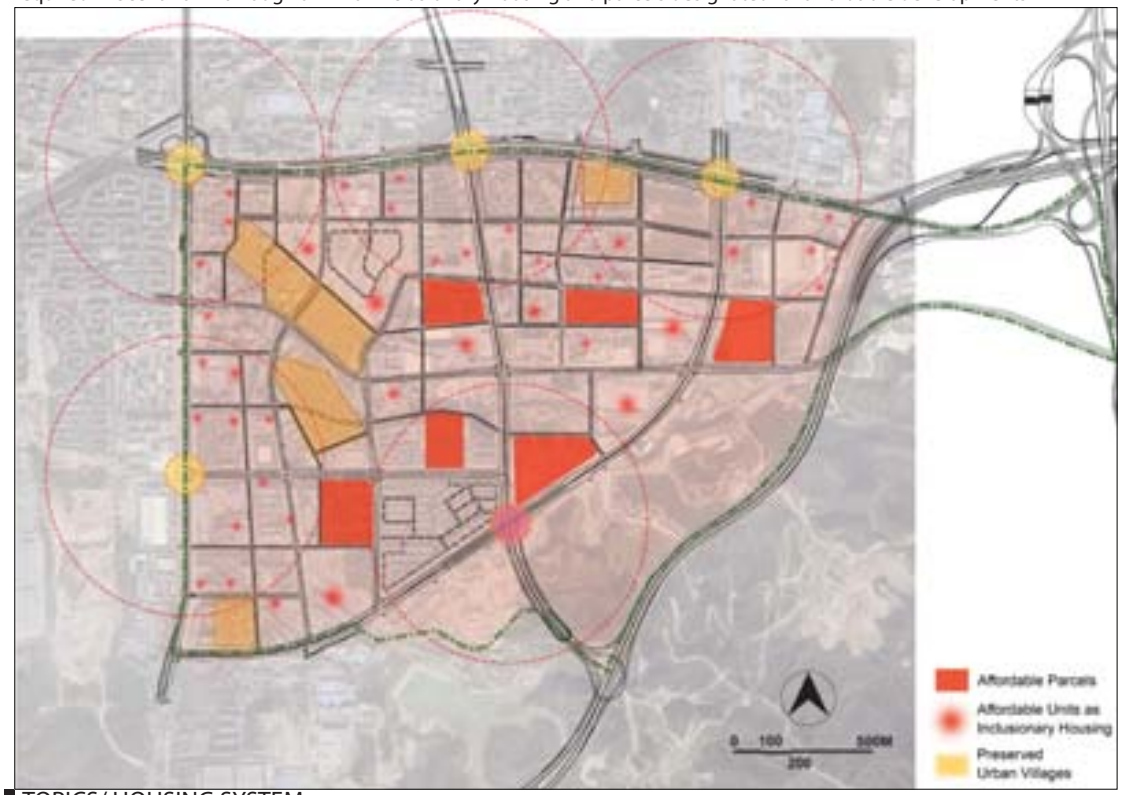
	No Change	Scenario #1	Scenario #2	Scenario #3
Assumptions				
Average Affordable Unit (m^2)	50	50	50	50
Average Market Unit (m^2)	90	90	90	90
Commercial Use	15%	15%	15%	15%
Retail Use	10%	10%	10%	10%
Affordable Housing Required	10%	10%	15%	20%
People per unit	3	3	3	3
Outcomes				
Average FAR (All Site)	1.7	2.2	2.2	2.2
Total Buildable Area*	3,264,120	4,142,053	4,142,053	4,142,053
Commercial m^2	489,618	621,308	621,308	621,308
Retail m^2	326,412	414,205	414,205	414,205
Residential m^2	2,448,090	3,106,539	3,106,539	3,106,539
# of Affordable Units	4,896	6,213	9,320	12,426
# of Market Rate Units	24,481	31,065	29,340	27,614
Total Population**	88,131	111,835	115,977	120,120

*Exclusive of land designated by the City govt as "institutional" or "green space."

**Does not include existing urban villages that will not be changed

Mixed Income Scenarios> Population and unit mixed based on different affordability scenarios. The "No Change" option uses the current proposed FARs of 1.5.

Housing Affordability Diagram for Scenario #2> This map visualizes how to achieve the affordability requirement required in Scenario #2 through a mix of inclusionary housing and parcels designated for affordable developments



Housing Affordability

Our FAR increase proposal facilitates the development of significantly more units but it does not guarantee the preservation or development of affordable housing. In fact, without proper policies in place it could lead to a decrease in affordable units as the area becomes more desirable, land prices increase and Urban Villages redevelop. The "Mixed Income Scenarios" spreadsheet shows the impact of FAR boosts combined with an inclusionary housing policy. The land area is based on parcel sizes we obtained from the District Government' land use plan.

The "No Change" scenario assumes current proposed average FARs of 1.7 for all residential land and a 10% affordability requirement for all new developments. While the 10% requirement is not official we assume that the government will require some type of affordable housing.

Scenarios 1,2 and 3 are based on our TOD proposal with increased FARs but have have different affordable housing requirements. One can see that under our proposal the site can house 20,000 to 30,000 more people and has siginificantly more affordable units.

The map (bottom) shows how Scenario #2 (15% affordability) could be implemented through a combination of affordable housing specific parcels and inclusionary housing. We intentionally dispersed the "affordable parcels" to ameliorate economic segregation and sited them so residents can still access transit sites. These parcels can hold about 7320 units development and will be funded primarily though linkage fees. The remaining 2000 affordable units would be located in private developments through inclusionary housing requirements.

LAND USE + DEVELOPMENT PROPOSAL> Urban Village Redevelopment

Two of the Larger Urban Villages in the Area>
There is a high liklihood that the Urban Villages will have incentive to redevelop into high cost units as market prices for home increase and land becomes scarce.

Urban Village Redevelopment>
Source: Aditi Mehta

Urban Village Redevelopment>Redevelopment of Urban Village residence near a new market rate building
Source: Pedram Mahdavi

Our proposal does not call for the redevelopment or de-densification of the largest Urban Villages on the site because they represent a significant stock of affordable housing in the area, are well situated with respect to transit stations and play a valuable role in the community. However, they are affected by the same upward price pressures as other developments and the Village Corporations, just like any private development, is motivated by potential profit. Hence, as land and home prices increase there will be significant pressure on the Urban Villages to redevelopment and charge higher unaffordable rents.

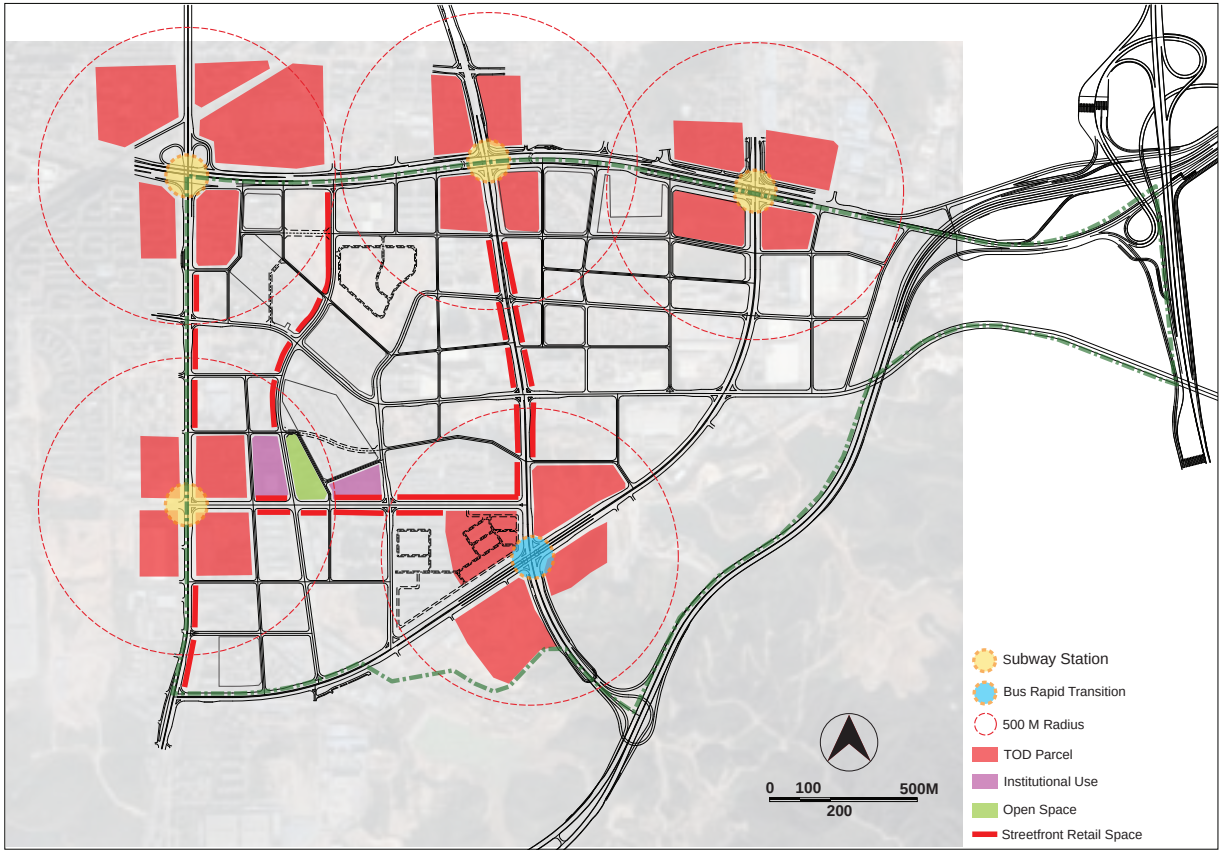
Additionally, preservation of affordable housing (in this case Urban Villages) would be significantly cheaper than developing thousands of new low-income replacements units, consume less land and be more environmentally efficienct.

To protect against complete redevelopment, we propose the government impose more strict regulations on the redevelopment of Urban Villages that encourage the preservation of affordable housing. Any redevelopment initiated by the Village Corporation should require a high percentage of units (higher than what is required of new developments) to be preserved as affordable to the lowest income groups and offer relocation assistance to displaced households. Other regulations include:

> Right of First Refusal by the Government: the government will have the first option to purchase any Urban Village that is being sold for redevelopment.

> Offering public subsidies to any organization or developer who commits to preserving a significant percentage of the Urban Village affordable.

LAND USE + DEVELOPMENT PROPOSAL> Value Generation & Capturing



Value Generation Diagram> This above diagram shows key areas that will experience higher land value (and potentially higher profits from development) as a result of new transit.

The emerging transit stations will increase the land value of parcels surrounding transit stations (highlighted in red) because of a desire to be close to public mass transit and high volume areas (this is particularly true or retail and commercial developments).

The government can leverage the additional profits through linkages and inlusionary housings to subsidize affordable housing.

What Creates Added Value?

> Transit stations

> Open space

> Community facilities

How do you capture that value?

> High-end residential development

> Streetfront retail space

> Commercial real estate such as hotel and office

What can additional profits facilitate?

> Cross subsidizing affordable housing to create a mixed income community.

LAND USE + DEVELOPMENT PROPOSAL> Financial Analysis

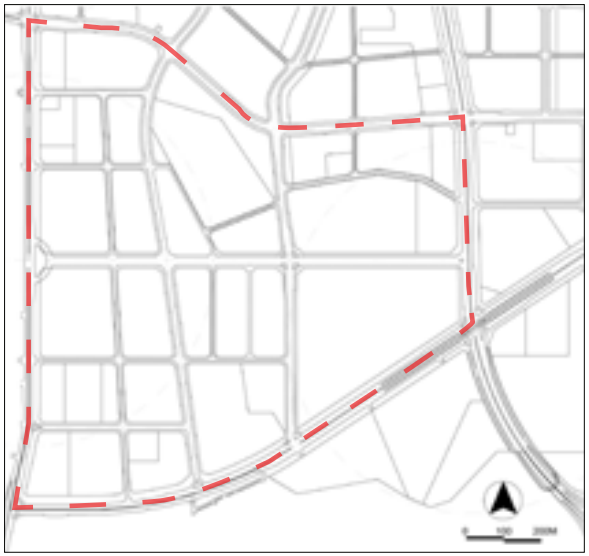
To illustrate the costs and returns of our TOD proposal we created a simple financial model based on assumed acquisition costs, linkage fees, rents and unit sizes. Our finances show two scenarios:

1) Current Conditions: Average FAR of 2 with no affordable housing requirements. Although the government has suggested an FAR of 1.5 we assume they will at least increase this slightly anyway to allow for more housing development.

2) TOD Scenario: Average FAR of 2.9 with linkage fees and inclusionary housing.

Current Conditions ProForma

As one can see from the proforma on the right, under this scenario the total return to the developer is about RMB 300 million for 7417 units and there is no affordable housing developed on the site.

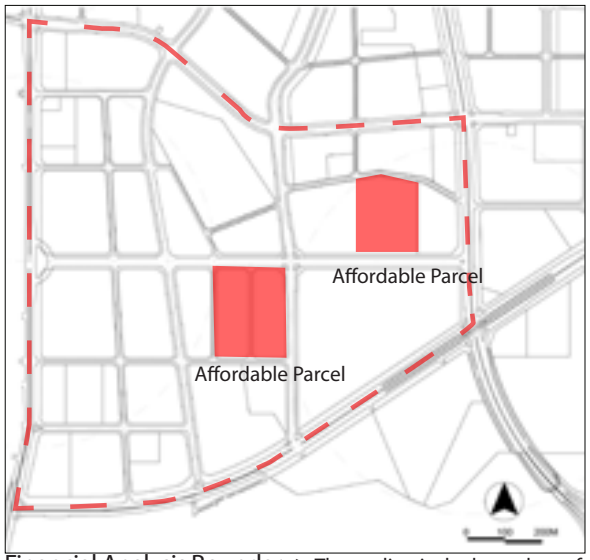


Financial Analysis Boundary> The outline is the boundary of our cost analysis for the current conditions scenario

CURRENT CONDITIONS	Residential Development	Commercial/Retail Development
Estimated Development Size		
Site area	445,008 m2	
Average FAR	2.0	
Gross Building Area	890,016 m2	
Nonresidential Building Area		--
Gross Residential Area	667,512 m2	--
Market Unit Area	667,512 m2	--
Affordable Unit Area	0 m2	--
Gross Non-Residential Area	--	222,504 m2
Avg. Market Unit Size	90 m2	--
Avg. Affordable Unit Size	-- m2	--
Total Units	7,417 units	--
Market Units	7,417 units	--
Affordable Units	0 units	--
Future Land Area	890,016 m2	
Estimated Rents and Future Value		
Market Rents	60 RMB/m2	75 RMB/m2
Affordable Units	-- RMB/m2	
Capitalization Rate	10%	10%
Future Value	4,806,086,400 RMB	2,002,536,000 RMB
Total Future Value	6,808,622,400 RMB	
Estimated Development Costs		
Construction Cost	3,000 RMB/m2	2,000 RMB/m2
Other Cost Factor	25%	0
Linkage Fee	0 RMB/m2	0 RMB/m2
Development Cost	3,750 RMB/m2	2,200 RMB/m2
Development Cost (- land)	2,992,678,800 RMB	489,508,800 RMB
Total Development Cost (- land)	3,482,187,600 RMB	
Acquisition Costs	962,720,000 RMB	
Future Land Cost	2,066,339,840 RMB	
Total Acquisition/Land Costs	3,029,059,840 RMB	
Development Cost (w/ land)	6,511,247,440 RMB	
Total Return to Developer	297,374,960 RMB	

Current Conditions Development Pro Forma> This proforma estimates the return to the developer for buildings in the study area "as is" (i.e. assuming that the maximum FAR is 2).

LAND USE + DEVELOPMENT PROPOSAL> Financial Analysis



Financial Analysis Boundary> The outline is the boundary of our cost analysis for this scenario we have also identified the two affordable housing parcels.

TOD Proposal

The figures under the green shaded area represent the mixed-use development area with a 10% inclusionary housing requirement. The developer would have to "buy-out" a few smaller Urban Villages directly around the transit station but the larger Urban Villages would remain intact. Despite the additional costs the developers has a return of 1.1 billion RMB because of the FAR bonuses.

The blue shaded area is the proforma for the "affordable housing parcels" that will be funded in large part by linkage fees. We assume the land for the affordable parcel will be subsidized by the government.

This proposal generates over 4200 units of affordable housing (in addition to the Urban Villages that will remain) and have a "financing gap" of 26,392,046 RMB that would need to be covered by the government. The red arrow identifies the linkage fees between the two developments.

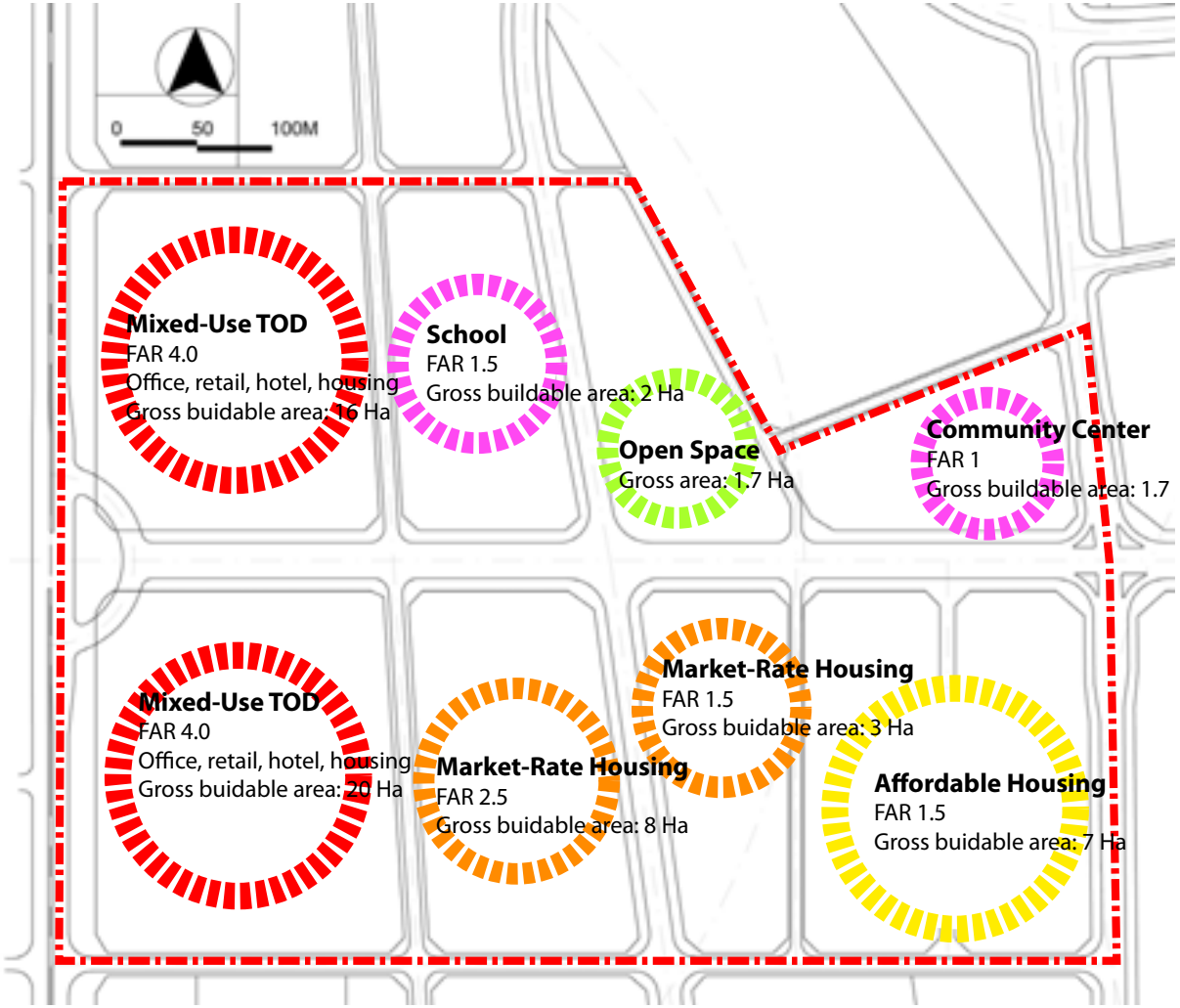
The summary chart that compare key figures from the two development scenarios we just analyzed.

TOD Development Pro Forma> This proforma estimates the return to the developer for buildings in the study area under our TOD proposal (i.e. assuming that the maximum FAR is 2.9) and with an affordability requirement.

TOD Scenario	Residential Development	Commercial/Retail Development	Affordable Development Parcel
Estimated Development Size			
Site area	445,008 m^2		72,946 m2
Average FAR	2.9		1.8
Gross Building Area	1,308,324 m^2		131,303 m2
Nonresidential Building Area	25%	--	15%
Gross Residential Area	981,243 m^2	--	111,607 m2
Market Unit Area	883,118 m^2	--	0 m2
Affordable Unit Area (10%)	98,124 m^2	--	111,607 m2
Gross Non-Residential Area	--	327,081 m^2	19,695 m^2
Avg. Market Unit Size	90 m^2	--	0 m2
Avg. Affordable Unit Size	55 m^2	--	45 m2
Total Units	11,597 units	--	2,480 units
Market Units	9,812 units	--	0 units
Affordable Units	1,784 units	--	2,480 units
Estimated Rents and Future Value			
Market Rents	60 RMB/m^2	75 RMB/m^2	0 RMB/m2
Affordable Units	35 RMB/m^2		30 RMB/m2
Capitalization Rate	10%	10%	10%
Future Value	6,770,574,216 RMB	2,943,727,920 RMB	401,786,568 RMB
Total Future Value	9,714,302,136 RMB		401,786,568 RMB
Estimated Development Costs			
Construction Cost	3,000 RMB/m^2	2,000 RMB/m^2	2000 RMB/m2
Other Cost Factor	25%	15%	10%
Linkage Fee	100 RMB/m^2	400 RMB/m^2	0 RMB/m2
Development Cost	3,850 RMB/m^2	2,700 RMB/m^2	2200 RMB/m2
Development Cost (- land)	4,660,902,540 RMB	883,118,376 RMB	
Total Development Cost (- land)	5,544,020,916 RMB		
Acquisition Costs	962,720,000 RMB		
Future Land Cost	2,066,339,840 RMB		
Total Acquisition/Land Costs	3,029,059,840 RMB		
Development Cost (w/ land)	8,573,080,756 RMB		245,536,236 RMB
			Linkage Subsid 219,144,190 RMB
Total Return to Developer	1,141,221,380 RMB		Financing Gap 26,392,046 RMB

Summary Chart> The chart (below) compares key outcomes from the two development scenarios. the TOD scenario has better outcomes for nearly all key indicators.

	Current	TOD Scenario
Average FAR	2	2.94
Inclusionary Housing Requirement	No	Yes
Development Linkage Fees	No	Yes
Total Market Rate Units	7,417	9,812
Total Affordable Units	0	4,264
Total Return to Developer (RMB)	297,374,960	1,141,221,380
Total Cash Cost to Government (RMB)	0	26,392,046
Cash Cost to Gov't per Affordable Unit (RM	0	6,189
Population Capacity	22,250	42,230



Buildable Estimation Diagram> Displays the development sites and buildable area under consideration

Buildable Estimations

According to the suggested FARs, the land use program and the parcel areas, we calculated gross buildable areas for each parcel in the illustrative urban design scheme.

The two transit-oriented development parcels have a total gross buildable area of 36 Ha, with mixed-use residentia;, retail and commercial development. The average FAR is about 4.0, with both high density and low density development.

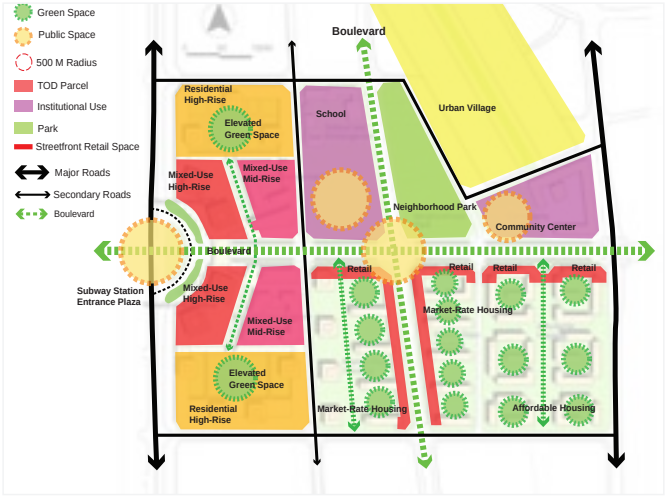
The FARs for residential parcels (set further back from the transit station) range from 1.5 to 2.5. The total buidable area for market housing is about 11 Ha, while the total gross buildable area for affordable housing is 7 Ha.

There are also 1.7 Ha for open space and 3.7 Ha area for community facilities.

Introduction

Based upon the consideration for FARs, land use program, and the financials, we developed an illustrative urban design scheme for part of our site-- an area of about 20 Ha. This scheme is not a concrete design, but is more an example of a possible TOD site plan. It contains different land uses such as mixed-use, institutional, community facilites, market-rate and affordable housing.

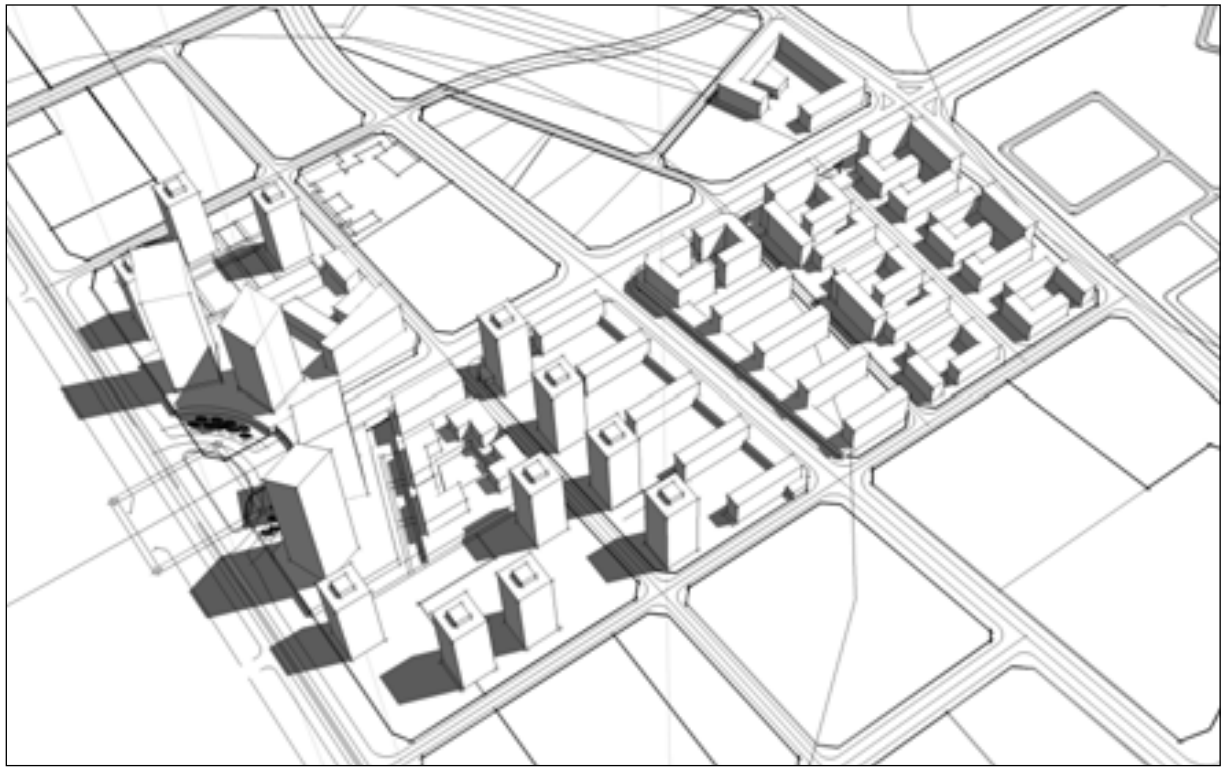
The lower diagram shows the spatial structure of the urban design scheme. We combine all land uses and types of spaces into a comprehensive system, connected by well-designed street public space systems.



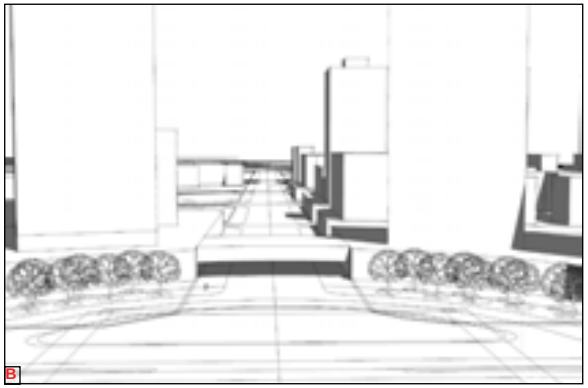
Structural Analysis Diagram> Urban Design Scale

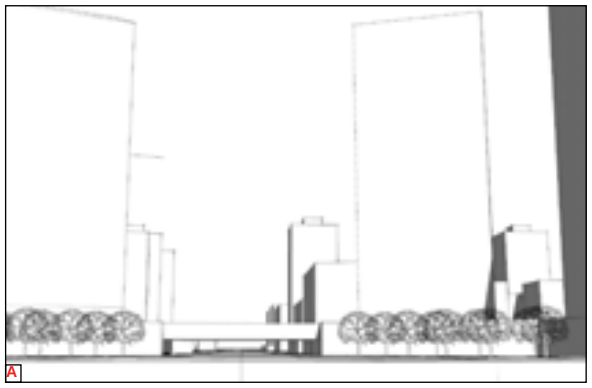
Illustrative Urban Design Site Plan

LAND USE + DEVELOPMENT PROPOSAL> 3D Visualization



Illustrative Urban Design> 3D Visualization





3D Visualization

The 3D visualization shows the fabric, the possible building layout and volume according to our FAR and land use proposal.

The space is organized by the transit node and the axis running through the center of the site. The crossing is enlarged to create a sence of entrance. The west-east axis is a boulevard with streetfront retail spaces on both sides.

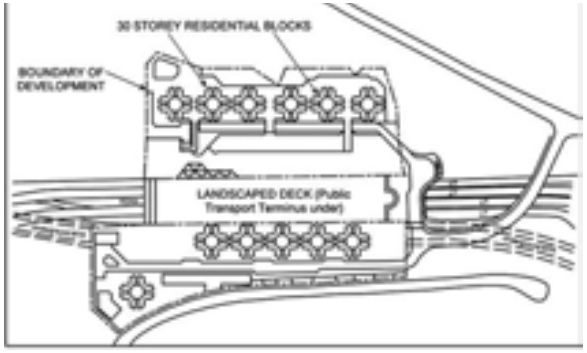
The highet density is located near the transit node, with an FAR up to 4. The mixed-use buildings on these parcels are between 20 and 30-stories. To the east of each TOD parcel are mid-rise mixed-use developments.

LAND USE + DEVELOPMENT PROPOSAL> Models for Transit Oriented Development

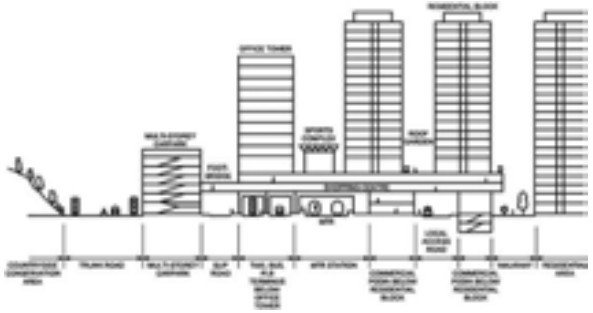
TOD Parcels> study area

TOD Parcels> urban design guideline area

Hong Kong Podium Model> plan



Hong Kong Podium Model> section



High-Rise Vertical Mixed-Use: Hong Kong Podium Model

In this model, the transit station, together with other mass transit are covered by a deck. The mixed-use towers are located on top of the deck, together with elevated green space. This vertical mixed-use model is good when there is limited space.

Mid-Rise Mixed-Use Model

The mixed-use development of mid-rise density is suitable for urban area without strict space constraints.

3D Visualization>

San Li Tun Village, Beijing, China> Source: Pianosky Travel

LAND USE + DEVELOPMENT PROPOSAL> Examples of Mid-Rise Housing Developments

Housing Clusters> market-rate and affordable housing

Housing Clusters 3D> market-rate and affordable housing

The Housing Design

The market-rate and affordable housing should be of same design quality to prevent social stigmas from developing and isolation.

The building layout should take into account the need for sunlight and open space. Linear green space and small plazas can be arranged in between buildings.

Mid-rise housing can be designed as courtyard-shaped buildings. Courtyards can be seen as very good open space with some privacy. Additionally, there should be human-scale streetfront retail spaces to bring activity, life and shopping to the area.

The pictures below are examples of good design practices for mid-rise developments.

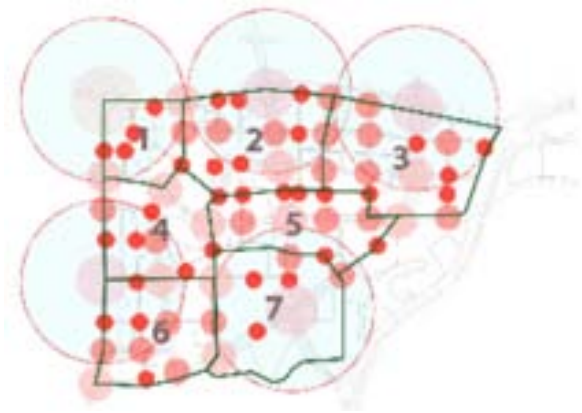
Affordable Housing Case> Winning project of the New Housing New York Legacy Project Competition (New York, NY)
Source: Dattner Architects and Grimshaw Architects, 2007

Affordable Housing Case> Winning project of the New Housing New York Legacy Project Competition (New York, NY)
Source: Dattner Architects and Grimshaw Architects, 2007

Affordable Housing Case> Submission for the New Housing New York Legacy Project Competition (New York, NY)
Source: Markus Dochantschi and company.

LAND USE + DEVELOPMENT PROPOSAL> Considering Community Facilities

Community Facilities Map> Source: Chapter Integrated Spaces



Community Facility System

There is a close relationship between housing and community facilities. Planners need to insure that there are adequate facilities (e.g. schools, community centers, etc) to meet the needs of the population that will be housed in the new developments.

Our studio's community facilities group, developed a proposal for how to distribute community facilities across the site area and the populaiton capactiy of the respective uses.

[REFERENCE INTERGRATED SPACES CHAPTER]

Centeralized Large Community Facilities>

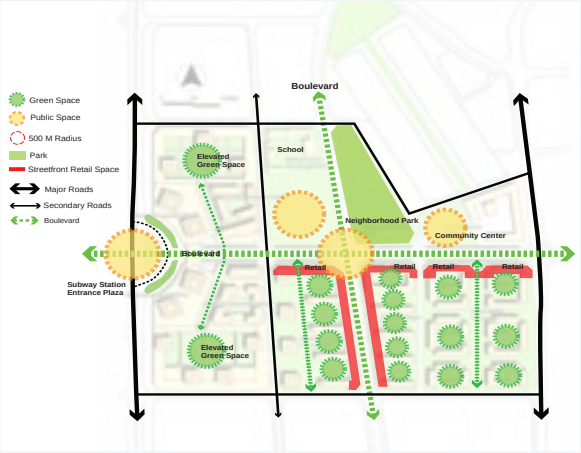
The site plan (above) proposes locations for a larger high school and community center to serve the new developments. The major facilities which require more land area, such as a large school or community activity center, should be clustered in the same area with shared open space and acccessible to different population groups.

Scattered Small Community Facilities> Streetfront Spaces

The smaller community facilities, such as kindergartens, local retail and service offices, could be scattered throughout residential clusters. For example, in the streetfront space at the bottom of each residential cluster.

LAND USE + DEVELOPMENT PROPOSAL> Considering Open Spaces

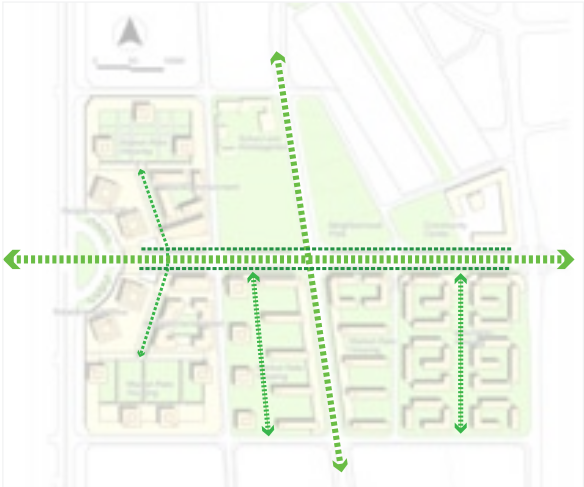
Open Space System>



Large Open Spaces> Park and Elevated Open Space

Dotted Open Spaces> Plazas, Open Spaces within Residential Clusters

Linear Open Spaces> Street Trees, Shopfront Open Spaces



Open Space System

There are three major types of open spaces:

> Big spaces: Park, Elevated Gree Space

> Dotted spaces: Entrance Green Plaza, Activity Plaza

> Linear spaces: Boulevard, Shopfront space

All types of open spaces should be connected by the well-designed street system.

[REFERENCE NATURAL SYSTEMS GROUP]

REFERENCES

Avault, John & Lewis, Geoff. (2000). Survey of other Linkage Program in other U.S. Cities with Comparisons to Boston. Boston Redevelpment Authority.

Bertaud, Alain. (2007, July). *Affordable Housing: the supply side.* Workshop on middle and low income housing in China. Washington, DC.

City of Arlington, Virginia. (2009). Planning Division Land Use Studies, Reports, and Other Documents. Retrieved May, 1, 2009. <http://www.arlingtonva.us/DEPARTMENTS/CPHD/planning/docs/CPHDPlanningDocsMain.aspx>

Commercial Linkage Strategies. (2009). from PolicyLink.org. Retrieved March 30, 2009. < http://www.policylink.org/EDTK/IZ/>

Milton Renewal (2009). Brisbane City Counsil. Retrieved March 25, 2009. <http://www.brisbane.qld.gov.au/BCC:BASE:1038539242:pc=PC_3096>

MTR Corporation Website. (2007). Retrieved April 4, 2009. <http://www.mtr.com.hk/eng/properties/prop_dev_index.html>

Reconnecting America Center for Transit-Oriented Development. (2008). *Financing Transit Oriented Development in the San Francisco Bay Area*. Prepared for the Metropolitan Transporation Commission.

Reconnectin America Center for Transit-Oriented Development. (2008). *Growing Mixed Income TOD.* Prepared for the Greater Communities Collaborative.

ReconnectingAmerica.og. (2009). Retrieved April 11, 2009. <http://reconnectingamerica.org/public/about>

U.S. Environmental Protection Agency. (2002). *Arlington County, Virginia - National Award for Smart Growth Achievement - 2002 Winners Presentation*. Retrieved May 2, 2009 <http://www.epa.gov/dced/arlington.htm>

What is Inclusionary Zoning? (2009). from PolicyLink.org. Retrieved March 30, 2009. < http://www.policylink.org/EDTK/IZ/>What is Inclusionary Zoning? (2009). from PolicyLink.org. Retrieved March 30, 2009. < http://www.policylink.org/EDTK/IZ/>

Bai, Jie. (2008) Estate-Level Facility Provision and Management in Market-Rate and Resettlement Coexisiting Housing Compounds. Cambridge: MIT.

Fang, Yan Zhang and Ke. "Is History Repeating Itself?: From Urban Renewal in the US to Inner-City Redevelopment in China." Journal of Planning Education and Research.

Schuwartz, Alex F. (2006) Housing Policy in the United States: CRC Press.

Shusong Ba, Xu Zhang, Miao Wang. The Financing Characteristics of Rental Housing in China.

Canada Mortgage and Housing Corporation. (1998) "The Role of Public-Private Partnership in Providing Affordable Housing." Canada.

Wilkins, Jill Khadduri and Charles. (2007) Designing subsidized rental housing programs: what have we learned? Cambridge, MA.

Zhou, Le. (2002) Some Thoughts about the on-Going Old and Dilapidated Housing Redevelopment in Beijing. "*Beijing City Planning & Construction Review", 4*, 2002.

Wang, Yaping, Wang and Wu. (Unpublished). Urbanization and Informal Development in China: Urban Villages in Shenzhen.

Song, Yan, Zenou and Ding. (2008). Let's not Throw the Baby out with the Bath Water: the Role of Urban Villages in Housing Rural Migrants in China. "*Urban Studies*", 2008.

Ho, Paul. (2007).Development of Public-Private Partnerships (PPPs) in China. City University of Hong Kong. Hong Kong.

Brown, Andrew and Orr. (2006). The Suitability of Public-Private Partnerships in the Provision of Sustainable Housing in China. Heriot Watt University. Edinburgh, Scotland, UK. "World Review of Entrepreneurship, Management and Sust. Development", Vol 2, 2006.

Liou, Y. Thomas. (1998). Community Development Intermediary System in the United States: Origins, Evolution, and Functions. "Housing Policy Debate" Vol 9, Issue 3, 1998. Fannie Mae Foundation.

Goldstein, Ari Alowan. (2007). Municipal Strategies for Affordable Housing: Inceting and Exacting Public Goods from Private Developers. Massachusetts Institute of Technology. Cambridge, MA, USA. 2007.

Chung, Amy. (2004). Bridging Sectors: Partnerships Between Nonprofits and Private Developers. Joint Center for Housing Studies of Harvard University. 2004.

Chan, Abert. (2008). Application of Public-Private Partnership (PPP) in Hong Kong Special Administrative Region -- the Critics' Perspectives. First International Conference on Construction in Developing Countries. *"Advancing and Integratng Construction Education, Research & Practice"*. August 4-5, 2008, Karachi, Pakistan.

[INDIVIDUAL TOOLS]

APPLYING MEMORY IN THE URBAN ENVIRONMENT

ECO-STREETS

MIXED-USE DEVELOPMENT AND DESIGN

DEVELOPING AN INTEGRATED HEALTH CARE SYSTEM

PLANNING for AFFORDABLE HOUSING

COMMUNITY SCHOOLS

BICYCLE-FRIENDLY STREET DESIGN

XIANG

INTEGRATED UTILITY & RESOURCE MANAGEMENT ORGANIZATIONS

ELECTRIC BIKES (E-BIKES)

THE PARTNERSHIP APPROACH FOR AFFORDABLE HOUSING DEVELOPMENT

Leesburg, Va. Source: Flickr user *jasonepowell*

Introduction

Historic and ecological preservation in China has long been a contentious endeavor. Undoubtedly, the country contains thousands of significant cultural relics and historic structures, as well as a plethora of distinct landscapes. However, as in the United States fifty years ago, a strong and diverse historic preservation movement in China is still in its nascent stage.

Recently, the cause has seen newfound support. Preservation is becoming a popular marketing device, if not simply a means of ensuring that the past remains a part of the present and future. Indeed, efforts to save vestiges of the past have retreated from the battlefield; during Mao Zedong's tenure (especially during the Cultural Revolution), and in the era of rapid development that began in the last decades

Bantian Site, 2002. Note the agricultural village and green fields, faintly at top center. Source: Google.

of the Twentieth Century, old buildings and cultural sites were viewed as merely impediments to progress -- whether political or economic.

Restored historic districts in Shanghai, Beijing, and in smaller cities and towns across the nation serve as beacons of the opportunity and distinction preservation can bring to a locality. It signals an embrace of the past, and a pride in a collective heritage. To be sure, the promise of increased tourism and profit based on marketable uniqueness can cloud an area's true historical narrative, and encourage a rewriting of the past. Still, the trend offers another needed step towards sustainable planning and design.

As seen in Bantian, Shenzhen, what comprises "history" has been compressed: former agricultural villages have either been wiped from the map or reborn as dense urban villages, and nearby streams that were open to the air for thousands of years have

Bantian Site, 2009. The remains of a stream-side village. A prime candidate for historic preservation. Source: Aditi Mehta.

Bantian Site, 2009. One of the few remnants of the site's natural hydrological system. Ideally, a candidate for landbanking and future reuse. Source: A. Mehta

only recently been buried underground. "Old" city buildings, including those in the urban villages, factories, and public amenities, are at most only thirty years old. This situation is bound to be repeated all across China as cities expand into former rural areas. What, then, of historic preservation in these settings? Moreover, in a city of shifting populations like Shenzhen, how to reclaim a collective narrative from the built environment?

What is this Tool?

Memory is a difficult phenomenon to categorize, let alone drive design and planning. For our purposes, it is mainly a poetic term that unites a few planning and design practices that attempt to unite the past with the present, or likewise, look to the past for a more sustainable future. These practices include landbanking, park planning/programming, historic preservation, and adaptive re-use. As a comprehensive tool, employing memory to guide the built environment would involve:

> Drafting a series of incentives for private adaptive re-use of existing buildings

> Urging municipalities to "landbank" -- i.e., settiing aside "original" landscapes and areas of cultural significance to be used as agriculture, open space, or preserved redevelopments

> Revitalizing old villages, ecology, and infrastructure through historic preservation.

Assumptions

Historic Awareness

That large Chinese cities such as Beijing and Shanghai are beginning to reconsider the value of historic districts is an indication that the country's historic preservation movement is indeed gaining ground. The applications of memory in the urban setting require a sustained commitment to the principles of historic preservation, adaptive re-use and landbanking: namely, that the past -- in buildings, landscapes, and social narratives -- is an asset to be maintained for future generations.

Where Does This Tool Apply?

Ideally, across the globe, whether in small towns or large cities, wherever a local story would like to be told. For the purposes of this report, memory could be used in Chinese cities and their suburbs that are rapidly urbanizing former agricultural land and villages. At the Bantian site level, this tool could be employed to responsibly redevelop the area surrounding the one remaining village hut alongside a partially-buried stream.

Why Should This Tool Be Used?

Quite simply, it encourages sustainable development and cultivates a richer sense of local identity. As has been seen, historic preservation in larger Chinese cities adds to that place's value both on the national and international fronts; and provides those cities with marketable, unique assets. In former agricultural areas, like the newly urbanized parts of Shen-

> At right, EDAW's master plan for the Qiaonan Village regeneration program. Note the historic core at the center, with larger developments flanking it. Source: *Architectural Record*

< At left, the culturally significant Luoyang Bridge. Source: EDAW

Case Study

Historic Preservation as Sustainable Asset: Qiaonan Village, Quanzhou City, Fujian

""This project represents an emerging type of response in Chinese cities, with a focus on regeneration, rather than replacement, as a vital part of the urbanization process." -- EDAW's Michael Erickson

Quanzhou is a city of roughly 7.5 million people in Fujian Province. It, like Shenzhen and so many other cities across China, has seen rapid growth and urban development in the past few decades. At the edge of the city lies a historic village core, Qiaonan, that anchors the Luoyang Bridge, a millennium-old granite causeway designated as a "national cultural heritage structure." Facing obsolescence in the face of rapid development, the small settlement composed of many diverse buildings found a new future in a master plan devised by the architecture and planning firm EDAW.

EDAW's plan, the Qiaonan Village Historic Preservation Scheme, sought to redirect the future by consolidating the past, incorporating new development into the historic village fabric while preserving its significant buildings and unique cultural environment. After a comprehensive study to determine the most economically-viable programming of the Village, EDAW pressed forward with plans to develop Qiaonan into a haven for cultural tourists as well as local citizens. The firm's plan is also a model for future responsible urban development. Indeed, "EDAW's plan also offers detailed design guidelines to ensure the continued use of traditional typologies, materials, and design elements" (Lind).

Beyond serving as a template for future historic preservation and sustainable regeneration, Qiaonan Village also raises important questions about urban memory and image construction: Who determines what collective memory is, and whose or what narrative should be incorporated into design? To what extent does explicitly categorizing an area as an "historic village" change a resident's experience of a place? There are no easy answers to these questions; in reality, they ought to form an ongoing dialogue during any application of memory as a planning tool.

zhen, reintroducing local food production could, however marginally, reduce the need for outside delivery, thereby reducing trucking costs and pollution. Finally, demolishing buildings that have vacated their original use is costly and unsustainable; rather, adapting them for another use -- e.g., renovating an obsolete factory as a greenhouse or a residential structure -- would not only retain a historical building fabric but also cut down on the demand for new resources.

When is This Tool Implemented?

Although the applications of memory in the urban environment have different timeframes, they all would occur concurrently with comprehensive planning of future development districts at both the regional and site levels. Whereas drafting incentives for adaptive reuse would ideally begin immediately to spur private economic development, municipal landbanking strategies and neighborhood-supported historic preservation schemes are ongoing processes. These latter two applications are driven by research, community participation, and goals: a landbank operation may set a twenty-year objective of X hectares, with each parcel a negotiated addition. Historic preservation movements can be local or national; yet each nominated landmark or landscape undergoes an undeterminably long focus of intense research, image creation, and physical restoration (or integration with another development).

Best Practices

Incentives for Adaptive Reuse: Los Angeles, California

The City of Los Angeles' Adaptive Reuse Ordinance is a comprehensive attempt to "revitalize the Greater Downtown Los Angeles Area… by facilitating the conversion of older, economically distressed, or historically significant buildings to apartments, live/work units or visitor-serving facilities." These physical changes, according to the City, will eventually enliven the downtown area and "encourage mixed commercial and residential uses in order to improve air quality and reduce vehicle trips…" by grouping a variety of land uses together. The City's goal is a valiant one; and to encourage this end, the ordinance offers several development incentives, including exemptions from Site Plan Review, lot area (density) requirements, off-street automobile parking provisions, and the requirement of a loading dock.

For urbanizing China, some of these exemptions may not be applicable; however, the precedent set by Los Angeles' Adaptive Reuse Ordinance is strong, and local Chinese governments should set about drafting a more district-specific set of exemptions to promote building reuse.

Landbanking Cultural Assets: Portland, Oregon

The City of Portland Parks and Recreation Department's Land Acquisition Strategy is designed to provide guidelines for the responsible gathering of land for a regional open space and cultural resources network. Indeed, landbanking is not only a device to ensure widespread accessible recreational uses, but it is also a method of ensuring the longevity of an area's cultural assets.

Portland's guidelines for "Significant Cultural Resources Properties" are directed by this objective:
"To preserve the City's rich, diverse cultural heritage by acquiring examples of irreplaceable cultural landscapes and properties which exhibit this diversity for current and future generations."

Given the diversity of urbanizing China, in a similar scheme the definition of a cultural asset would be expanded to include both resources of national, archaeological significance, as well as local landmarks -- whether villages, communal wells, or meeting places. Alongside planning for a comprehensive land use proposal, a municipality would use a rubric similar to Portland's to set aside areas of local social and cultural significance.

REFERENCES

City of Los Angeles. "Adaptive Reuse Ordinance." < http://lafd.org/prevention/pdfforms/adaptive_reuse_ord.pdf> (2001)

City of Portland Parks and Recreation. "Land Acquisition Strategy." <http://www.portlandonline.com/shared/cfm/image.cfm?id=130675>

EDAW. "Qiaonan Village Historic Preservation." < http://www.edaw.com.hk/whatWeDo/projects/Qiaonan-ECON.htm>

Johnson, Ian. "Saving China's Past." *The Wall Street Journal*. March 15, 2008. < http://online.wsj.com/article/SB120553155838337655.html?mod=pj_main_hs_coll>

Knapp, Ronald G. *China's Old Dwellings*. University of Hawaii Press, 2000.

Lind, Diana. "Qiaonan Village Historic Preservation Scheme." *Architectural Record China*. < http://archrecord.construction.com/ar_china/bwar/0604-11_Qiaonan.asp>

Min, Robert Lin. "Modern Shenzhen and its Rediscovered Past." < http://www.szcityguide.com/living/shenzhen/history/history.html> (2008)

Pan, Tianshu. "Historical Memory, Community-Building and Place-Making in Neighborhood Shanghai." *Restructuring the Chinese City,* Eds. Laurence J.C. Ma and Fulong Wu. 122-137.

ECO-STREETS > Haley Heard

Ecological Infrastructure

Shenzhen is considered the "Overnight City" due to its phenomenal development rate in the last 30 years. This growth has been achieved through advancements in infrastructure, such as dams and major roadway networks. However, the growth, current infrastructure, and development practices have caused extensive ecological degradation in the area. The city is projected to continue this unprecedented growth for several years and without an intervention, the environment will continue to be exploited.

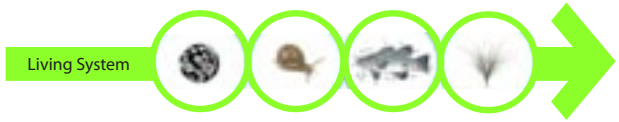
Creating a sustainable tool for Shenzhen must address several needs. The area is lacking in accessible and usable open space, as well as clean water. The road network within the city makes up approximately 30% of the area, yet the right of way is rarely considered part of the open space network. Redesigning the streetscape within Shenzhen to treat the water, create connections to open space and create a vibrant and economically viable public realm, would benefit the residents both socially and economically.

Tool

The Eco-Street is a tool to create a more dynamic open space network by designing the streetscape that links parks while also acting as the water treatment system. The concept addresses the streetscape design in several ways. First, it designs the right of ways along the streets to advocate pedestrian mobility and promote more accessible open space.

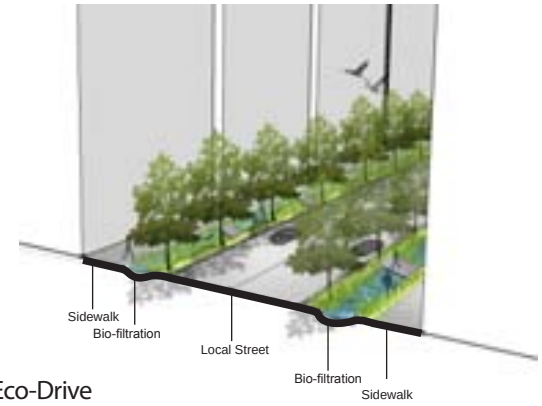
Second, it uses the already connected road network to link the breached ecological systems. Implementing a continuous progression of living-machines into the streetscape will capture the storm water and treat it as it flows through the city until it is deposited back into the regional hydrological system.

This tool is beneficial at the local level, but once it is replicated, the aggregation creates a connected regional water filtration and open space network. The regional connection is important, because purifying and managing wastewater and storm water runoff at a large scale will eliminate the need for expensive water treatment facilities and flood control infrastructure proposed in the area. The Eco-Streets will also protect the region's water in periods of drought and scarcity. The money saved could then be reallocated to be used for park management or the creation of more open space.



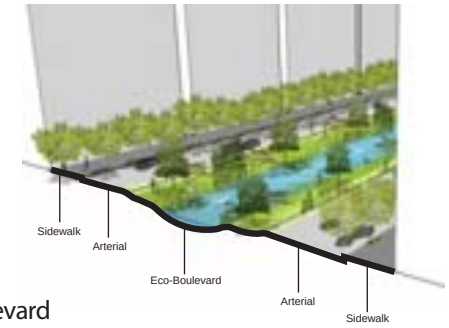
Living Machines incorporate helpful bacteria, plants, snails and fish that thrive by breaking down and digesting organic pollutants. There are no harmful chemicals or expensive infrastructure. Wastewater treatment takes place through a series of differently managed environments, a diversity of organisms that eat the waste in the water.

Source: UrbanLab; Social Design Notes



Eco-Drive

Eco-Avenue



Eco-Boulevard

What is this Tool?

The Eco-Street is a streetscape design that integrates various methods of water filtration, while also creating a continuous park network throughout the city. The street network is engineered with natural systems that act as biofilters, removing sediments and pollutants such as heavy metals from the water, mimicking the function of natural wetlands. Nutrient rich, it also acts as habitat for wildlife. (Lienard, et al 2005)

This system provides the dual purpose of creating an enjoyable park environment along the roadway. This environment will connect existing parks and open space, creating a continuous and accessible greenway network throughout the city. In addition, the Eco-Street promotes pedestrian activity, which in turn will activate the street; promoting safety and spurring economic activity for retail.

The Eco-Street is a typology that can be implemented to perform different levels of water filtration depending on the road right of way. These hierarchies include:

>Eco-Drive
>Eco-Avenue
>Eco-Boulevard

Constructed wetlands are an evolution of a filtration and purification technique using aquatic plants that has only evolved in the last forty years. The latest application was discovered by UrbanLab in the "City of the Future" Competition. UrbanLab created a series of boulevards that integrated Living Machines into streets throughout the City of Chicago. This tool expands this idea into a hierarchal system that integrates with the hierarchy of the road network.

Eco-Drive

The Eco-Drive is the first scale of the streetscape typology, applying a water filtration system to the a local neighborhood street. The streetscape includes a landscape zone that buffers between the pedestrian and vehicular realm. The landscape zone also acts as a continuous strip of bioremediation, capturing and filter solids and pollutants from storm water before it enters back into the city's water system.

Eco-Avenue

The second scale of the streetscape typology is implemented into a bigger right of way, utilizing the addition space as a linear parkway. The Eco-Avenue is large enough to accommodate constructed wetlands and water retention. The parkway also provides bike paths, nature trails, and other recreational uses.

Eco-Boulevard

The eco-boulevard is the largest scale streetscape intervention, serving as a linear park system connecting the city's open space network and water system. The eco-boulevard is comprised of a series of living-machines that purify storm water and wastewater, while providing a contiguous habitat local wildlife. The eco-boulevard also provides a space for various recreational uses and an opportunity for a productive landscape such as urban agriculture.

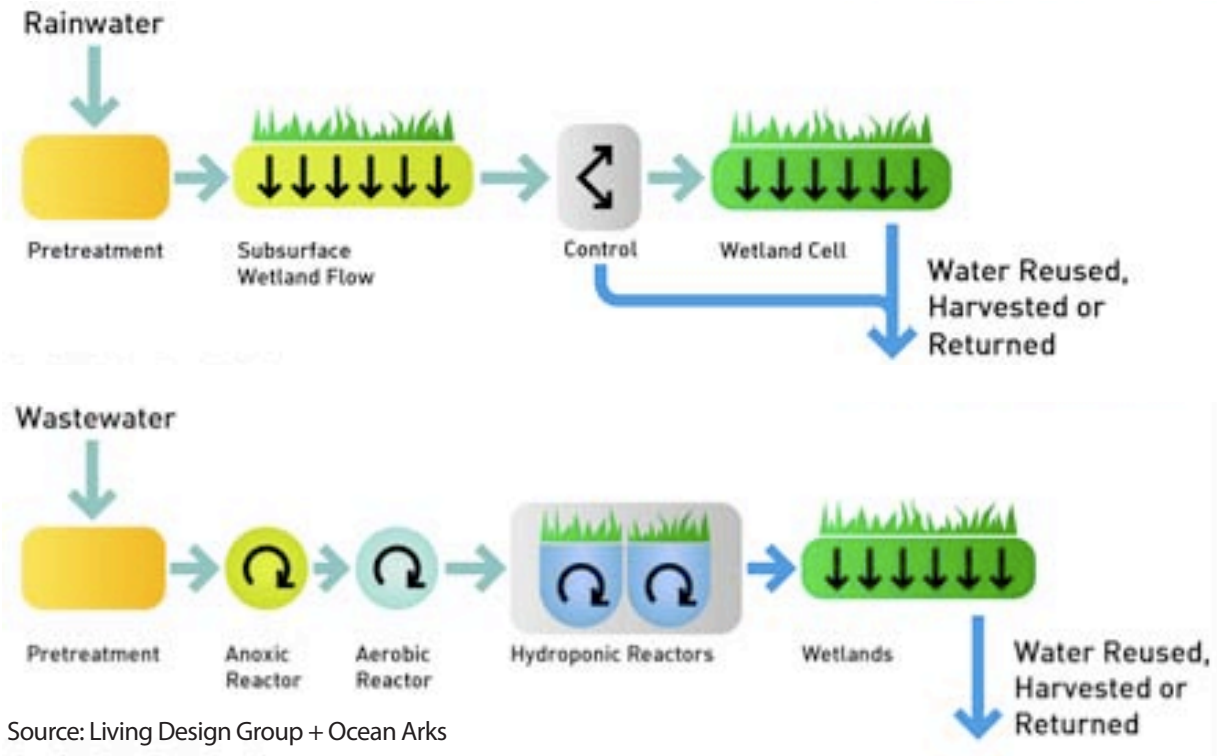
Eco-Boulevard in Urban Village

The Living Machine

The living-machine is a series of above and below ground cleaning processes. Above ground, water will filter through landscapes along the streetscape before going underground into an intense cleansing phase. The high intensity treatment areas will be located to large areas of open space that capture the water and allow it to slowly seep back into the hydrologic network.

Part natural and part man-made, the living machine is a system was designed to percolate wastewater through different ecological systems that process and filter it in different levels of purification. Each ecological system is isolated from the others so that it can treat wastewater based on its own unique biological processes, after which the water flows to the next community. (Inhabitat)

The technology uses "helpful bacteria, fungi, plants, snails, clams and fish that thrive by breaking down and digesting pollutants". Selecting and then cultivating diverse communities is key in order for all pollutants to be treated. (John Todd)



Source: Living Design Group + Ocean Arks

The series of ecosystems work together to break down water contaminants. If linked together to act as a system, this approach offers a natural and environmentally friendly alternative to costly and traditional water treatment infrastructure.

Source: UrbanLab

Wetland Living Systems

Constructed landscapes such as wetlands, prairies and forest that use low energy processes to biologically filter stormwater naturally. (Ocean Arks)

Hydroponic Living Systems

Ecological treatment "machines" that use aquatic and wetland ecological processes to wastewater naturally. (Ocean Arks)

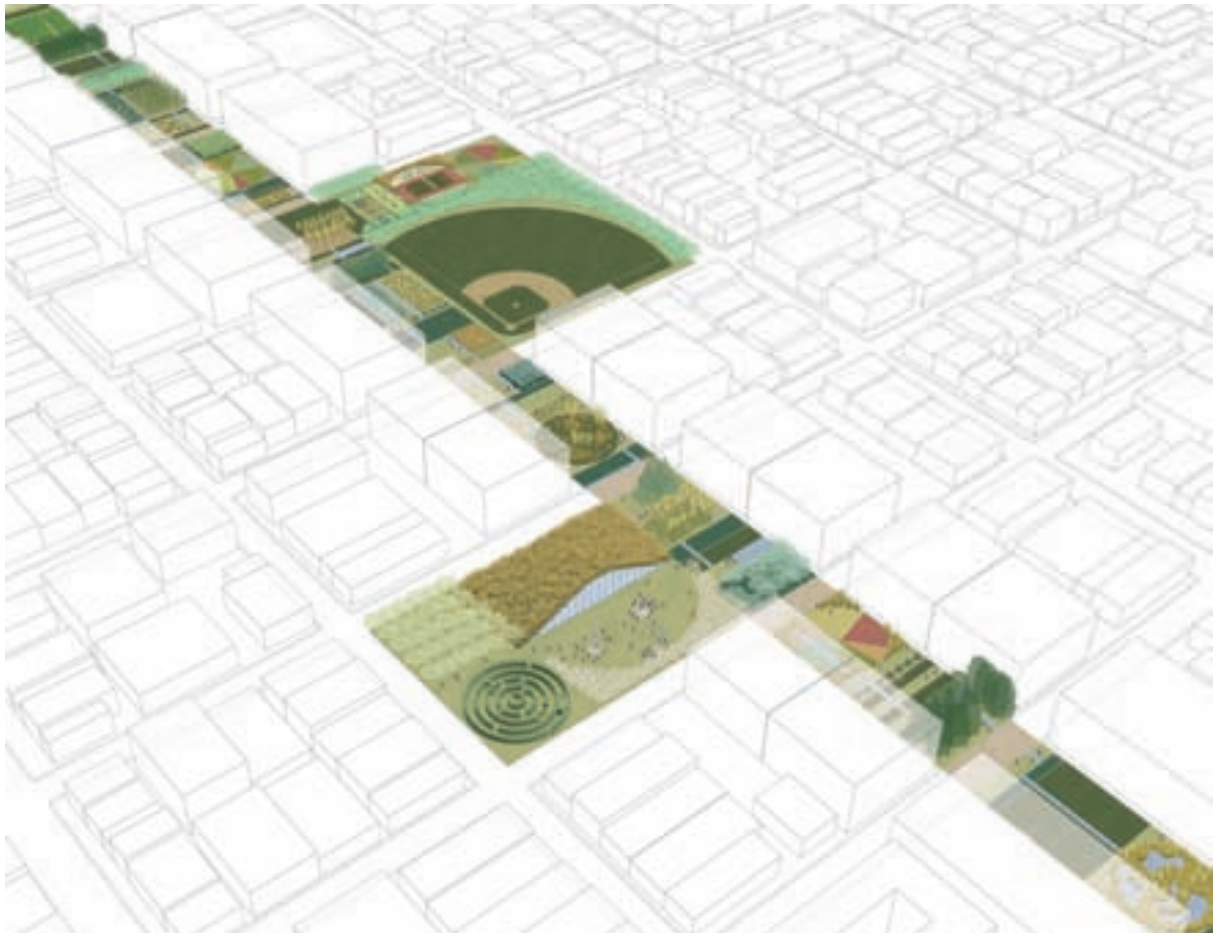
Additional Benefits

Pedagogical: An Eco-Street brings benefits beyond the environmental gains and offers a way of implementing pedagogical design. Redesigning road infrastructure to reintroduce natural systems into the urban fabric educates the city's residents by immersing them in the system. This immersion is an educational tool that allows people to understand local natural systems like hydrology, wildlife habitats and the importance of protecting their natural resources.

Transportation: Creating pleasant environments as a way of connecting destinations throughout the city will promote more environmentally friendly modes of transportation, such as biking and walking. The Eco-Street also becomes a destination in itself.

Community: Locating linear parks along the road network ensures easily accessible open space for everyone. Providing a space for communities to engage activates the street, which makes streets and communities more safe.

Land Values: Sustainable practices have become a way of marketing developments. Attractive open space will increase real estate prices, and benefit the wider community.



Source: UrbanLab

REFERENCES

Inhabitat. < http://www.inhabitat.com/2008/08/06/living-machines-turning-wastewater-clean-with-plants/>

Molle, P., Lienard, A., Boutin, C., Merlin, G., & Iwema, A. (2005). How to treat raw sewage with constructed wetlands: an overview of the French systems. Water, Science, and Technology, 51(9), 11-21.

Ocean Arks International. <http://www.oceanarks.org> (2008)

Social Design Notes<http://www.backspace.com/notes/2003/07/the-living-machine.php>

Todd Ecological. <http://www.toddecological.com/> (2008)

UrbanLab. < http://www.urbanlab.com/h2o/>

MIXED-USE DEVELOPMENT AND DESIGN > Yang LIU

Background

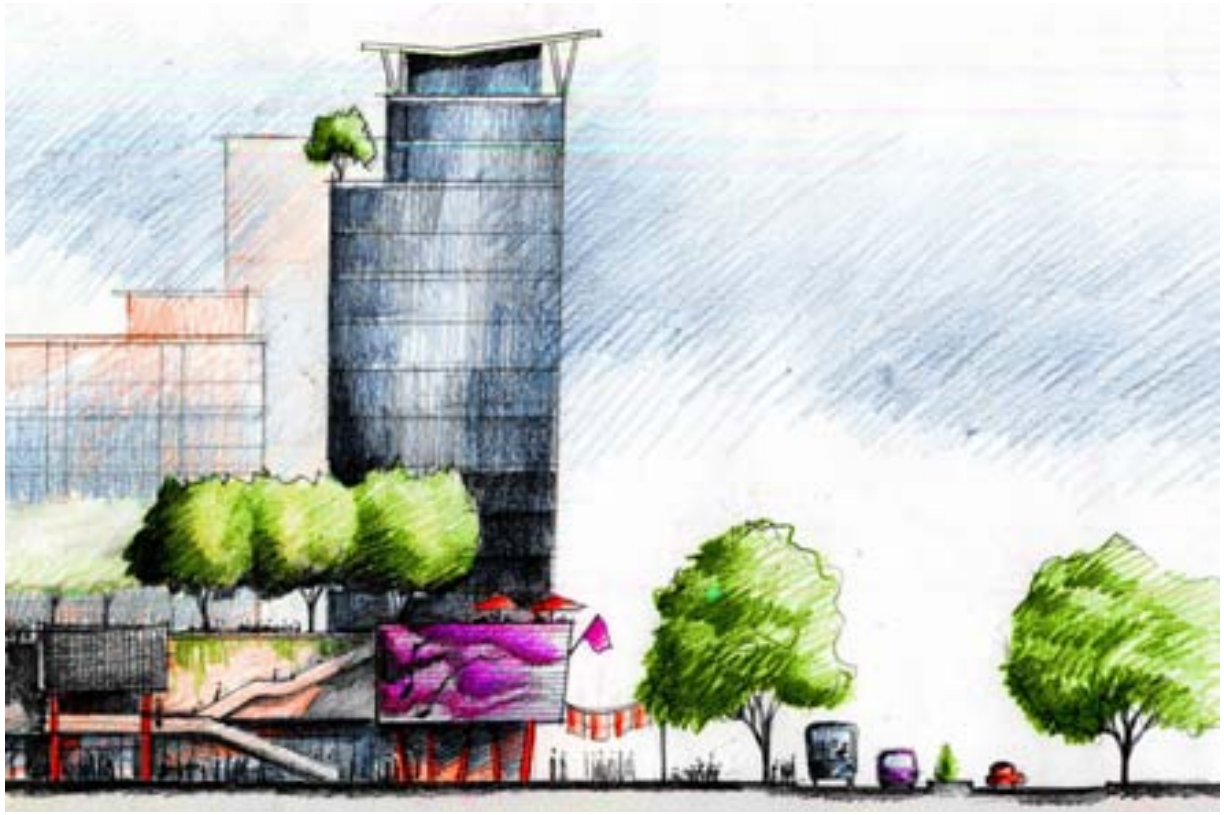
Problem—Current developments in Bantian district are characterized by large-scale projects such as Fifth Garden and Wonderland. One of the problems within large scale project is that it often ends up with large-scale development with single land use. Residents who live within these residential projects are disappointed by the inadequate provision of public services such as retail and healthcare facilities. The problem is exaggerated by the poor public transit system at present.

From a social perspective, the problem also causes social exclusion and segregation. For example, people of different social classes–for example, residents from urban villages and residents from middle class neighborhoods—have unequal access to these public services.

Opportunity—Due to the global financial crisis, the Pearl River Delta economy has shrunk in size because of the decline in export and hence the unemployment rate goes up high. Municipal government of Shenzhen responds to the crisis by increasing government expenditure on infrastructure, healthcare and education. This creates an opportunity to develop or reallocate urban infrastructure and public services in a more efficient and sustainable way. And this also calls for an integration of different land uses into large-scale developments.

What Is This Tool?

Mixed-use developments generally include three or more different land uses. These different land uses are physically and functionally integrated. Design is a key in mixed-use development. Without careful design of pedestrian connections and thus no human activity interactions between different land uses, the idea of "bundling" different land uses become less meaningful.



Proposed Mixed-use development and design in Bantian District, Shenzhen

Mixed-use developments usually occur in urban environment characterized by higher building density and population density.

Why Should This Tool Be Used?

First, mixed-use development can encourage ACCESSIBILITY through physical proximity. Mix-use development brings different urban land uses and functions close to each other and hence reduces the commuting time between these places.

Second, mixed-use development can enhance EFFICIENCY. Mixed use development has the potential to maximize the use of urban resources such as infrastructure, public services, especially when supported by public transit system.

Third, mixed-use development can promote DIVERSITY.

How Has This Tool Been Applied?

Kowloon Station Development, Hong Kong

The site of Kowloon station development is located to the west of Tsim Sha Tsui. It covers 13.54 hectare and enjoys a spectacular view of the Victoria Harbour and Hong Kong Island.

The site is conveniently served by public transit system- Mass Transit Railway. The master plan includes a world class office/hotel tower, open spaces and residential and retail uses.

Out of the seven packages in the development, the first four built are high rise residential. The shopping mall "Elements" opened in 2007. The remaining packages are supposed to be completed by 2010.

Location of Kowloon Station Development, Hong Kong
(Source: Hong Kong MTR website)

Master Plan of Kowloon Station Development, Hong Kong
(Source: Hong Kong MTR website)

Aerial Photograph of Kowloon Station Development, Hong Kong
(Source: GoogleEarth)

The entire development is about 1.09 million square meters, including residential, office, retail and hotel facilities. A Summary of the different uses in Kowloon Station Development is as below.

Development Components	Development Details
16 Residential Towers 2 Mixed-use Towers	5,809 residential units 72,472sq.m.serviced apartments a hotel
118-storey Tower	231,778 sq.m. offices a deluxe hotel an observation deck
A shopping centre	82,750 sq.m.
A kindergarten	1,050 sq.m.
Parking spaces	5,400 car
Transport interchange for public buses, coaches, minibuses, taxis, hotel shuttle and tour buses	

Shopping Mall Elements's supported by MTR, Hong Kong
(Source: www.elementshongkong.com)

Shopping Mall Elements's Floor Plan
(Source: www.elementshongkong.com)

Residential blocks in Kowloon Station Development, HK
(Source: Yang LIU)

Roof plaza in Kowloon Station Development, HK
(Source: wiki website)

Rink in Kowloon Station Development, HK
(Source: wiki website)

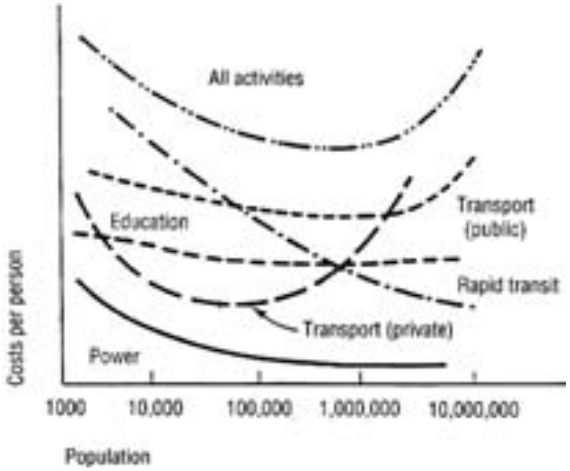
What Is Required To Make This Tool Work?

Transit Oriented Development

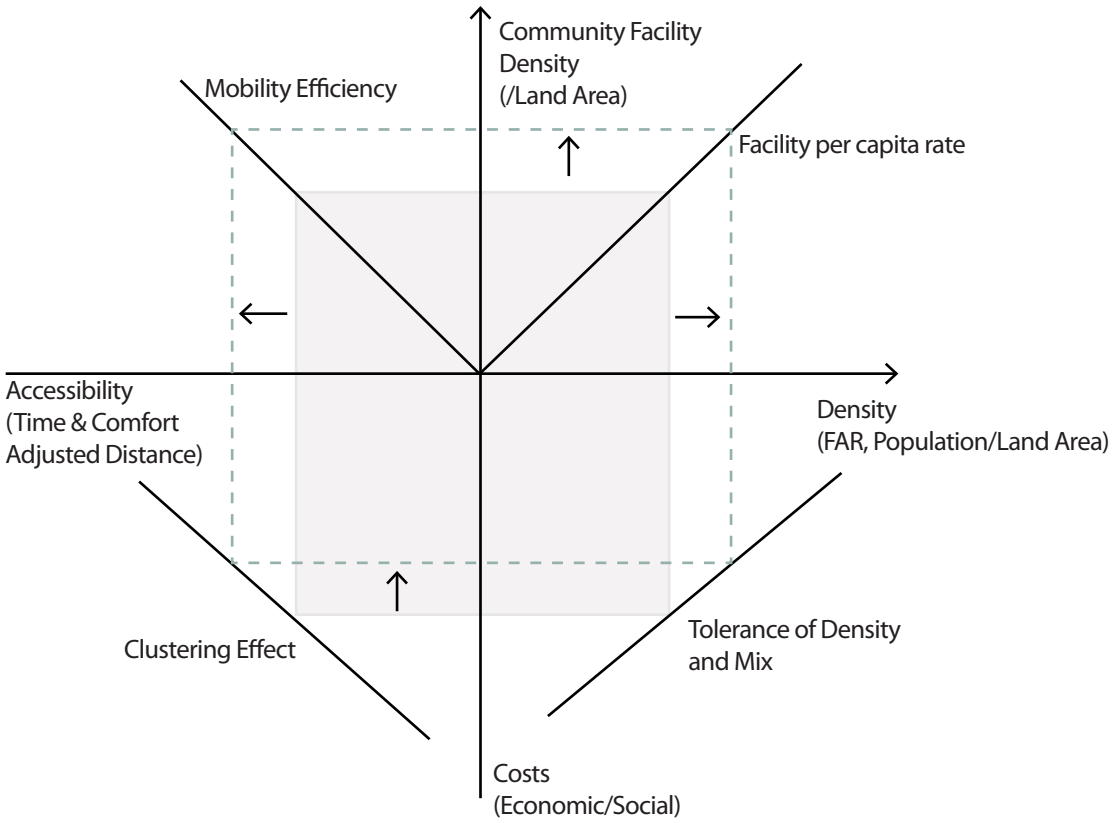
TOD? The provision of public services should be incorporated with and supported by a comprehensive urban infrastructure system, especially the Mass Transit System such as subway. The synergy of MTR and public services helps to increase the accessibility of the public services. Moreover, the easier accessibility also brings about potential profits to various businesses such as cultural, recreational and retail activities.

Density Threshold

Certain density has to be achieved in order to create a critical mass. That population can support the public services so the mix-use development becomes economically viable.



Threshold to urban density: economies and diseconomics of scale in providing services
(Source: Morrill, 1970, in Cadwallader)



Density Effects

In the First quadrant, the higher development density (measured by FAR or Population per hectare) calls for higher demand of community facilities. The facility per capita rate is also set by planning requirements.

In the Second quadrant, the community facilities should be supported by transit system, and the combination of higher mobility efficiency and compact development result in higher accessibility (measured by time and comfort adjusted distance), which is a desired planning goal.

In the Third quadrant, the Clustering effect (economy of scale) brings down the social and economic cost of providing public facilities.

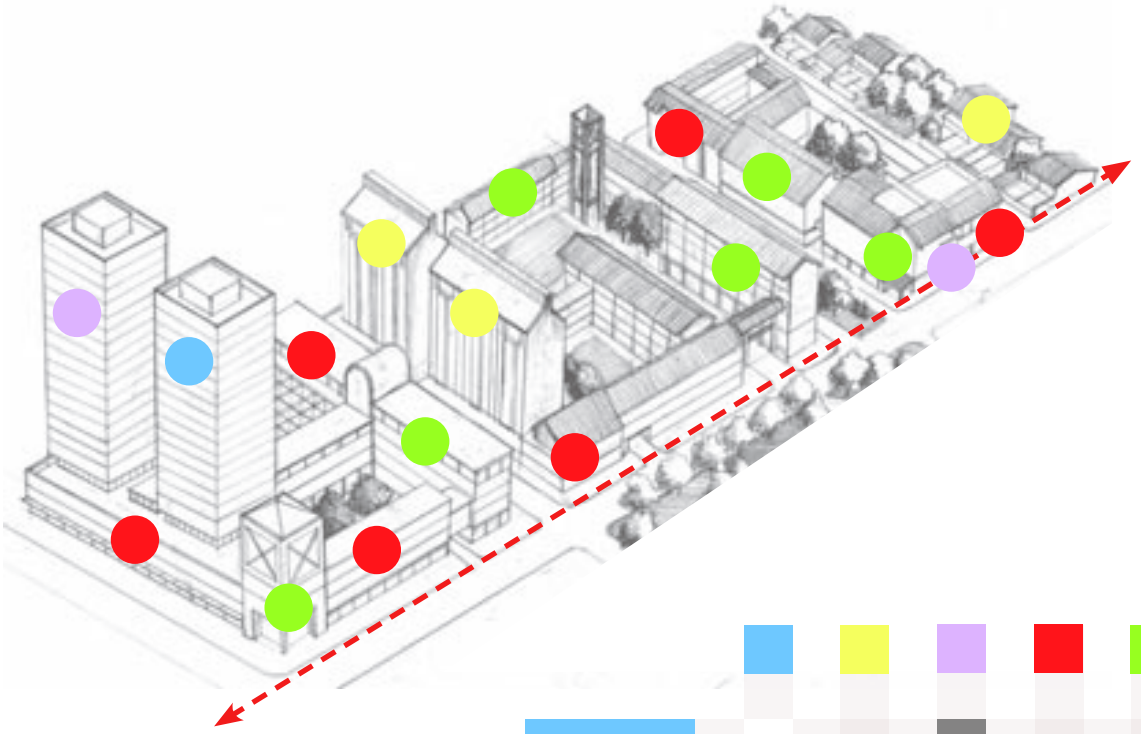
In the Fourth quadrant, the lower cost further encourages higher density and mixed- use development.

Synergy of Mixed-uses

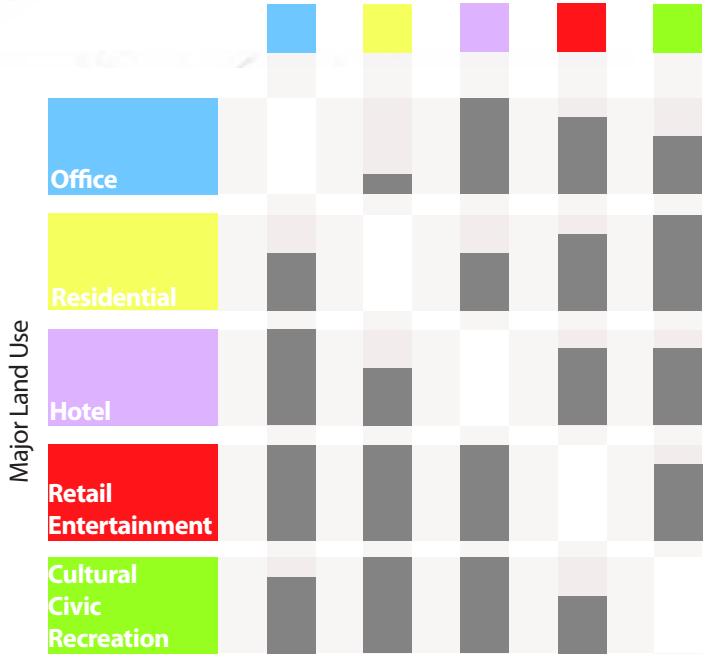
Not all land uses are compatible to each other. Some combinations of uses are more instrumental to interactions than others. Besides the mutual compatibility of different land uses, issues such as needs for privacy, frequency of uses and the hierarchy of facilities within one land use category should be considered. Some land uses are more likely to contribute to a positive urban environment thus should be preferred over others and designed accordingly. For example, Parking should be located below ground or inside urban blocks, thus allowing shops to open on the ground floor directly to the street.

Pedestrian friendly public realm

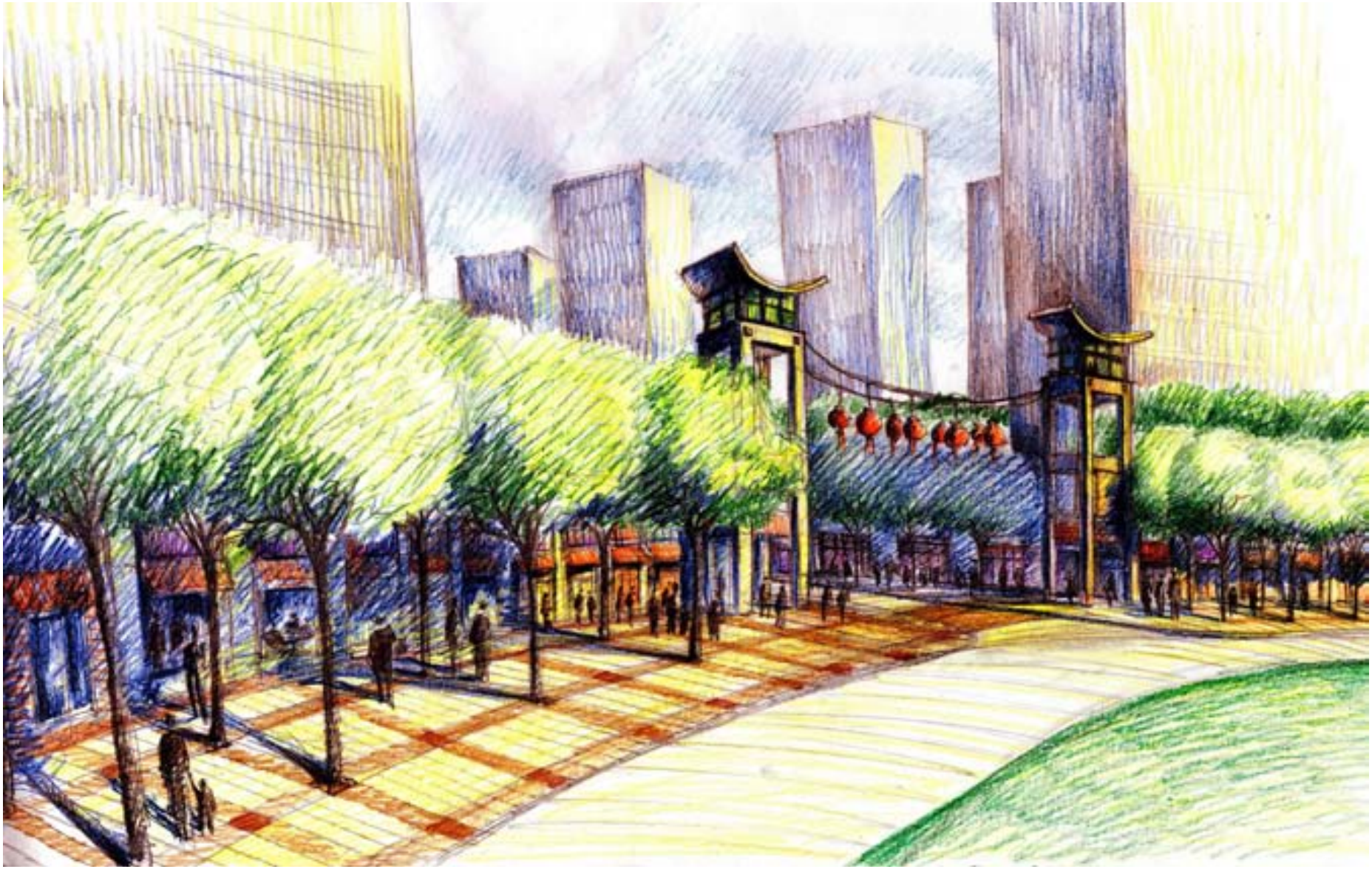
Successful mixed-use developments are characterized by extensive open space, recreational facilities and neighborhood community facilities—both public and private owned, The provision of shared spaces can serve as a platform where people of different social classes can communicate and interact with each other through both active and passive involvements.



Development Density and Mixed-Use Types



Land-use Compatibility Matrix
(higher dark bar indicates higher compatibility)
(Source: Redraw from Mixed-Use Development handbook)



Proposed Entrance of Main Street. High density devleopment around subway station.

Aerial View of Main Street. A green corridor is created running through the Main Street.

Main Street. A green corridor is created running through the Main Street.

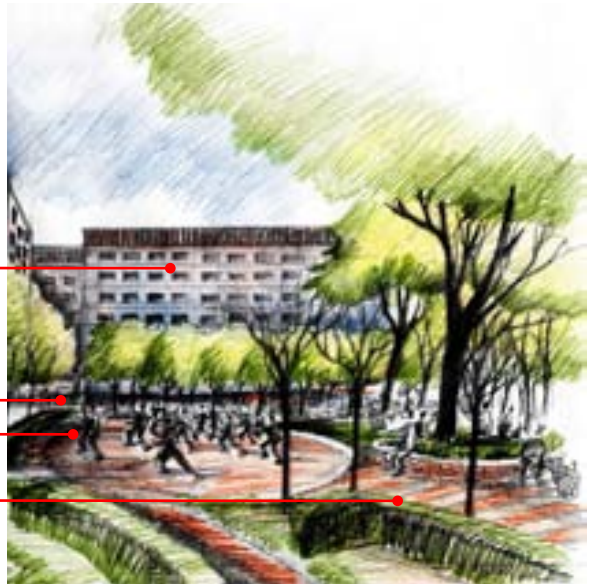
Proposed Neighborhood Park in Urban Villages in Shenzhen.

Proposed Destination Park. Open space is created to accommodate different cultural, recreational and entertaining activities.

Proposed Market Street.

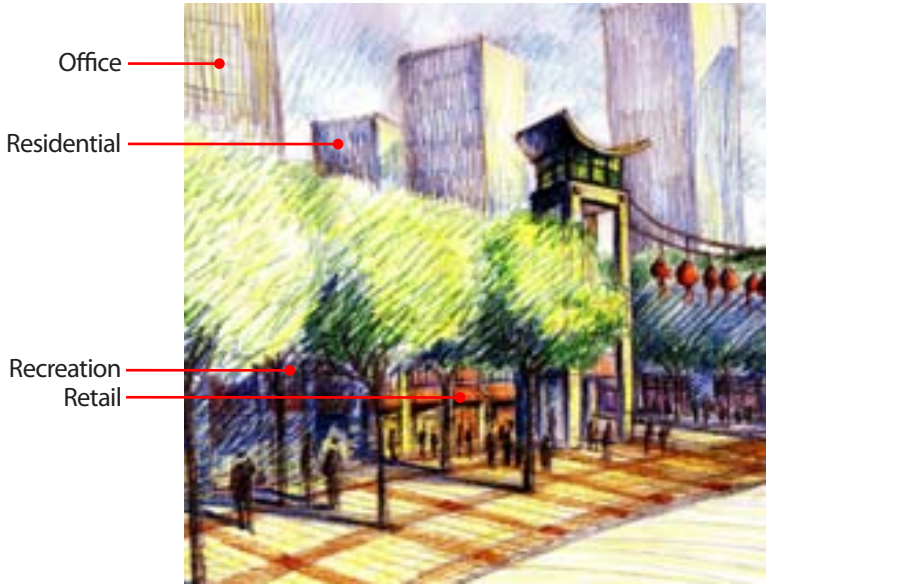
Proposed Community Center with Open Space and Retail Facilities.


Residential
HealthCare
Recreation
Neighborhood Retail


Residential
Neighborhood Retail
Recreation
Neighborhood Park


Recreation
Cultural Activity


Destination Park



REFERENCE

Elements Shopping Mall. <http://www.elementshong-kong.com>

S.S.Y. Lau, R. Giridharan, S.Ganesan. Multiple and intensive land use: case studies in Hong Kong. 2004

Schwanke, Dean. Mixed-use development handbook / sponsored by the Executive Group of the Urban Development/Mixed-Use Council of ULI--the Urban Land Institute. Washington, D.C. : ULI, 1987.

Witherspoon, Robert E. Mixed-use developments :new ways of land use /Robert E. Witherspoon, Jon P. Abbett, and Robert M. Gladstone. Washington : Urban Land Institute, c1976.

Chan, Janelle (Janelle Jie-Ying) Chinese housing mixology :considerations for the successful development of mixed-income housing /by Janelle Chan. c2007.

Lawrence D. Frank and Gary Pivo. Impacts of Mixed Use and Density on Utilization of Three Modes of Travel: Single-Occupant Vehicle, Transit, and Walking. Transportation research record1466

Health Care Delivery

Access to affordable and well-coordinated healthcare is an integral piece of a stable and sustainable community. This kind of health care system would include resources at every level from activities to protect and promote health to self-administered care to primary care to specialized clinics to community and tertiary hospitals. Every level would be safe and high quality. Each would be accessible both spatially and financially. This requires that sufficient facilities exist within a community and that those facilities are open to all by being safe and attractive places for care that is made affordable to all. China is finding that as it develops, its rules, regulations, and standards are becoming more stringent. This results in housing development costs that increase faster than incomes. The affordable housing shortage occurs when a family's income is not sufficient to pay rents that meet or exceed these rising development costs.

Health Care in China

Currently, the healthcare delivery system in Shenzhen – and the rest of China – is heavily fragmented and often inaccessible. People are served by a mix of individual clinics, community health centers, and hospitals. Even when facilities are available in one's neighborhood, the facilities may not be accessible either because they are too expensive or perceived as too low quality or dangerous.

To combat this problem, the Chinese government dedicated 850 billion RMB ($124 billion USD) between 2009 and 2011 to reform the health care system. The goal of the reform is to achieve universal and equal access to health care and public services. In regards to health care delivery in urban areas, the reform will establish a network of community health centers. The community health centers will relieve pressure on hospitals and establish a strong primary care system.

Based upon the existing system, the reform plans, and projected population trends, health care in Shenzhen in 2030 can be assumed to have the following characteristics:

- Universal access to care
- Medical clinic in every village and neighborhood
- Rational payment system
- Aged population
- Chronic disease as the major health issue
- Reliance on pharmaceuticals and medical devices

With these assumptions in mind, the following is a blueprint for a cutting-edge, coordinated health care delivery system for the Bantian district.

Source: www.hzhhyy.com

Photos Source: Madden

An Integrated Care Network

For the purpose of planning a health care system, health care can be typified into several different levels of care. These range from the individual's self -treatment to basic primary care to specialized care and complex care for trauma or life-threatening illness. With well-defined and clear access to the right care at the right time, a community can achieve a high degree of health.

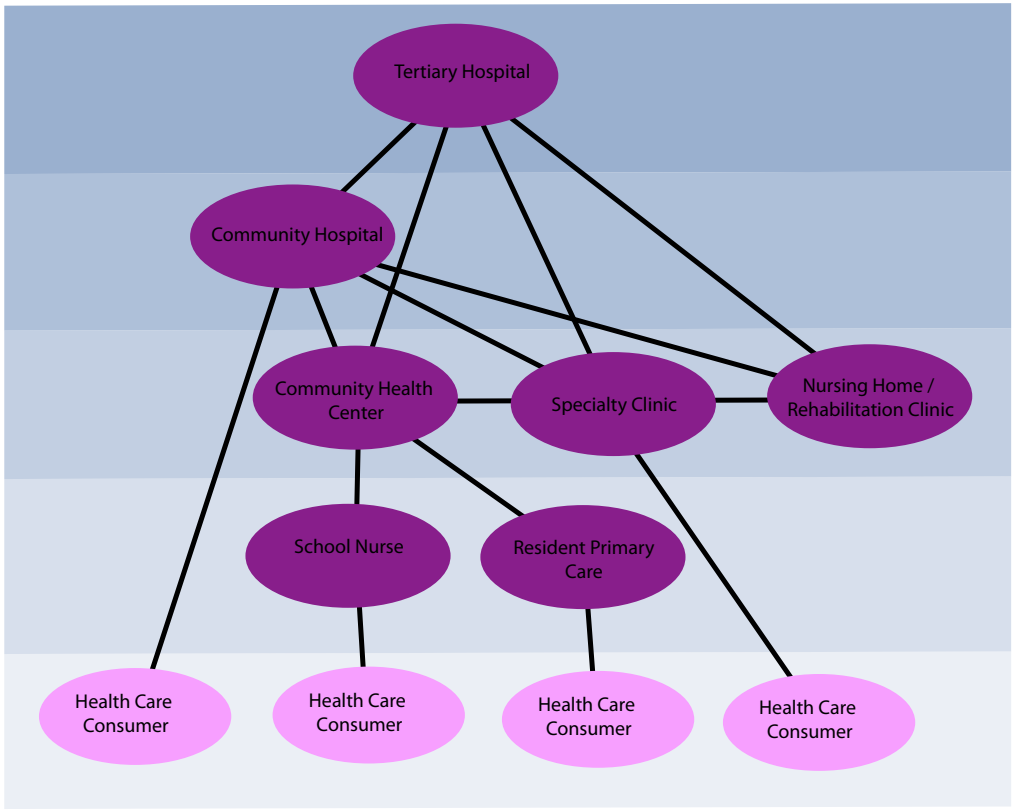
1) The Health Care Consumer
Most health care happens at home. Families care for each other. Individuals treat themselves. This is an approriate level of care for maintaining heatlh, managing chronic disease, and treating very minor illnesses and injuries. Health care consumers are most effective when guided by a primary care person and/or community halth worker.

2) Community Health Workers
Because most health care happens outside of a health care facility and because many individuals need extra help taking care of themselves, community health workers are an integral part of the health care delivery system. Community health workers come in different forms, but they all assist in care - either directly or by helping individuals care for themselves - in a community setting. School nurses are one example. Health care personnel embedded in workplaces or residential developments are another. Outreach workers and health educators can access hard to reach populations where they live or work. In addition, community health workers can act as a link between individuals and health care facilities such as clinics and hospitals, guiding patients to the appropriate care setting.

Chronic disease self management (CDSM) will become more important in China as the population ages, life expectancy increases, and chronic disease becomes the most prevalent health issue. Community health workers train individuals in CDSM. Subjects covered include:

1) Techniques to deal with problems such as frustration, pain, and isolation
2) Appropriate exercise for maintaining and improving strength, flexibility, and endurance
3) Appropriate use of medications
4) Communicating effectively with family, friends, and health professionals
5) Nutrition
6) Making informed treatment decisions.

Integrated Health Care Delivery System



Health Care Delivery System > A well coordinated system provide people appropriate care at all levels from the individual, to routine primary care, to more specialized care, and to the hospital level for more serious issues.

The Stanford model of CDSM has been shown to be highly effective in pilot programs in the US. A Chinese version adapting the Stanford model to China showed positive results through a pilot program in Shanghai.

3) Health Centers and Clinics
Primary care and specialized clinics are the appropriate setting for most routine health care. A community health center is a primary care facility focused on providing ongoing care to a particular neighborhood or community. Specialty clinics provide specialized care, for example radiology or dermatology, outside of a hospital setting. Nursing homes and rehabilitation centers provide care for those who need assistance with daily functions, either for a period or permanently. These clinics may handle referrals from other health care facilities, and they may need to refer their patients to others.

4) Community Hospitals
Community hospitals provide a full range of care, including emergency services, specialist treatments, obstetrics, ambulatory and inpatient care. Community hospitals should receive patients from other health care facilities or directly in the cae of an emergency. The community hospital is the top tier of care for most cases.

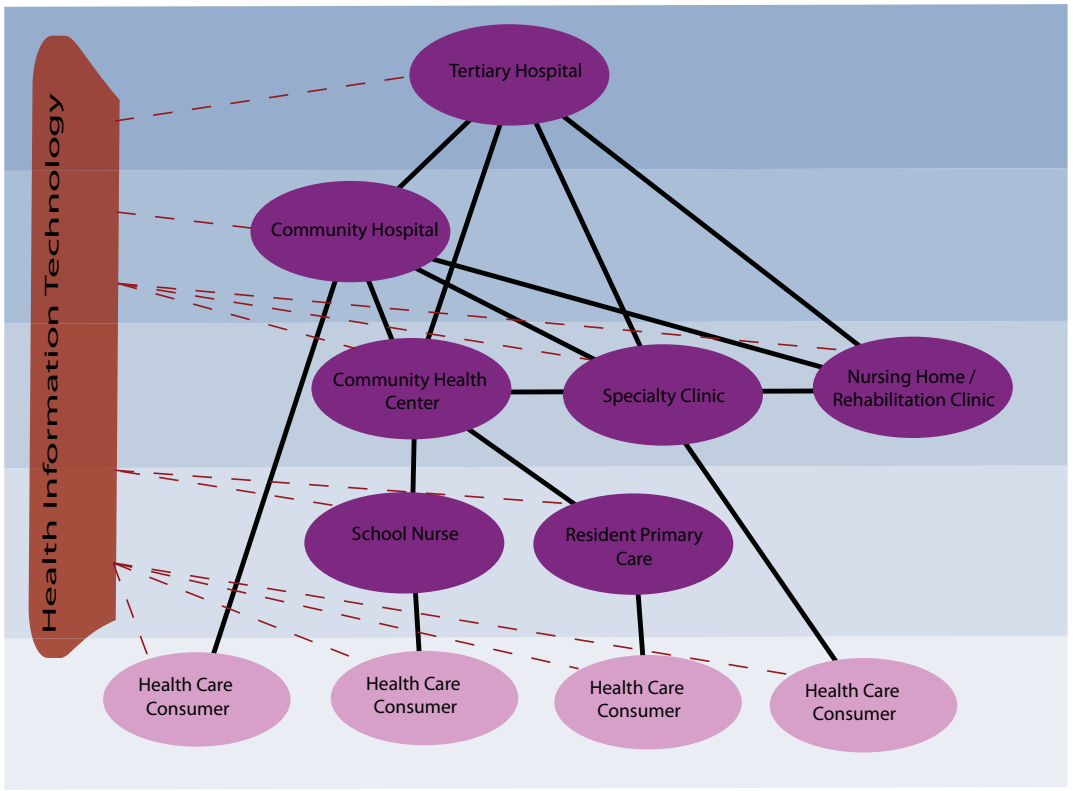
5) Tertiary Hospital
Tertiary hospitals are the highest level of care. They include all of the services of a community hospital, and they may act as the community hospital for the areas in which they are located. Additionally, they provide tertiary health care. Tertiary health care is specialized consultative care, such as cancer care and complicated surgery. Tertiary hospitals are often academic medical centers, affiliated with a school of medicine and engaged in research activities.

E-Health: Connecting the System

The complex health care delivery system should be connected through the deployment of an interconnected health information technology system. This system would combine medical records from all different care settings in a single interface. Health care consumers would be able to access it through personal electronics to manage their own care.

Interconnected electronic medical records systems are the cutting edge of health technology currently. They are difficult to implement in well-established health care systems because of the difficulty of computerizing paper records and the balkanization of computer systems across different health care settings. Much of the health care system in Shenzhen, however, has yet to be built. It can be built with creating this sort of system as a goal. Additionally, a potential future system

Integrated Health Care Delivery System



E-Health Connectivity > Interconnected E-Health system allows an easy connection among all pieces of the health care delivery system.

could put individual consumers in the driver's seat of their personal health care. The E-Health system could give them access not only to their personal records but enable communications with their health care providers, help monitor health and manage chronic disease.

Shenzhen is well-poised to create a futuristic E-Health system as it builds and expands its health care delivery system. Health care planners can partner with the growing electronics industry in Shenzhen to create the system. The development of this system would create a healthier community, a world-class health care system, and stimulate the local economy.

REFERENCES

Eggleston, K. et al. (2008). Health Service Delivery in China: A Literature Review. *Health Econ. 17*: 149–165

Forbes.com. (29 Apr 2009). China Tackles Massive Health Care Overhaul. Retrieved 11 May 2009. http://www.forbes.com/2009/04/28/china-health-care-insurance.

Fu Dongbo et al. (2003). Implementation and quantitative evaluation of chronic disease self-management programme in Shanghai, China: randomized controlled trial. *Bulletin of the World Health Organization 2003; 81:*174-182.

Knowledge@Wharton. (15 Apr 2009). China's Health Care Reform: The Focus Shifts to Basic Health Care Service. Retrieved 16 Apr 2009. http://www.knowledgeatwharton.com.cn/index.cfm?fa=viewArticle&articleID=2021.

Master R, Feltin M, Jainchill J, et al. (1980). A Continuum of Care for the Inner City; Assessment of its Benefits for Elderly and High-Risk Populations of Boston. *New England Journal of Medicine 302 June 26 (1980)*:1434-1440.

Master, R., Simon, L., and Goldfield, N. (2003). Commonwealth Care Alliance: A new approach to coordinated care for the chronically ill and frail elderly that organizationally integrates consumer involvement. *The Journal of Ambulatory Care Management 26.4 Oct-Dec. (2003*): 355-361.

Medical News Today. (10 Jan 2008). China Puts Healthcare at the Top of the Agenda. Accessed 12 Mar 2009. http://www.medicalnewstoday.com/printerfriendlynews.php.

Affordable Housing in Cities

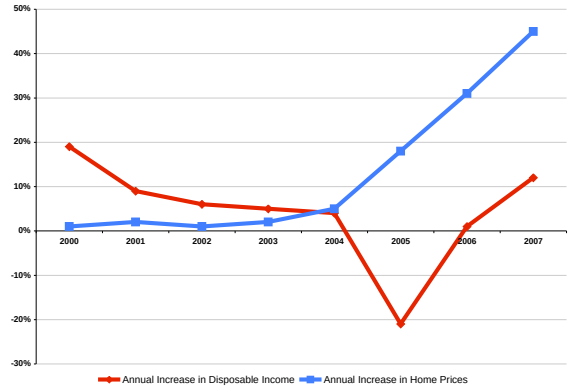
Cities function and grow because of their diverse labor pool. All individuals, from low-level factory workers to executives, contribute to the vitality of a city and, therefore, cities must be able to properly house and serve them. However, as economies grow and cities become more desirable the price of housing increases at a much faster rate than incomes. This is certainly the case in Shenzhen (see graph) where a combination of rural to urban migration, increased demand for housing, land scarcity, increasing unit sizes and other factors are driving the market out of research for many of its residents.

Under these conditions, the market will not create housing for low-income residents, except in the form of older and more dilapidated housing (such as what one sees in the Urban Villages), and residents are forced to move further away from their workplaces to find decent afforable housing. This process fuels economic segregation, creates social inequity and leads to a generally unsustainable environment in cities.

Recognizing the importance of affordable housing the Chinese government devoted a significant share of its RMB 4 trillion Stimulus Package to developing housing for low-income families. More specifically, the Chinese

Tulou Affordable Housing in China> Source: Arch Daily

Growth in Income vs. Home Prices > Scarcity of land, migration, and economic growth have put significant upware pressure on the Shenzhen housing market. While income has also increased it is increasing at a slower rate than housing.



Premier Wen Jiabao recently stated, "We will provide housing to 7.5 million low-income Chinese in three years, and provide better shelter for 2.4 million Chinese who still live in shacks." (Chinese Government Website). The recent commitment to build affordable housing has raised concerns from private developers, including Vanke Corporation, and likely community residents about the impact of these developments on property values and community life.

Tools

This tool reviews the relevant research on the impact of affordable housing on property values in the United States and outlines best practices for creating well-integrated affordable housing through predevelopment planning. The key components of the pre-development process, which I adapted from various guides created by the Urban Land Institute, include:

> Establishing Partnerships

> Conducting a Needs Assessment

> Design Proposals

> Implementation and Management

Through effective planning the government and developers can insure that new developments have a positive and lasting impact on their communities.

Affordable Housing & Property Value

Historically, the development of affordable housing has been a controversial matter. Communities have resisted affordable housing development due to quality and design, concern with its impact on the character of the neighborhood, possible strain on local resources and infrastructure, and, perhaps of biggest concern, fear that it would lower property values. To better address this last issue, numerous researchers have tried to determine the impact affordable housing on property values through methods such as comparing values in similar neighborhoods overtime and hedonic price modeling, which breaks down housing price into various components (e.g. location, size, neighborhood, etc).

To date, studies have been inconclusive about the impact of affordable housing on surrounding properties. While the majority of studies showed there is no or a positive impact, some did suggest that under certain conditions proximity to affordable housing could decrease property values (Nguyen, 2005).

Case Study: Yonkers, New York, USA

Yonkers, New York is a suburban town located north of New York City with a population of about 200,000 in 1990. As a result of a lawsuit that claimed all public housing had been unfairly concentrated in a small

corner (southwest) of the city, in 1985, a federal district court order the City and the U.S. Department of Housing and Urban Development to develop 200 units of public housing scattered around the city (see picture for location of the old and new housing developments).

The decision was controversial and the City Council, along with many residents, spent years fighting the developments. Those most concerned were white homeowners who were worried that public housing and the low-income tenants, who were all Hispanic and African-American, would decrease property values, increase crime and destablize the community. Despite the opposition the public housing developments were constructed in the early 1990s.

In their study of the impact of the public housing developments on property values and community well-being in Yonkers, Briggs, Darden and Aidala (1999) found:

> no change in property values

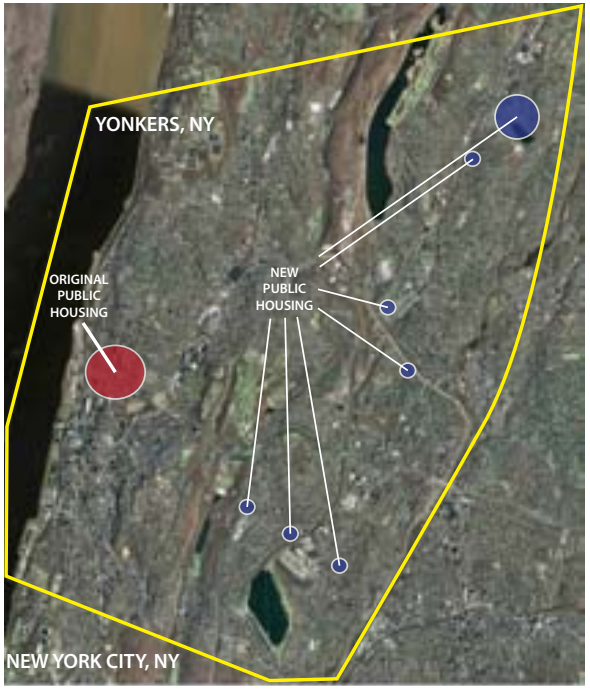
> no change in the social quality of the communities

> very few "panic" housing sales directly related to the public housing development

These findings are particularly interesting given the intense political and community opposition and racial/ethnic mixing. One would expect that under conditions of extreme opposition and animosity the affordable housing would have a more negative effect; however, the research found no effect.

This is one example of the successful mixing of affordable and market rate housing. As previously mentioned, without the appropriate planning the developments can have a negative effect on the community. The next section outlines best practices in pre-development and planning for affordable housing.

Affordable Housing in Yonkers, NY > Despite being forced to build public housing across the city (blue circles) there was no change in housing prices and only a few "panic sales" in the very short term.



Pre-Development Planning

Establish Partnerships

The public and private sectors, developers and community should all be involved in the planning process (i.e. on the Development Team). Each stakeholder brings a specific asset ranging from policy incentives (public sector) to construction and implementation expertise (developer) to financing (private and public). Community involvement, through open and clear communication, is particularly important in order to build trust and support. Residents in market rate units, who will be living near the affordable housing developments, will feel more comfortable about their properties if they are aware of the project and have a voice in the process.

Conduct a Needs Assessment

The purpose of a needs assessment is to understand the current housing conditions in a study area (e.g. prices, vacancy, etc) and determine the depth and quantity of affordability that is needed. Additionally, the development team should understand the workforce needs of the area and economic growth patterns. The components of a successful needs assessment include:

> Determining affordable housing needs (i.e. demand and supply)

> Understanding existing conditions of housing and the site itself (access, topography, etc)

> Identifying and describing the key market area

> Determining the income groups the development will target

Design Proposal

Design is arguably one of the most important components of the development process because it has the most visible impact on the community. Quality and appropriateness of the design must be considered so the development does not become a visual burden and stand out. In the U.S., although not poorly designed, per se, the large imposing structures of early

public housing came to be stigmatized overtime and symbols of decay, crime and poverty. To avoid the pitfalls of bad design developers must:

> ***Meet user's needs*** - are the structures servings families, single workers, elderly clients, young professionals, or individuals with disabilities?

> ***Respond to the Context*** - observe surrounding homes and structures and incorporate their design characteristics (e.g. colors, style, shape, etc) into the affordable housing development. The development should blend into the community so that visitors and residents do not perceive it as an abnormal presence.

> ***Enhance the Neighborhood*** - although it is "affordable housing" the development has the responsibility of enhancing the neighborhood socially, economically and physically.

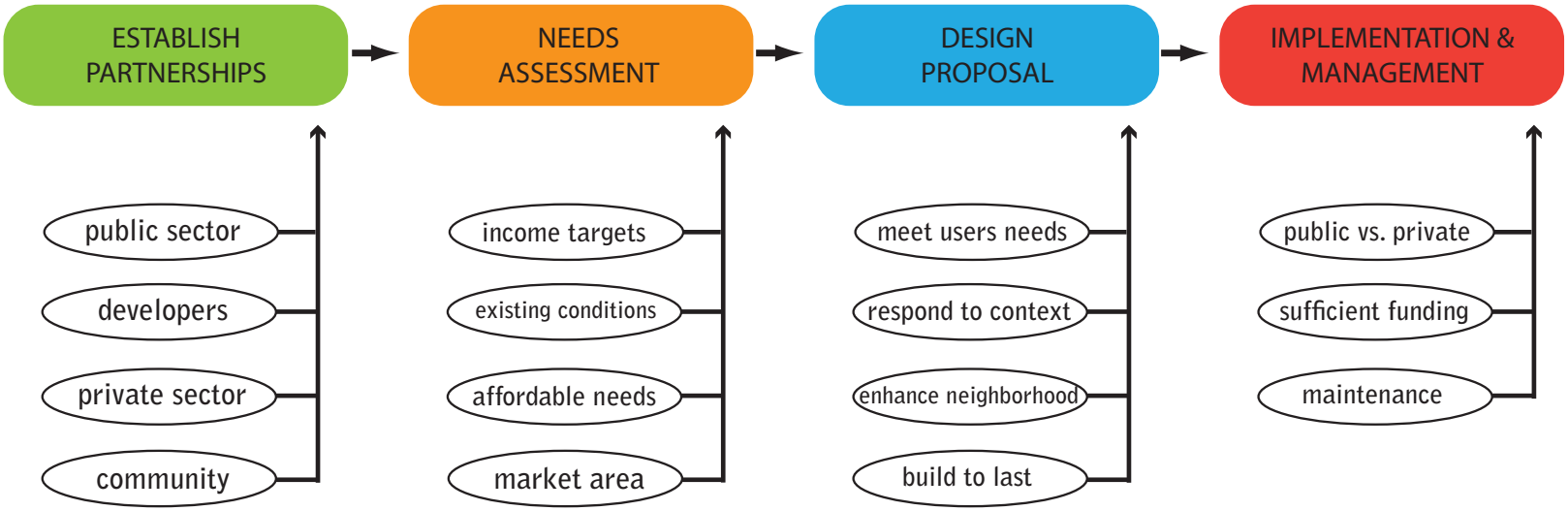
Traditional U.S. Public Housing > The Cabrini Green development in Chicago is an example of early public housing design that was out of place and too imposing on the neighborhood. (Source: Seth Anderson)

> ***Build the Development to Last*** - one challenging element of affordable housing is keeping costs down and obtaining subsidies to make it affordable. This leaves the tempation to use lower quality (i.e. cheaper) building materials. However, using high quality materials contributes to the longevity of the buildings and allows the development to appreciate in value rather than depreciate as it falls into disrepair.

Implementation + Management

Another fatal flaw of early U.S. public housing was poor property management and insufficient funding for property maintenance.

Research has found that private sector property managers (non-profit or for-profit) are more effective at maintaining the integrity of the property over the long term because of knowledge, experience and performance incentives.



Pre-Development Process > This diagramm outlines the order and main components of each component of the pre-development process. An effective and inclusive planning process is critical to insure that the affordable housing developments positively contribute to the vitalitiy of the community.

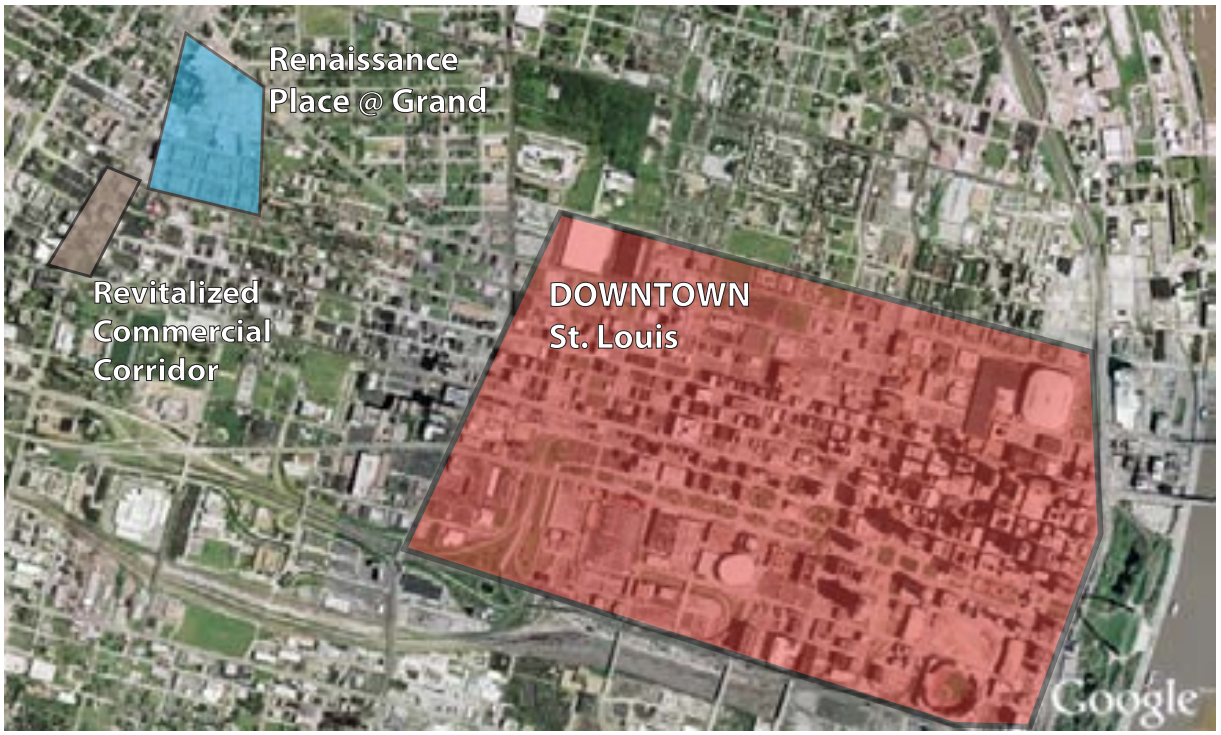
Additionally, the deal needs to be structured so that the public sector provides sufficient financial assistance (in the form of lump sum grants or rental subsidies for the affordable units) to allow proper physical maintenance. The market-rate rents will provide enough revenue to support the maintenance of those units but the affordable units will require a subsidy.

The development should also have an annual "replacement reserve" (or fund) to pay for major capital improvements.

Case Study: Renaissane Place at Grand (Saint Louis, Missouri, USA)

The Renaissane Place at Grand mixed-income development was the outcome of a revitalization effort initiatied by the St. Louis Housing Authority in 2001. The Blumeyer Public Housing Development had become a burden on the community, was a haven for crime and had physically deterioriated. Meanwhile, Downtown St. Louis was experiencing a housing and commercial boom and economic revitalization. The redevelopment of "Blumeyer" was to contribute to that process.

The Housing Authority selected McCormack Baron Salazar, Inc (MBS), an experienced private developer, to lead the planning, design and development process for the redevelopment. Using their many years of experience, MBS quickly established a partnerships driven pre-development process that included the key stakeholders (the City, federal government, housing authority, community and private sector) to develop a site that would be supported by the community and contribute to the general revitalization of the city.



Site Area> Aerial view of Downtown St. Louis and the redevelopment site (Renissance Place). Also visible is the commercial corridor that was revitalized during the proces (Source: Google Earth Pro)

The end result was a 542 unit mixed-income development that cost $82,000,000 to development. The development has also spurred the revitalization of an adjacent commercial corridor as an arts and entertainment district.

MBS selected McCormack Baron Ragan Management Services (MBRMS), the develoer's property management division, to be responsible for the future management of the property. As an experienced mixed-income property manager MBRMS understands how to maintain physical quality, manage resident interaction, maintain high property value and keep the property full occupied.

MBS also secured Urban Strategies Inc, a community services agency, to work with residents to meet their service needs and support their efforts toward economic growth (e.g. education, job training, etc).

The next page outlines MBS's pre-development process and shows the outcome of the process.

Pre-development Process for Renaissance Place at Grand (Case Study)> The diagram below shows how McCormack Baron Salazar (developer) used an effective planning process to create a valuable mixed-income housing develpoment that triggered economic development and raised property values.

The Development Partnership

Developer:
McCormack Baron Salazar, Inc

Public Sector:
St. Louis Housing Authority
U.S. Department of Housing and Urban Development
City of St. Louis

Private Sector:
US Bank

Community:
Blumeyer Village Tenant Association
Elderly Tenant Advisory Board

→

Needs Assessment

Existing Conditions: High density public housing serving only the neediest residents. High crime, vacancies and below standard physical conditions

Needs: Retain affordable housing but create a mixing of incomes to contribute to the ongoing revitalization of the downtown area.

Income Targets: Market rate housing, workforce housing (up to 60% area median income), and public housing (below 30% area median income)

→

Design Proposal

Meet User Needs: Held multiple design charettes with community members to get input on needs and design proposal.

Respond to Context: Used historic St. Louis homes as design inspiration.

Enhance Neighborhood: New development was a catalyst for economic development along nearby corridor.

Build to Last: Used high quality materials and energy efficiency techniques.

→

Implementation + Management

Private Sector Property Manager:
McCormack Baron Ragan Management Services

Commnity Services:
Urban Strategies, Inc

Original Blumeyer Public Housing Complex> Photograph of the old public housing development that would be replaced by Renaissane Place at Grand (Source: Urbanreviewstl.com)

Community Needs & Context> A typical McCormack Baron Salazar community design charette (top). The surrounding traditional St. Louis homes (bottom) served as inspiration for the design of the housing development. (Source: Prettywar-Stl, Highlandpark.wordpress.com)

Renaissane Place at Grand> The new Renaissance Place mixed income housing development. Management Offices (Top left), general occupancy townhomes (top right) and elderly housing (bottom). (Source: UrbanReviewStl.com, McCormack Baron Salazar)

REFERENCES

Affordable Housing Design Advisor. < http://www.designadvisor.org/>

Briggs, Xavier de, Joe T. Darden, and Angela Aidala. (1999). In the wake of desegregation: Early impacts of scattered-site public housing on neighborhoods in Yonkers, New York. *Journal of the American Planning Association,* 65(1), 27-49.

Chinese Government's Official Web Portal. *Premier: Investment plans in China's stimulus package fully debated*. (2009). Retrieved May 3, 2009. <http://english.gov.cn/2009-03/13/content_1258764.htm>

Haughey, Richard et al. (2005). *Best Practices in the Production of Affordable Housing*. Urban Land Institute. Washington, DC.

Jackson, Kenneth. (1987). *Crabgrass Fronter: the Suburbanization of the United States*. Oxford, UK: Oxford nivertiy Press.

McCormack Baron Salazar Inc website. (2009). Retrieved May 12, 2009. <www.mccormackbaron.com>

Myerson, Deborah. (2003). Mixed Income Housing: Myth and Fact. Urban Land Institute. Washington, DC.

Nguyen, Mai T. (2005). Does Affordable Housing Detrimentally Effect Property Values: A Review of the Literature. *Journal of Planning Literature*, 20(1), 15-26.

Haughey, Richard et al. (2007). *Ten Principles for Developing Affordable Housing.* Urban Land Institute. Washington, DC.

Vale, Lawrence J. (2002). *Reclaiming Public Housing: A Half Century of Struggle in Three Neighborhoods*. Cambridge, MA: Harvard University Press.

COMMUNITY SCHOOLS > ADITI MEHTA

Introduction

Physical and community development are inseparable when building sustainable places. How can real estate developers such as Vanke help strengthen community networks and provide access to needed opportunities linked to education, healthcare, and / or recreation? New housing projects should aim to fuse real estate and community development through programming such as workforce training, community playground builds, the construction and management of daycare, recreation, or education centers to improve neighborhoods beyond just the built environment. Such projects can be designed, financed, and managed through innovative partnerships among various stakeholders.

For example, the concept of a Community School refers to a place where programs and services for students, parents, and others are offered at all times of the day. Community Schools are a strategy, not a program. According to the Coalition of Community Schools, "Using public schools as a hub, community schools bring together many partners to offer a range of supports and opportunities to children, youth, families and communities - before, during, and after school, seven days a week." In this way, the physical environment becomes a gathering place for residents of all ages, strengthening social ties.

Current Situation

Since the 1980's, China has been experiencing the world's largest internal rural-urban migration. Many migrate as teenagers, often with friends or neighbors, leaving behind their family in the countryside. In general, migrant workers tend to have no more than a junior high school diploma. Wages vary by city and company, but migrant workers in Shenzhen factories earn approximately 1,000 RMB a month. The current financial crisis is leaving many of these workers jobless because export factories in the area are downsizing due to the loss of business. These workers do not possess the skills needed to find new employment in the changing economy. The recent China Stimulus Plan has invested 4% in social services, which includes education and workforce development, with the greatest amount of money being invested into construction and infrastructure. While the investment in construction and infrastructure may increase employment rates by providing new jobs to migrant workers, there are still few opportunities for this population to enhance their skills, incomes, and quality of life. Without a strong education system, the country is not investing in its future workforce or giving citizens the opportunity to move upward economically.

The Community School model can help migrant workers and their children gain new skills and knowledge through language courses or computer training, among other programming. Also, because the institution would serve as a multi-faceted destination for users of different ages and socioeconomic statuses, community schools allow neighborhoods to build social capital.

Goals of the Tool

- Build social capital in communities by creating information and resource centers
- Maximize public benefit for all stakeholders including residents, the developer, and the municipaliy
- Create better learning environments for students
- Provide a wider array of services within a specific site and support efficient land-use

Building Social Capital

In Community Schools, the partners who share their assets and expertise within the institution are important sources of social capital. For example, financial capital enables people to purchase goods and services, and social capital connects people to one another, as well as to crucial information that can help them solve problems and foster learning.

For young people, especially those who are from lower-income communities or migrant worker families, social capital, similar to financial capital is not readily available. A Community School would be able to change this. These institutions build social capital by facilitating mentoring relationships with adults through the various partnerships and activities present at the school. School-to-work learning experiences would significantly increase young people's knowledge or career choices and help them develop the skills needed to pursue them.

Likewise, adult family members and other neighborhood residents can also increase their access to social capital through community schools.

Typical middle school scene in China
Source: James Madden

History of the Community School Movement in the United States
(Source: Making the Difference: Research and Practice in Community Schools)

In the late 19th century, Jane Addams' settlement house movement brought recreational, health, and educational services to working-class, largely immigrant neighborhoods in Chicago and similar urban-industrial centers. By the early 1900s, John Dewey's concept of the "school as a social center" encouraged advocates to bring these opportunities into public schools. Fostered by the Charles Steward Mott Foundation and its work in Flint, Michigan, a formal movement to promote community education gained national visibility in the 1930s. Its goal was to make schools the social, educational, and recreational anchors of their communities and to involve adults as well as young people in lifelong learning.

Since the 1980s, various local, state and foundation-funded efforts have produced new models that further developed the key features of community schools and greatly increased their numbers. Approaches designed to mobilize the assets of communities and address barriers to learning resulting from poverty, changing demographics and other contemporary facts of life emerged alongside more established community education programs. New community school efforts brought innovations such as family support centers, early childhood and after-school programs, health and mental services, partnerships with business and civic groups, and initiatives to use school facilities as community centers.

"Community Schools can provide leadership-training programs and offer ongoing opportunities to hold decision-making roles, to speak out in community forums, and work with others on related projects," according to the Coalition of Community Schools. Such experiences allow participants to develop awareness of neighborhood institutions and build relationships, while enhancing their own standing in their communities. As mentioned previously, opportunities to build essential occupational or life skills, such as English fluency, computer literacy or financial management, can greatly improve families' lives.

Implementation

Depending on the size of the institution and intended catchment population, Community Schools can serve an entire district or just a neighborhood. Either way, creating a sustainable Community School is a complex enterprise that involves various partners including the government, the developer, neighborhood residents, social service organizations, school systems, and other stakeholders. The involvement of young people, parents, families, and community residents are especially important. Together, these stakeholders develop a broad vision of what their community schools should look like and the multiple levels of programming and progress they expect to achieve.

Facility Hours - One of the key components of operating community schools is to keep the institution open before and after the regular school day and on weekends all year long. This asset provides taxpayers with an effective way to see the value of their investment in schools and students.

Building and Site Design Guidelines

Similarly, planning and executing the joint use of public facilities through Community Schools means reducing the duplication of similar functions and services. This is a more efficient use of taxpayer money. Vanke should work with the City to build and rehabilitate appropriately sized buildings as Community Schools. Older buildings with historical value, which already may be centers of community, should be rehabilitated to serve as Community Schools. Neighborhoods should think of planned Community School buildings as centers of community life. School districts, the local government; and social groups with expertise to engage students, parents, and residents should work together to envision multiple purposes for these buildings, the services and opportunities they want to make available, and the kinds of space needed.

Building Community Schools is also beneficial for the City and the developer because both entities would need to leverage their assets to make the development possible. Thus, neither is completely responsible for the risk of the building. Revenue streams would come from a variety of sources including public subsidies and commercial rent.

Newly built school could serve as community hub
Source: Yang Liu

Community Partnerships

- Local Level:

A comprehensive system of community schools that links elementary, middle, and high schools requires leadership from a broad-based coalition of stakeholders. The purpose of such a coalition is to develop and promote a community school vision, mobilize resources, ensure accountability for results, keep the community informed, nurture partnerships and relationships, and build the capacity to sustain the effort.

- Building Level:

Planning and decision-making teams that include families and residents, school staff, and community partners provide leadership for individual community schools. The purpose of such teams is to review data, assess existing programs, identify gaps in services, mobilize community resources, monitor progress toward results, and serve as a resource for parents and community engagement in the school.

Case Studies

East Elementary School
Kings Mountain, North Carolina

The North Carolina State public school system, Boy Scouts and Girls Scouts, Vision Service Plan, Lions Club, Successful Education Corporation, local churches, and Eden Gardens Nursing Home all partnered together to initiate this Community School. Kings Mountain, North Carolina faces many of the same challenges as other rural communities in the state including working poor families, single mothers, and a high unemployment rate. A Family Resource Center in an integral part of this facility. The center provides emergency resources and food, provides students and their families with eyes exams, glasses, dental care, and school supplies.

Elliott Elementary School
Lincoln, Nebraska

This Community School is a serves high-poverty area with a large immigrant population. It was started in 1993, and by partnering with the Lincoln YMCA, the school has become a welcoming place for students and their families. The YMCA brings recreation, character development programs, academic support and positive supervision for children before and after school as well as during holiday breaks. Additionally, citywide partnerships are also being developed. As part of city efforts to expand the Community School model, stakeholders developed a community leadership council to guide the development and long-term financing of learning centers in Lincoln's neediest schools. For example, the publisher of the local newspaper serves as the Chair of the Lincoln Public School Foundation, and began this effort in partnership with the mayor, the school superintendent, county leaders, and local business and foundation executives.

Elliott Elementary
Source: www.hausmannconstruction.com

Carson High School
Carson, California

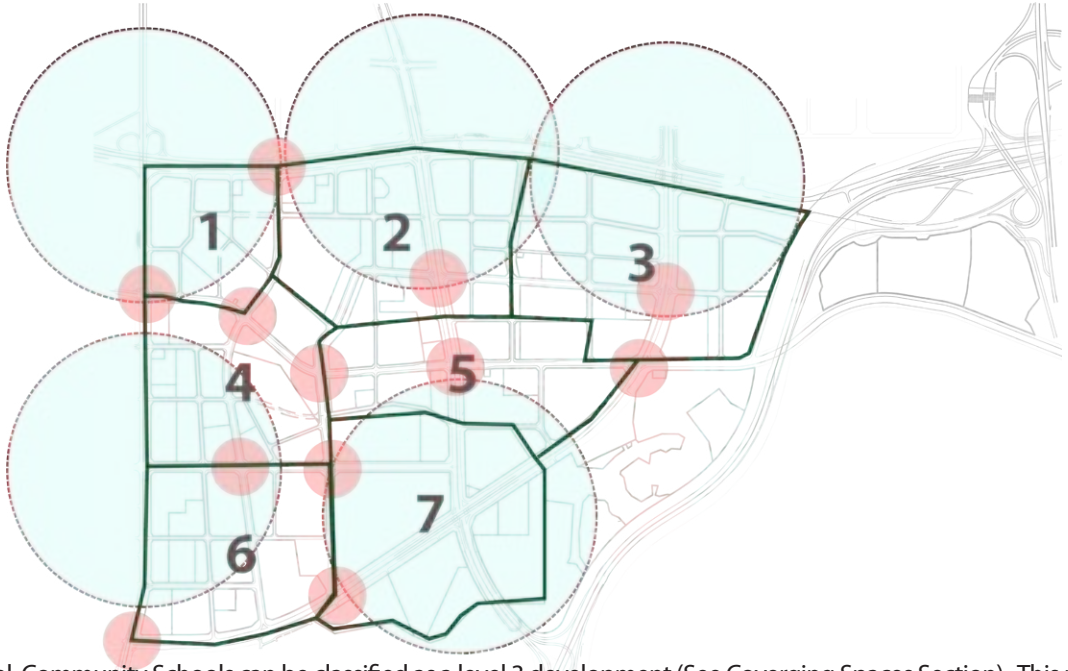
The Carson High Community School realized that student test scores and performance would not improve without better health and social services. In order to put these needed supports in place, the school acquired a grant from the California State Department of Education and the LA Unified School District's Medi-Cal Reimbursement Program to fund a school nurse and community medical center. Suspensions and dropout rates have improved substantially over the last several years.

Halls of Carson High
Source: www.hausmannconstruction.com

Gathering Space at Carson High
Source: www.hausmannconstruction.com

Typical Activities in a Community School

-Adult Education	- Environmental Education	- Parent Leadership
-Arts Education	- Family Literacy	- Peer Mediation & Resolution
- Before & After School Programs	- Family Nights	- Pregnancy Prevention
- Career Development	- Family Support Centers	- Prevention Services
- Case Management	- Health Care Referral	- Primary Health Care
- Child Care	- Health Promotion	- Recreation
- Citizenship Education	- Home Visits	- School-to-Work Opportunities
- Community-Based Learning	- Housing Information	- Service Learning
- Community Organizing	- Job Training Programs	- Student Leadership Development
- Counseling	- Leadership Training Programs	- Substance Abuse Prevention
- Crisis Intervention	- Mental Health Services	- Student Support Services
- Cultural Activities	- Mentoring	- Tutoring / Literacy
- Dental Services	- Multidisciplinary Curriculum	- Violence Prevention
- Early Childhood Education	- Parent Education	- Volunteer Opportunities
- English as Second Language	- Nutrition Counseling	- Youth Development



In general, Community Schools can be classified as a level 3 development (See Coverging Spaces Section). This map highlights level 3 nodes that may be appropriate locations for Community School in the study area.

REFERENCES

Blank, Martin et al. Making the Difference: Research and Practice in Community Schools. (May 2003) Coalition for Community Schools. Edited and Design by KSA-Plus Communications.

Chang, Leslie. (2008) Factory Girls. Spiegel & Grau: New York.

Sergiovanni, Thomas. (Winter 1996) Building Community in Schools. Harvard Educational Review. http://www.hepg.org/her/abstract/251.

Coalition for Community Schools (2009). www.communityschools.org

Rural School and Community Trust (2009). www.ruraledu.org

Epstein, Joyce. (Vol. 76, 1995). School, Family, Community Partnerships: Caring for the Children We Share. Phi http://www.hepg.org/her/abstract/251

Epstein et al. Developing Community Empowered Schools: School, Family, and Community Partnerships. (2000) Corwin Press

Tschang, Chi-Chu. (February 4, 2009). A Tough New Year for China's Migrant Workers. BusinessWeek

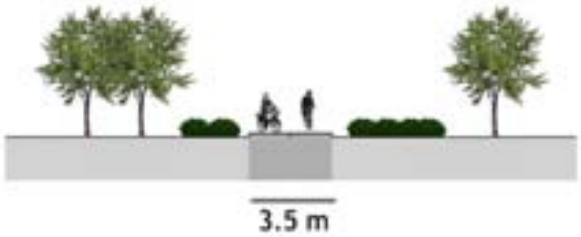
Harney, Alexandria. Migrants are China's Factories without Smoke. (February 19, 2009). http://edition.cnn.com/2008/WORLD/asiapcf/02/01/china.migrants/index.html

BICYCLE-FRIENDLY STREET DESIGN > Eric Minikel

What is this tool?

Bike-friendly street design is design which accommodates cyclists safely, comfortably and efficiently. Safety means minimizing the risk of collisions between cyclists and autos or between cyclists and pedestrians. Comfort means minimizing the stops and grades, and giving a perception of safety, both from collisions and from angry motorists. Efficiency means ensuring that bike traffic can flow smoothly, and that cyclists do not interrupt auto traffic.

There are a variety of street designs which meet these goals, but none can be applied universally. Different conditions—adjacent land uses and density, frequency of cross streets, and many other factors can make certain options impractical or unsafe. The planner looking to create a truly bike-friendly city or neighborhood must know the site well and apply designs in accordance with local knowledge. This appendix presents five bicycle-friendly street designs along with guidelines on when and how to use each of them.



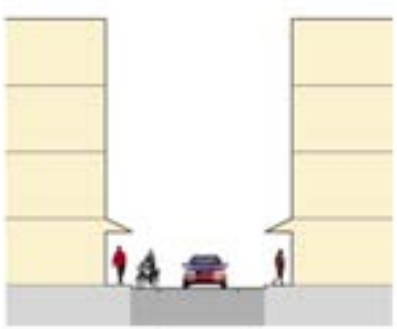
(1) Bike Paths

Bike paths are exclusively or almost exclusively for cyclists, with few or no pedestrians and no auto access whatsoever. For long-distance cycling, bike paths are the ultimate option: free from the noise, pollution and danger of auto traffic, cyclists can reach high speeds at great comfort. Yet bike paths have their drawbacks too: at night they may become relatively deserted, leaving cyclists vulnerable to crime, and in the day the high speeds possible tend to attract athletic racing cyclists who make the path less pleasant for ordinary users.

Bike paths are difficult to retrofit into an existing street network: while public streets can be redesigned, whole new rights-of-way cannot readily be cut through private property. So in practice, bike paths are often confined to open spaces and to easements on top of underground transit lines or abandoned surface rail lines. In a site being designed from scatch, however, long-distance bike paths could be arranged in a grid complementing the auto and pedestrian street network.

Street-level bike lanes in Kunming, China. Source: Eric Minikel

Holland Walk in Kensington and Chelsea, London, U.K. Part of the path is designated for bike use and part for pedestrians. Source: Eric Minikel



(2) Xiang

For denser urban grids, xiang are a much more viable option than bike paths, albeit at slightly lower speeds. Bikes share the lane with pedestrians engaging in often vibrant street life, and sometimes with autos as well. The narrowness of the right-of-way, combined with alternative paving such as bricks or stones, alerts drivers that autos have low priority. In practice, very few cars use these streets: instead, they function largely as urban bike paths, while also allowing vehicular access for deliveries or emergencies.

Thus, where alternate arterial routes are available to handle auto traffic, xiang can function as the primary type of street within a neighborhood, carving up what would otherwise be a superblock while using minimal area for right-of-way, suitable for high-density areas. Cars achieve high speeds on nearby arterials, while pedestrians and cyclists enjoy human scale on the shared streets. The pedestrian presence and eyes on the street from neighboring buildings improve security at night.

The main drawback of this type of street is that, if autos are allowed at all, the street's functioning depends on drivers responding to signals to drive slowly and yield to pedestrians. Many of the streets in Beijing's hutongs, while sufficiently narrow and well-used by pedestrians to qualify as xiang, suffer from aggressive driving and

Top left: Cyclists in a hutong in Beijing. Source: Eric Minikel

Top right: Cyclist in a commercial xiang in Ferrara, Italy. Source: Tunney Lee

Bottom left: A hutong in Beijing. Since pedestrians abound, cyclists can't travel as fast as on bike paths. Source: Sonia Vallabh

Bottom right: A shared xiang in Itabashi Kuyakusho Mae, Tokyo, Japan. Source: Google Streetview

(3) Bicycle Boulevards

On a bicycle boulevard, bicycles simply use the same lane as cars, but a variety of interventions signal to drivers that cyclists have priority. Street signs and pavement bear logos indicating cyclists, and frequent speed bumps prevent high speeds. Network design can further reduce car traffic: by periodically creating parks or adding barricades in the place of intersections, auto through traffic can be prevented while still allowing cycles through. Parallel parking may or may not be offered.

While this type of street cannot accommodate high volumes of auto traffic, and is not as comfortable for cyclists as an exclusive right-of-way, it can handle a large number of curb cuts and cross-streets without endangering cyclists, and so works well for low-density residential areas. The right-of-way width, curbs and pavement can be the same as a standard car-oriented street, so bicycle boulevards are ueful for quick retrofits on streets that cannot be easily redesigned.

Below: Milvia Street in Berkeley, CA, United States is exactly like any normal car-oriented street in Berkeley. Its signage, speed bumps, pavement markings, and barricades make it a bicycle boulevard. Source: Google Streetview. Bottom: Milvia Street at Blake Street, Berkeley, CA. The intersection is barricaded to allow only cyclists to pass through.

Pavement markings provide additional signals to drivers that cyclists have priority.

These barricades prevent autos from continuing, but allow bikes through.

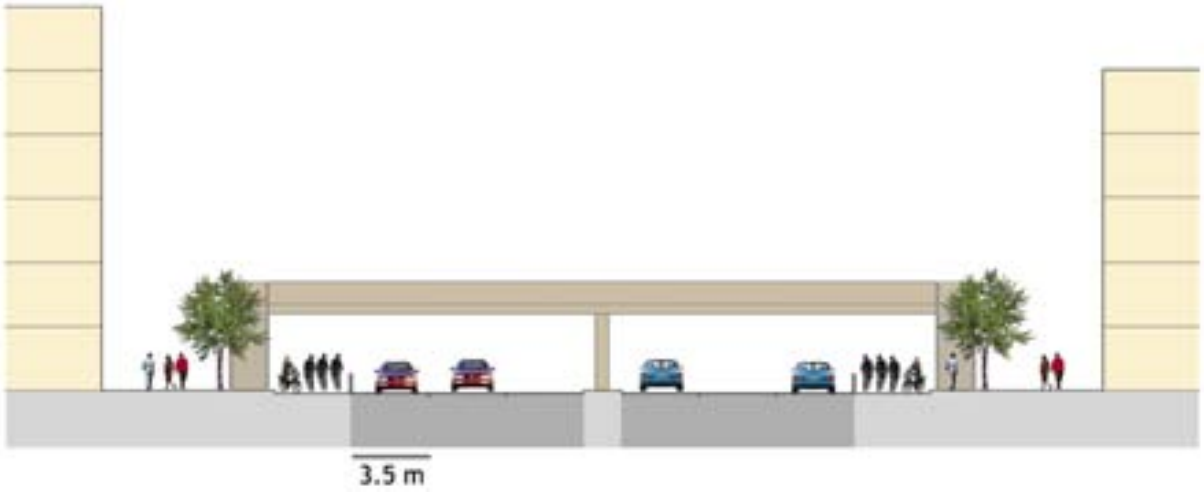
(4) Sidewalk-level Bike Lanes

In order for cyclists to reach commercial areas and public transport stations, cycle access is often needed on busier streets. Faster, denser auto traffic creates a danger and makes it unacceptable for bicycles to share right-of-way with cars. Bicycles can then be accommodated in a separate lane at sidewalk level protected from cars by a curb, fence or planting. Many variations are possible: both directions of cycle traffic can be accommodated on one side of the street (as above), or on opposite sides, or each side can allow both directions.

Cyclists feel very safe and comfortable on these streets, but it is less clear whether they are actually safe. They are separated from adjacent traffic lanes, and thus safe from overtaking cars. But overtaking accidents are less common than collisions at intersections, which these streets don't accommodate well. Cyclists are far from cars and so might not be noticed by drivers until the driver is already turning. Moreover, if both directions of cycle traffic are allowed on one side of the street, cyclists will be coming from a direction that drivers will not think to look. To mitigate this danger, this type of bike lane should be used on streets with relatively infrequent intersections and almost no driveways or curb cuts. At intersections, cyclists can be offered a separate crossing signal while all autos have red lights, or can be forced to dismount and cross with pedestrians.

Above: Sidewalk-level bike lanes on Vassar Street on M.I.T.'s campus in Cambridge, MA, United States. The lanes are painted blue near curb cuts to alert drivers. Source: Eric Minikel

Left: A sidewalk-level bike lane in Hyde Park, London, U.K. Source: Eric Minikel



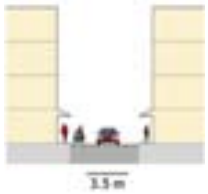
Above: Dongfeng Dajie in Kunming, China. The bike lane is fenced off from autos as well as from pedestrians, who must cross via bridge. At intersections, however, cyclists are vulnerable to turning cars. Source: Eric Minikel

(5) Street-level Bike Lanes

This design, popular in nearly all Chinese cities until a few years ago and still seen quite widely, can allow huge volumes of cycle traffic on large arterials that also handle large amounts of vehicle traffic. Wide bike lanes at the street level, separated from cars by a fence or planting, allow cyclists relative safety from autos within blocks, though noise and pollution still adversely affect the cyclist experience. Cyclists can achieve higher speeds because they are more effectively separated from pedestrians. The problem, as with sidewalk-level bike lanes, is intersections. Since this design is used on major arterials, curb cuts and driveways are usually not present, but intersections are unavoidable and the break in the fence leaves cyclists exposed to turning autos. The only solution for cyclist safety is to include a separate signal for cycle crossings in the traffic light sequence.

Left: Cyclists encounter conflict with right-turning cars at this intersection in Zhongguancun, Beijing, China. Right: An arterial in Wudaokou, Beijing, China. Cyclists are separated from traffic by a planting strip. Source: Eric Minikel

Summary Matrix

	Best use	Other interventions needed
Bike path 	Long-distance connections with few destinations along the way, or recreational spaces.	> Priority crosswalks, signals, bridges or underpasses to cross streets. > Lights for nighttime use.
Xiang 	A bicycle and pedestrian route, where autos have alternate routes available. Often useful for interiors of superblocks defined by major auto routes.	> Alternative routes for autos. > Alternative pavers (bricks, etc.) to signal to autos that nonmotorized modes have priority.
Bicycle Boulevard 	Retrofits on existing, car-oriented low-volume streets with frequent curb cuts and intersections	> Frequent signs and pavement markings indicating that it is a bicycle boulevard. > Speed bumps and low speed limits to lower auto speeds and generally discourage auto use.
Sidewalk-level Bike Lane 	Major auto streets with relatively few intersections and curb cuts.	> Separate bicycle-crossing time within the signal cycle at intersectons, or sign warning bicyclists to dismount and cross as a pedestrian at intersections. > Different pavement color or texture to alert pedestrians not to wander into the bike lane.
Street-level Bike Lane 	Largest auto streets with very few, if any, curb cuts.	> Separate bicycle-crossing time within the signal cycle at intersectons, or sign warning bicyclists to dismount and cross as a pedestrian at intersections. > Fence or planting strips between bike lane and auto lanes.

Where does this tool apply?

In an ideal world, bicycle-friendly design would be applied across entire cities. For that matter, bike paths could extend between cities for truly intrepid cyclists. But the beauty of this tool is that it doesn't need that ideal world in order to thrive; it can be applied piecemeal on any scale and have benefits.

While there are those cyclists who are willing to bike ten kilometers to their workplace downtown, or who want to bike a hundred kilometers for fun on the weekend, most people will use other modes for long-distance travel. For them, biking is a tool for reaching daily needs such as shopping and recreation, and for arriving at, say, a metro station for onward travel. Thus, applying these designs at the neighborhood level is sufficient to meet most users' needs. Even a single street, or some segment of a single street, is helpful, because cyclists are already using the existing street network, dangerous as it may be.

Why should this tool be used?

Bicycles are cheap to purchase and even cheaper to operate and maintain, and almost everyone knows how to ride one. Many people find cycling enjoyable, and it provides exercise. Bicycles use far less street space than cars, and offer far more freedom than buses. They require minimal parking area and emit no greenhouse gases.

It seems that bicycles are a win-win proposition. But there's one catch: while pedestrians have their sidewalks and cars have their streets, bicycles have no space to exist. They mix awkwardly with either group, placing their users in mortal danger and inconveniencing motorists or pedestrians.

When is this tool implemented?

Design to accomodate bicycles ought to be considered in the same breath as design for cars and pedestrians. In other words, from the moment that streets are laid on paper, from the moment cities are built.

It is more difficult to accomodate cyclists after streets have already been built, but not impossible.

What is required to make this tool work?

Several things make this tool work more effectively:

(1) Bike racks

When cyclists reach their destination, they will need a place to park. If bike parking is not secure, people will find that the best defense against theft is to own a bike that's not worth stealing. But riding a heavy bike with one gear, rusty brakes and parts that rub against each other makes cycling into a chore. If people are to be encouraged to ride, secure bike parking must be provided.

People can always lock a bike to itself, but this approach does little to prevent theft. In China, shopping centers have for years offered supervised bike parking, where for a few *mao* someone will watch your bike while you shop. Within the next twenty years, it seems likely that labor costs will rise to make this impossible. Locking a bike *to* a bike rack, then, is the future.

Bike racks should be metal, so that thieves cannot cut through them, and located in exposed places, so that thieves cannot pick locks in secrecy.

Top: An attendant supervises parked bicycles in Zhongguancun, Beijing, China. Labor costs will someday make this impossible. Above: A bike rack on the sidewalk next to a subway station in Berkeley, CA, United States. Source: Eric Minikel

(2) Density

Cycling has a longer range than walking, but if destinations are several kilometers away, most potential cyclists will be deterred. Higher density, then, brings more stores, schools, transit stations, and other destinations within easy reach of cyclists.

That said, even in the most disperse locations, where useful destinations will usually be too far away for cycling, bicycle-friendly design at least allows people to cycle recreationally.

(3) Establishment and enforcement of traffic laws

Street design can protect bicyclists much more effectively if traffic laws are enforced so that motorists must yield to bicyclists at crosswalks and when the motorist wishes to turn at an intersection.

(4) Requirements on private cooperation

Bicycle-friendly design on public streets is more useful if it is also easily reachable from private homes. When building a bicycle-friendly network, cities should require developers to connect to the network. (See below)

Left: This cul-de-sac in Davis, CA, United States, as required by the city, connects to a bike path along the adjacent collector street. Source: Google Earth.

Where can I find additional information?

A number of handbooks for bicycle facility design are available online; some are listed at right. Many researchers have attempted to analyze bicyclist accident data and recommend solutions, but one obstacle is a relative lack of complete data on how many people are bicycling in the first place.

REFERENCES

American Association of State Highway and Transportation Officials [www.aashto.org]. "Guide for the development of bicycle facilities." (1999).

Association of Pedestrian and Bicycle Professionals. "Bicycle Parking Guidelines." <http://www.apbp.org/resource/resmgr/publications/bicycle_parking_guidelines.pdf>

bicyclinginfo.org Pedestrian and Bike Information Center. <http://www.bicyclinginfo.org>

Dill, Jennifer and Carr, Theresa. "Bicycle commuting and facilities in major U.S. cities: if you build them, commuters will use them -- another look." Transportation Research Board 2003 Annual Meeting.

Hunter, William W., Stewart, J. Richard and Stutts, Jane C. "Study of bicycle lanes versus wide curb lanes." Transportation Research Record. Paper No. 99-0208. Vol 1674, pp 70-77. (1999).

Moeur, Richard C. "Bicycle Facility Design." <http://www.iowadot.gov/iowabikes/pdf/Bicycle%20Facility%20Design.pdf> (2007).

National Highway Traffic Safety Administration. "Fatality Analysis Reporting System." <http://www-fars.nhtsa.dot.gov>

Stutts, Jane C. and Hunter, William W. "Motor vehicle and roadway factors in pedestrian and bicyclist injuries: an examination based on emergency department data." Accident Analysis and Prevention. Vol 31, pp 505-514. (1999).

Small Scale Streets: the Xiang

Xiang means "small street" in Chinese. Other languages call this street type a mews, an alley or in the Netherlands, a woonerf. Regardless of the name, the basic concept holds: a small-scale street where pedestrians and bikes have precedence over cars.

The accessibility section presents a network of street types with a definitive hierarchy. At one end of the spectrum is the highway: large scale, meant for traveling long distances and entirely car-oriented. At the other end is the xiang: small scale, creating circulation within larger blocks, and pedestrian oriented (figure 1).

A good city will have a whole spectrum of street types, considered as a hierarchy and forming a network. Keeping the network in mind, this tool focuses on the xiang, presenting examples and testing site specific implementation.

Inspiration

One of the big surprises in visiting Shenzhen and particularly the area around Fifth Garden was that the relatively high density did not automatically lead to walkability.

Walkability is a function of both physical environment and a network of destinations. Is it a pleasant, safe environment? Can you get to where you would like to go?

In visiting the site, and later studying the circulation network, we found that large blocks make accessibility more difficult. Although there is no perfect block size, smaller scale blocks create a finer grain of pedestrian circulation, shortening distances and making a smaller-scale environment (figures 3, 4).

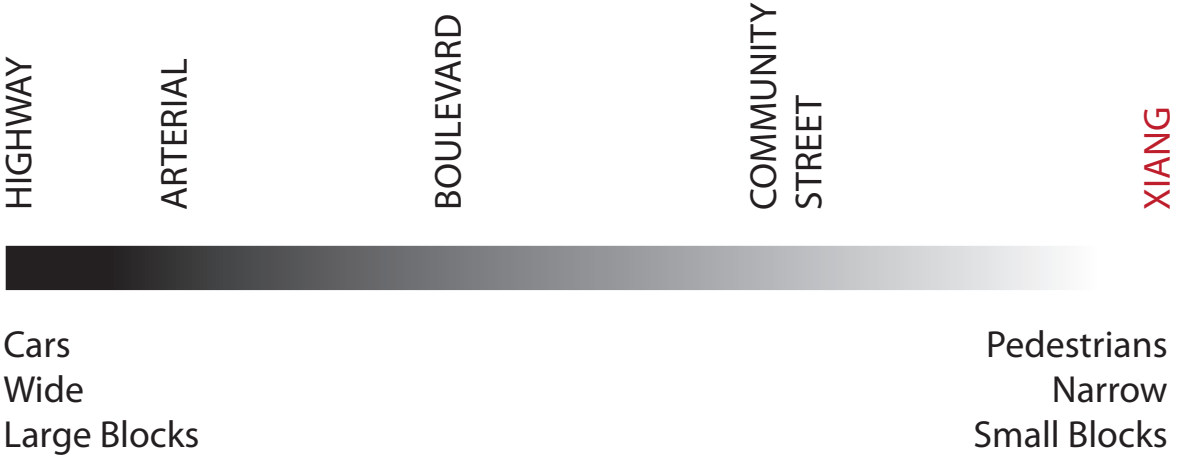


Figure 1. Spectrum of Street Types

An idea for this street type already exists on the site, in the form of small informal streets running through the urban villages (figure 2). While these streets have their problems, including lack of light and poor security and sanitation, they also have their strengths: breaking up large sections of housing, providing access through blocks and allowing for informal commercial uses. It is possible to re-imagine this piece of urban fabric, considered as part of a continuous pedestrian network, planned with compatible uses and formalized with improved paving and landscaping.

Figure 2. Urban Village Street. Source: Kristin Simonson

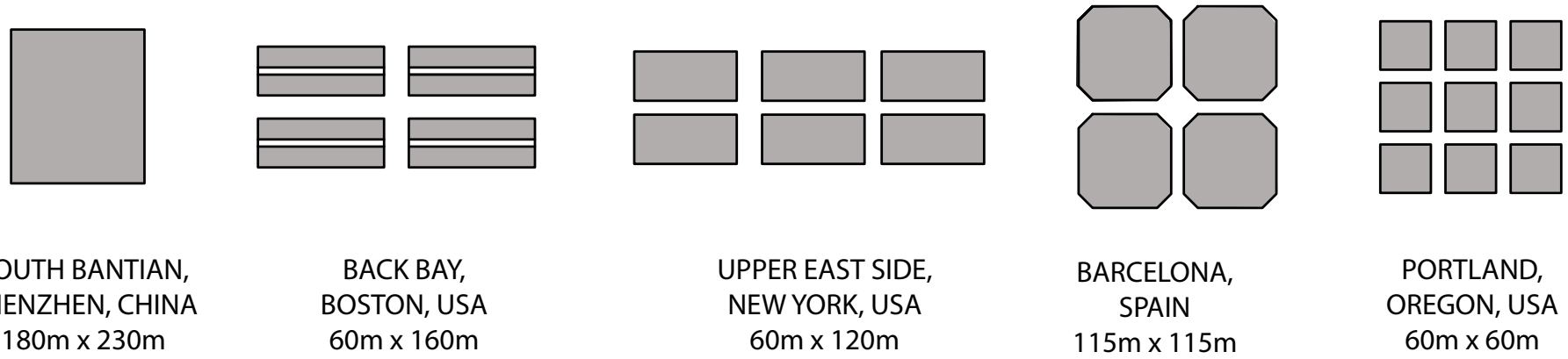


Figure 3. Comparative City Block Sizes

Figure 4. Large blocks and security fences prevent pedestrian connections through the block. Fifth Garden perimeter. Source: Kristin Simonson

Underlying Assumptions

> Although car ownership will continue to grow in the next 20 years along with rising affluence, car usage will be limited if good alternatives to driving are available and daily destinations are convenient and accessible.

> Increasing affluence will also lead to increasing leisure time. Good walking environments and access to open space will be in demand.

> Not everyone will become wealthier. Having good accessibility to destinations and transit for those without cars will be increasingly important to avoid marginalizing segments of the population.

> Pedestrian scale and circulation will be planned together with car and traffic considerations. The streets will be planned as part of a connected network.

Implementation

The xiang is most effective as part of a network, or system, and the city and district planners are in a position to introduce a smaller scale of streets over the large scale of a neighborhood or district. However, it is also a tool that can be used by individual developers, either in planning for large blocks or retroactively in breaking up large blocks. Implementation by a developer would require allowing a public easement through the property for the xiang, which would be balanced by the benefit of improved convenience for residents.

Uses

To begin thinking about how the concept of xiang might be deployed across the site, as well as the different characteristics the xiang might have depending on immediate context, I test three test cases on site (figure 5). The first is mid-block near the MTR station, in an area of high commercial concentration. The second proposes opening up a public xiang through the existing fabric of Fifth Garden. The third looks at the xiang as an opportunity for connecting to open space.

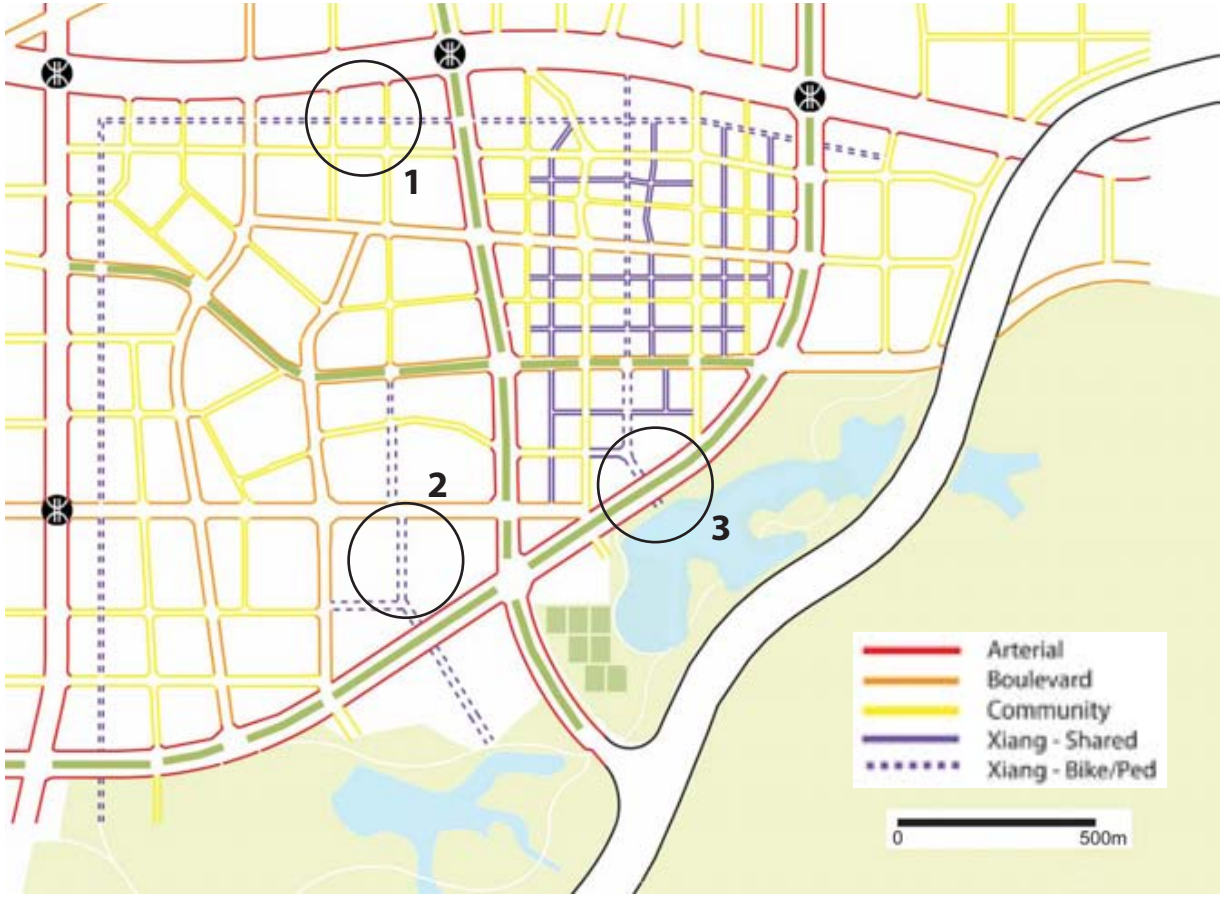


Figure 5. Proposed street network with design test locations.

Test 1: Commercial/ MTR

Figure 6. View of proposed xiang near MTR.

Figure 7. Arcaded streets in Bologna, Italy.
Source: Sebastia Giralt, Flikr.

Figure 8. Arcaded streets in Guanzhou, China.
Source: Kristin Simonson

Test 2: Through Fifth Garden

> Create public xiang within existing development.

> Increase overall accessibility for residents, allow access to regional park to the south for residents and neighbors and activate commercial center of Fifth Garden.

> Adjust security system to provide gates along xiang instead of at perimeter.

Figure 9. Fifth Garden proposed plan with xiang. Source: Google Earth.

Figure 10. Existing path through Fifth Garden. Source: Kristin Simonson.

Figure 11. Existing gate at Fifth Garden. Source: Kristin Simonson.

Test 3: Regional Park Access

> Create pedestrian and bike access to regional park beyond under arterial via underpass.

> Kiosks along the xiang provide continuity and street definition. Programmed with uses that support a recreational area, such as food, bike rental or children's activities.

Figure 12. View of proposed xiang connecting to regional park.

Figure 13. Pedestrian and bike underpass, Central Park, New York. Source: StephenRees, Flikr.

Figure 14. Ponte Vecchio, Florence, Italy. Source: Marco Menu, Flikr.

Figure 15. Hills south of the site, Fifth Garden on the right. Source: Kristin Simonson

Case Study: Woonerf
Netherlands

> Extensive use of landscape elements to direct circulation.

> Residential use, surrounded by moderate density.

> Private parking.

> Mix of cars, bikes and pedestrians. Bikes and pedestrans have precedence.

Figure 16. Dutch Woonerf. Source: Stroupe.

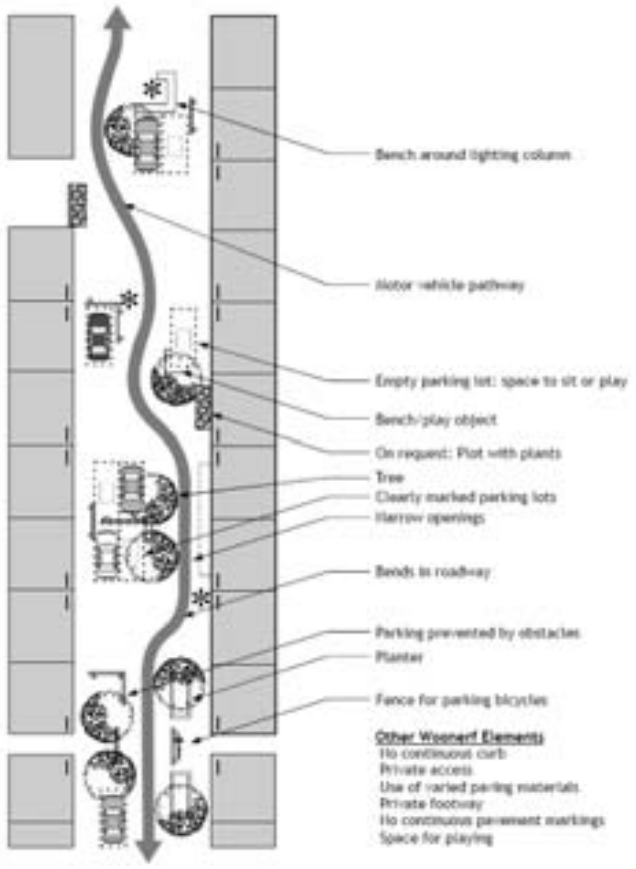


Figure 17. Woonerf Deisgn Guidelines, Plan. Source: USDOT.

Case Study: Tianzifang
Shanghai, China

> Commercial, arts and entertainment uses.

> Historic city fabric.

>Pedestrian only.

Figure 18. Tianzifang. Source: Cultural China.

Figure 19. Tianzifang aerial photo. Source: Google Earth

Figure 20. Tianzifang. Source: Endworld, Flikr.

Case Study: Motomachi
Yokohama, Japan

> Building setbacks modulate street scale. Appropriate for high density.

> Intensive commercial use.

> Continuous loggias and overhangs provide cover and increase the capacity of the sidewalk.

> Mix of cars and pedestrians. Pedestrians are primary.

Figure 21. Motomachi. Source: Panoramio.

Figure 22. Motomachi. Source: OiMax, Flikr.

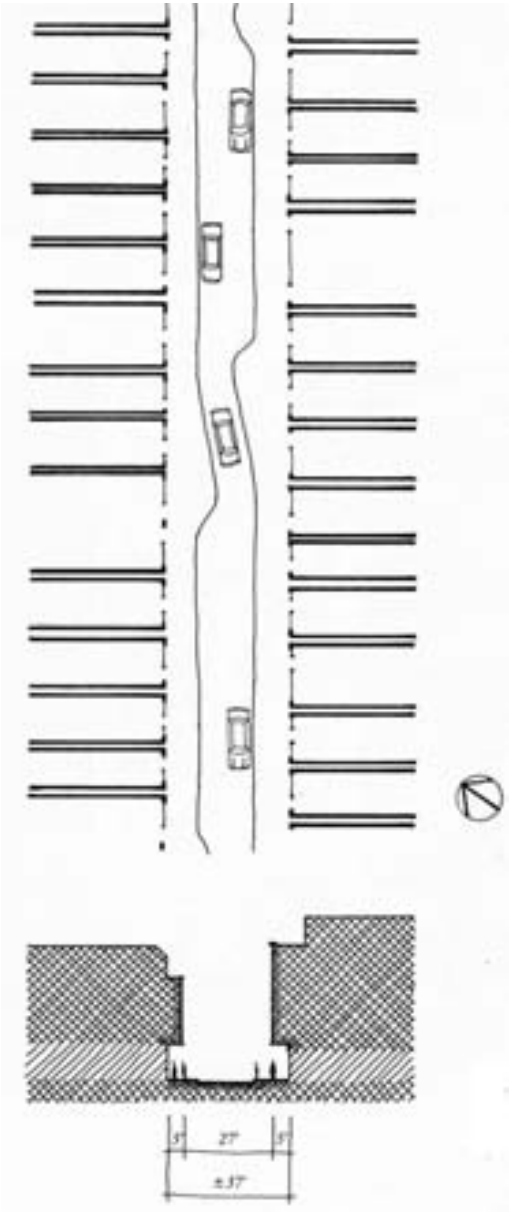


Figure 23. Motomachi, Plan and Section. Source: Jacobs.

Case Study: Other Examples

Figure 24. Street in Bologna, Italy. Source: Adactio, Flikr.

Figure 25. Street in Bologna, Italy. Source: Eaglekepr.

Figure 26. Xiang, Chengdu, China. Source: Eric Minikel.

Figure 27. Hong Kong. Source: Kristin Simonson.

REFERENCES + CREDITS

Jacobs, Allan B. (1995). *Great Streets*. Cambridge, MA: MIT Press.

METRO. (2002). *Creating Livable Streets: Street Design Guidelines for 2040*. Portland, OR.

Moughtin, Cliff. (1992). *Urban Design: Street and Square*. Oxford: Architectural Press.

US Department of Transportation, Federal Highway Administration (USDOT). Lesson 20: Traffic Calming. Accessed online at http://www.tfhrc.gov/safety/pedbike/pubs/05085/chapt20.htm, May 14, 2009.

From the Shuo Wen Jie Zi (SWJZ). Accessed online at http://www.gg-art.com/imgbook/index.php?bookid=53, May 14, 2009.

PHOTO CREDITS

Cultural China. Accessed online at http://www.culturalchina.com, May 12, 2009.

Eaglekepr. Blog. Accessed online at http://www.eaglekepr.com/TripsAround/Aviano/index.htm

Flikr. Accessed at www.flikr.com. Photos cited by user name.

Panoramio. Accessed online at http://www.panoramio.com/photo/4311724, May 13, 2009.

Stroupe Condo Blog. Accessed online at http://www.stroupecondoblog.com/tag/woonerf/, May 13, 2009.

INTEGRATED UTILITY & RESOURCE MANAGEMENT ORGANIZATIONS > Gary Shu

Introduction

Communities require utilities to provide services and commodities like water, electricity, heating/cooling and environmental management. Typically, a business is only present in one or two of these service markets, leaving residents to do business with an assortment of firms in order to acquire a minimal standard of living.

A new concept for the utility services would be a novel organization that would deliver all of these services at once: an integrated utility and resource management organization.

The new utility organizations would not only deliver the products of typical utilities like electricity and water, but it would optimize over many different resource and environmental goal by supplying land and wastewater management. Aggregations of many different residential customers could occur to the point that scalable facilities like district heating and cooling would be made available to district residents.

These integrated resource service organizations would be a "one-stop" shop for all a residents' maintainence and monthly service needs. Some, most or all of the following could be incorporated: electricity, natural gas, gasoline, heating/cooling, landscaping, local environmental management, potable water, wastewater, and trash.

Resource management organizations would be able to optimize energy use and services across each the services in order to provide the lowest cost solution while still reaching the lifestyle goals of the residents.

By uniting several different utility services, innovations in the provision integrated utility service could flourish. Examples could include:

> Treating wastewater using constructed wetland management for local recycling and water reuse.

> Large-scale central heating and cooling facilities that would simultanously generate electricity and heating/cooling for neighborhood areas.

> District composting services for separate waste streams that would generate biodiesel for shared carpooling services.

Vanke Wonderland in Guangzhou, China

The lake in the development not only serves as landscaping and ornamentation but requires environmental and water management and by the property manager.
(Source: Gary Shu)

Requirements

Several conditions need to be fulfilled in order for integrated utility and resource management organizations to work well in maximizing user efficiency and resource utilization.

Strong Business Regulation

Government rules and regulations must enable such organizations to exist since they will essentially be local monopolies on essential services. In addition to strict regulation and oversight, competition in the form of regular requests for proposals (RFPs) and contract bids could ensure utility performance. Standards on delivery and environmental management would need to be strict in order to avoid utilities' "race to the bottom".

High Fuel Prices.

Prices for fuels such as natural gas, gasoline, electricity, water and heating and cooling would need to be substantially higher than current prices in order for management companies to be incentivised to look for efficiency and savings opportunities. This is especially important when considering innovative cross-fuel and integrated systems (e.g. reusing lightly-processed grey water for coolant) that would be require large initial capital outlays.

Strong Zoning Regulation.

In potential large scale systems such as water networks or district heating and cooling, the district or neighborhood plan would have to require developers help build out part of the network infrastructure or at least provide links for others to.

Appropriate and strategic land use zoning would have to be present in order for these large-scale systems to benefit from pre-existing site conditions such as reservoirs for water management and storage.

Incentives

Governments need to provide incentives for utilities to integrate and minimize costs across several different services. One example could be subsidies and expedited permitting for multi-purpose infrastructure.

Appropriate Pricing

Multi-purpose utility management organizations would need to properly price their fees. Fixed monthly subscription fees for the use of all services for instance would incentivise users to waste resources since their marginal use has no impact on their bill.

A more suitable and sustainable method of pricing would be to charge a substantial monthly sum to cover capital and maintenance costs in conjunction with a small marginal use cost per service (e.g. cooling) in order to prevent waste.

Water Management Systems

Techniques for sustainable and efficient environmental resource management exist but require strong zoning and regulation requirements for developers to be incentivised to implement them.
Source: Gary Shu

(Far left) Stormwater management integrates with landscaping.

(Left) Fountains supplied by locally produced grey water.

Individual Air Conditioning Units

Building developers lack incentives to build more efficient and cheap centralized HVAC systems. The result is that each housing unit has its own air conditioning equipment.
(Source: Gary Shu)

Goals

Integrated utility and resource management organizations would decrease the principal-agent problem by which the party that spends money to invest in efficiency savings would not be able to capture the monetary benefits of such capital expenditures.

A common and highly visible example of this issue in Shenzhen and China are cheaply built, uninsulated housing like the urban villages. Their concrete walls do not contain insulation and no central heating or cooling systems are built since only the developer would incur such costs.

The result is a row of individual air conditioning units lined on the outside of an apartment building whose aggregate cost dwarfs that of a centralized system.

The consolidation of interests allow firms to optimize the costs across the numerous variables of the fuel and service costs in order to reach the consumer value at the lowest cost. Firms which are able to innovate and provide solutions that cut across numerous services and fuels will stand apart in the market and acquire business.

A key objective of enabling such organizations is the privatization of environmental management in order for developers and real estate management organizations to take on the role of supervising surrounding environmental areas.

In doing so, governments can facilitate multi-use and multi-functional open space that provides deeply integrated benefits beyond recreation and natural habitats. These new institutions would impart and maintain integrated systems that would solve multiple purposes to optimize for efficiency in economic, environmental and social benefits.

Who Will Use This Tool?

In order to be effective integrated utilities, a variety of organizations and agents would be ideally suited for taking on the responsibilites of integrated resource management at certain implementation scales.

> Site Parcels - Developers, Property Managers

At this level, the developers or real estate property managers would be best suited to providing maintenance and resource services. These firms could aggregate larger, conventional utility services into a single service while at the same time performing other

services that help consumers minimize costs such a energy efficiency projects and co-use of facilities.

By providing a single service that encompasses all maintenance, integrated utility services can give property managers and developers an additional level of control for quality, leading to enhanced revenue and additional profit sources.

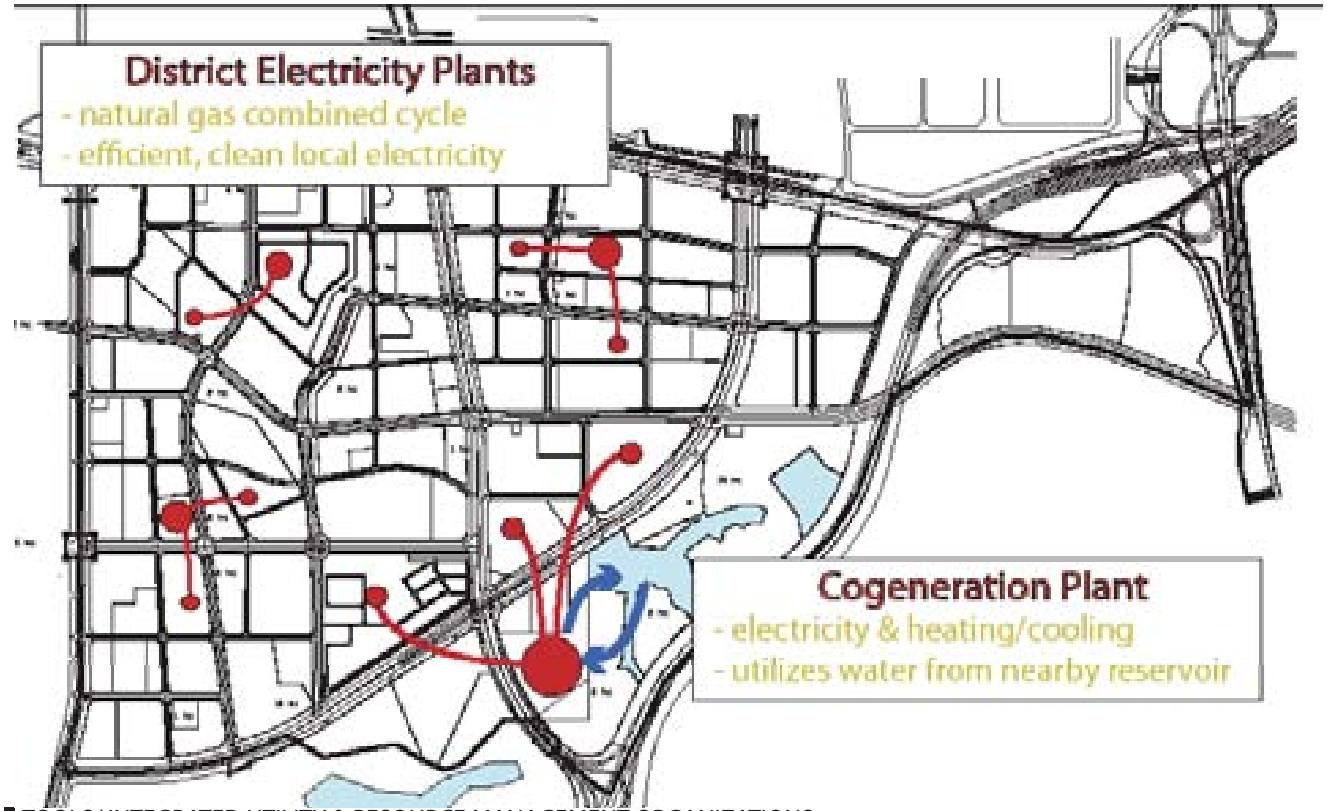
> Neighborhoods and Superblocks - Community Co-ops, Neighborhood Businesses

When combining larger numbers of residential properties, an appropiate organization to handle integrated utility services would be a community co-op. These firms would retain local control while at the same time being of a large enough scale to leverage capital investments into larger infrastructure.

Community co-ops would be able to handle multiple developments and site parcels while also creating large scale integrated systems across multiple projects, further realizing efficiency and management savings.

> Districts and Cities - City Administrations, Municipal Utilities ("Muni's")

At a district or city level, if such utilities were being implemented, an organization would likely have to be overseen by the city government like a municipal utility. Like electric or water municipal utilities ("munis"), these organizations would answer to the city government while serving the public interest.



District Electricity, Heating and Cooling

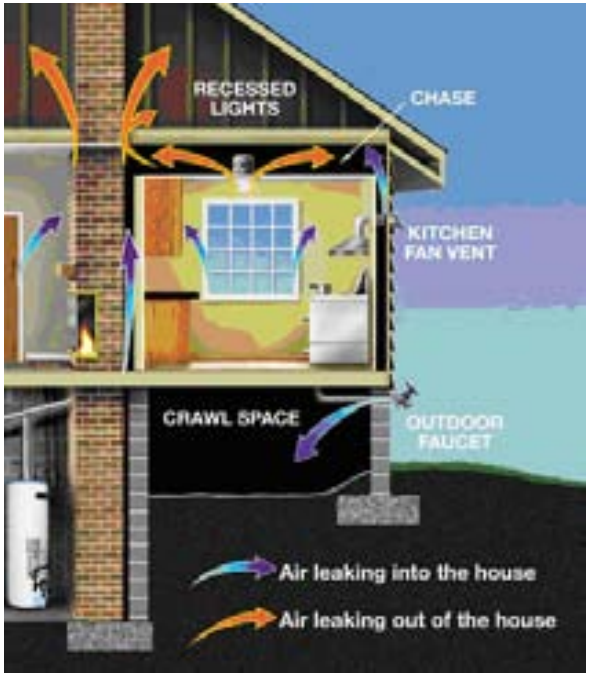
A large centralized cogeneration plant provides electricity and heating/cooling to several large developments while utilizing neighboring water resources. Other districts receive electricity from small decentralized power plants fired by clean burning natural gas. Source: Gary Shu

Case Study: Energy Service Companies or "ESCOs"

Energy Service Companies, or "ESCOs", are private firms that perform a number of services related to energy and energy efficiency as indicated by their names. ESCOs, sometimes known as Energy Savings Performance Contractors, perform a variety of services.

ESCOs perform an entire suite of services related to energy efficiency. They may perform design and construction of energy projects associated with supply, generation, conservation and efficiency. ESCOs may also serve as a management contractor, finding and supervising subcontractors in the auditing, analysis and construction of energy projects. Finally, ESCOs may provide financial services including supplying capital and financing projects, guaranteeing the performance of energy projects and managing risk.

Such organizations have demonstrated the financial feasibility of energy savings across water, lighting, electricity bills. By combining ESCO's technical expertise and financial resources with a utility's infrastructure and service mandate, exceptional efficiency and resource managment capacity is possible.



Energy Efficiency Auditing
ESCOs provide energy performance auditing as initial evaluations into the ability of buildings to achieve energy savings. Source: Envinity, Inc.

REFERENCES

Effective Utility Management (EUM) Collaborating Associations. *Effective Utility Management: A Primer for Water and Wastewater Utilities.* June 2008.

Ernest Orlando Lawrence Berkeley National Laboratory, University of California Berkeley. *Public and Institutional Markets for ESCO Services: Comparing Programs, Practices and Performance."* (2005). Nicole Hopper, Charles Goldman, Jennifer McWilliams, Dave Birr, Kate McMordie Stoughton.

Jianga Binbin, Chen Wenyingb, Yu Yuefengc, Zeng Lemind and David Victore. *The future of natural gas consumption in Beijing, Guangdong and Shanghai: An assessment utilizing MARKAL*. Energy Policy. Volume 36, Issue 9, September 2008, Pages 3286-3299.

Karplus, Valerie J. *Innovation in China's Energy Sector.* Working Paper #71. (March 2007.) Program on Energy and Sustainable Development at the Center for Environmental Science and Policy, Stanford University.

US Environmental Protection Agency. *Achieving Environmental Excellance: An Environmental Management Systems (EMS) Handbook for Wastewater Utilities.* (2004).

World Bank. *Financing Energy Efficiency: Lessons from Brazil, China, India, and Beyond.* (2008). Robert P. Taylor, Chandrasekar Govindarajalu, Jeremy Levin, Anke S. Meyer, and William A. Ward. World Bank: Washington.

Zhang Wencheng, Wenji Guan, Yungang Pan, Gao Ding, Xiaochun Song, Yali Zhang, Ying Li, Hang Wei, Yuping He. *Municipal District Heating and Cooling Co-generation System Feasibility*. Building Commissioning for Energy Efficiency and Comfort, Vol.VI-7-4. ICEBO2006, Shenzhen, China.

ELECTRIC BIKES (E-BIKES) > Ruifeng Tian

"The question should not be what kind of transportation system do we want but what kind of city do we want."

---- Taebel, Delbert A. and Cornehls, James V.

Bike style e-bikes and scooter style e-bikes

(Image source: Christopher Cherry: Electric Bike Use in China and Their Impacts on the Environment, Safety, Mobility and Accessibility)

GreenWheel: a product which can transform a normal bicycle into electric bikes by adding a motor on the back wheel.

(Source: http://www.autobloggreen.com; Image by Michael Lin at MIT Media Lab)

What is this tool?

Transportation tools play key roles in urban development. For example, the popularization of automobiles in the U.S. in the 1950s contributed much to suburban sprawl, while wide usage of bicycles in Amsterdam has made it one of the most energy-efficient cities in the developed world.

Electric bikes (E-bikes) are an emerging transportation tool in China. The e-bike originates from ordinary bikes, but is powered by electricity. It has two variations: bike style e-bikes and scooter style e-bikes. The bike-style ones are light-weight, while the scooter style are much heavier. It can also be categorized into hybrid powered e-bikes (electricity and pedaling) and purely electricity powered e-bikes. Currently, China is the largest producer of e-bikes in the world. Annual e-bike sales have grown fast from 40,000 in 1998 to 10,000,000 in 2005 (Cherry). China produces more than 90% of the world's e-bikes and sells most of them domestically.

E-bikes are also a controversial transportation tool in China. The usage of e-bikes varies in Chinese cities. Some cities, Shanghai and Kunming, have been putting efforts in promoting e-bikes; some cities, such as Zhuhai, have banned e-bike for many years; and some others, such as Beijing, change their policies towards e-bikes over time.

Where does this tool apply?

Due to the cycling culture in most of Chinese cities, E-bikes can be applied in most of Chinese cities. E-bikes make more sense when the topography is hilly enough to discourage regular biking, and the personal income is not high enough to afford a car. In the case of Bantian district, the site used to be a mountainous area. Even though new development has leveled many hills, substantial grades are still found on many streets. In our site interviews, two of the residents mentioned that these ramps make normal biking very difficult.

In Shenzhen, only hybrid bike style e-bikes with a speed limits of 20 km/hr under 40 kilograms are recognized as non-motorized bikes. Other e-bikes have to be licensed in order to ride on roads. The non-motorized e-bikes are allowed to ride on bike paths/lanes within the urban area. However, in reality a large portion of e-bikes in the streets violate this standard. They still ride on bike paths/lanes, and even pedestrian walks. The larger weight and higher speed make them dangerous to both cyclists and pedestrians. The most recent policy by Shenzhen Transportation Bureau in March 23, 2009 restricts e-bike use to certain area, such as Futian and Luohu district. The future policy towards e-bikes is still unclear and highly dependent on how the manufacturer neogotiate with the government to produce safer e-bikes.

Why should this tool be used?

1. Increasing Mobility

The most obvious advantage for e-bikes is their long-distance travel capacity. Most of the e-bikes can travel 40-50 kilometers at a single charge. If people want to use e-bikes for commuting, they can commute to jobs which are as far as 20-25 kilometers away only charging the e-bikes once a day.

2. Increasing Accessibility

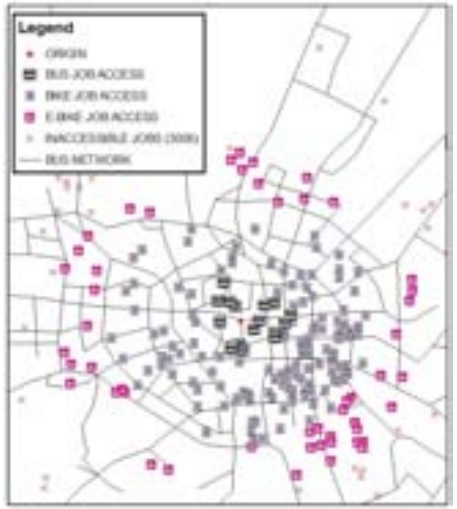
According to *Electric Bike Use in China and Their Impacts on the Environment, Safety, Mobility and Accessibility*, e-bikes provide much more job accessibility in Kunming than either buses or bikes

Normal speed of walking, biking, and e-biking (km/hr)

Comfortable travel distance for walking, biking, and e-biking (km)

Walking
Biking
E-biking

(Source: author)



Job accessibility in the city of Kunming by different travel modes

(Source: Christopher Cherry: Electric Bike Use in China and Their Impacts on the Environment, Safety, Mobility and Accessibility)

provide. Compared to public transportation, E-bikes can arrive at many more places.

3. Expanding User Group

Biking is very sensitive to the grade of roads. People have to pedal with much more effort while they are cycling up a ramp. At the same time, few people are willing to travel long distance (20 kilometers for example)with bikes. With the help of electricity-assisted e-bikes, more demographic groups – such as elderly people and women – can use this mode easily and travel longer. Specifically, Bantian district is mountainous and consist of many streets with grades. E-bikes can greatly encourage more people to travel longer.

The following quotes from a recently published article from *The Economist* can best illustrate this e-bikes' advantage:

"Your correspondent borrowed the new A2B electric bicycle from Ultra Motors, a British firm, and took it for a spin in London. The ease with which you can slip in and out of traffic, without breaking into a sweat, is intoxicating. The pedals are there should you wish to use them. And there is no battle of wills between pedestrian and cyclist. It is no sweat to restart, so the temptation to zip through a red traffic light, menacing people as you do so, is removed. "

4. Increasing Affordability

In 2008, the personal average annual income in Bantian district is about 60,000 RMB. Normally a medium price e-bike costs about 1500 – 2200 RMB (225-325 USD). At the same time, a moderate automobile will costs about 80, 000 – 100, 000 RMB. Considering the local income imbalance in this district (people living in the Fifth Garden and the urban villages), e-bikes are much more affordable to low income people.

5. Saving Urban Land/Reducing Parking Spaces

The more urbanized a city is, the more scarce its land is. In most cities, land values are very high. However, in order to meet people's parking needs, there are always many parking lots in the urban center. Usually, a car spent its more than 90% of its life time parked, occupying precious urban space. Moreover, parking spaces are also unfavorable for people. E-bikes could be good alternatives to solve this problem. It only takes 1/5 parking area as a normal car (some research shows even less parking space for e-bikes). Furthermore, reducing the parking space ratio could have substantial impacts on future urban planning process.

Where are the best practices?

The city of Kunming can best illustrate e-bikes' advantage of job accessibility. The chart on the left shows the job accesses of bicycles, buses, and e-bikes. On the lower part of the chart, it shows the accessibility indices between e-bikes and other alternatives, which are derived from dividing e-bike job accesses by those of other alternatives. It illustrates that for 10 to 60 minute commutes, e-bikes outperform most of the other transportation tools. In certain range of travel time, e-bikes have a dominant advantage (for example, within 20 minutes, e-bikes' job accessibility is more than 23 times as much as buses').

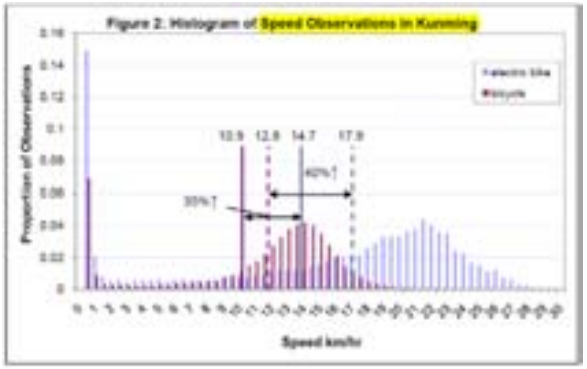
What is the current disadvantage of this tool?

1. Tailpipe pollution

Table 6: Job Accessibility Indices Between E-bike and Alternatives						
	Cumulative jobs accessed from all residential origins (x1000)					
	10 min	*20 min*	*30 min*	*40 min*	*50 min*	*60 min*
Bicycle	12508	43984	80814	115223	146332	171103
Bus (10kph)	0	3002	17938	42587	68878	99021
Bus (16kph)	0	8672	44753	90246	132313	165930
E-bike	21985	69673	116736	157266	183580	195956
	Accessibility Index					
	10 min	*20 min*	*30 min*	*40 min*	*50 min*	*60 min*
E-bike/Bicycle	1.76	1.58	1.44	1.36	1.25	1.15
E-bike/Bus (10kph)	inf	23.21	6.51	3.69	2.67	1.98
E-bike/Bus (16kph)	inf	8.03	2.61	1.74	1.39	1.18

Job accessibility indices in the city of Kunming

(Source: Christopher Cherry: Electric Bike Use in China and Their Impacts on the Environment, Safety, Mobility and Accessibility)



Speed difference between e-bikes and bikes observed in Kunming

(Source: Christopher Cherry: Electric Bike Use in China and Their Impacts on the Environment, Safety, Mobility and Accessibility)

In terms of air pollution, "zero tailpipe emission" gives e-bikes a sustainable feature. However, some argue that the electricity e-bikes are using is still generated by coal-burning power plants which still produce air pollutions. The difference is tail-pipe emissions by buses or automobiles are mostly generated in the center of cities, while air pollution generated by power plants is mostly at remote areas.

With China putting more and more emphasis on clean energy, power supply for e-bikes could some day be obtained from remote clean power plant such as wind farms, tidal power plants, and so on. Centralized power supply is also more efficient than individual cars which are powered by gas.

2. Battery Pollution

95% of e-bikes sold in China use Pb-acid batteries which are considered to be the source of lead pollution from e-bikes. Although there are alternatives (such as lithium batteries) in the market, they substantially increase the cost of e-bikes. Statistics also show that even when e-bike batteries are very well recycled, 69% of lead will go to the environment (Electric Bike Use in China and Their Impacts on the Environment, Safety, Mobility and Accessibility). While the effect of enhancing the recycling rate of the batteries is limited, the more fundamental solution will be improving the battery technologies that enable cheap and Pb-free batteries.

3. Security

E-bikes have long been criticized for their safety. The security issues include two aspects: one is for the riders, and the other is for the pedestrians. As for the riders, there is no obvious evidence showing that e-bikes are more dangerous than regular bikes; however, for the pedestrians, e-bikes create more accidents than bikes due to their higher speed and higher weight.

Speed of e-bikes is a doube-edged issue. One hand, the riders prefers the shorter commuting time that e-bikes bring to them; at the other hand, higher speed means more danger to normal cyclists and pedestrians. According to a research by Christopher Cherry, the average speed of e-bikes is 18km/hr while average speed of normal bikes is 13km/hr. Moreover, when an e-bike is in a bike lane, it generates disturbance to the bike traffic flow, which also causes accidents.

Solutions can be from both road design and policy. In road design, special lanes for e-bikes/bikes could be introduced, and safer intersections and signal design should be implemented. In the policy part, regulations on e-bike speed limits and helmets for the riders could be enforced.

What is required to make this tool work?

E-bikes can be a safe commuting tool and a substitute for normal bikes and cars if the following conditions are met:

1. Integrating transportation network with land use planning

By considering transportation planning at an early stage with land use, a city can substantially reduce long-distant daily commuting. Mixed-use planning provides homes and working places within a smaller area. Thus owning a car is not necessary.

2. Coherent e-biking path linking e-biking-friendly zones to establish a city-wide network

Continuity is an important issue for urban cycling

network. Street conditions, intersection designs, and traffic light policies should ensure the coherency of cycling routes.

3. Integrating e-bikes with public transportation stations

Enough parking spaces should be provided at subway stations and bus stations.

4. Clean energy generation and non-pollution energy storage (batteries)

5. Charging stations as a new type of urban infrastructure

As e-bikes have largely emerged in very recent years, the policies towards them are still ambiguous. Right now, e-bikes are not very well regulated in China and are banned in some cities due to the dangers they bring to pedestrians and to the environment through the lead pollutions. However, we can see that in the future these problems could be solved by both new policies and innovative technologies.

References:

[1] Christopher Cherry. *Electric Bike Use in China and Their Impacts on the Environment, Safety, Mobility and Accessibility*. UC Berkeley Center for Future Urban Transport. April, 2007.

[2] Christopher Cherry, Robert Cervero. *Use characteristics and mode choice behavior of electric bike users in China.* Transport Policy 14 (2007). April, 2007.

[3] Jonathan Weinert, Chaktan Ma, Christopher Cherry. *The transition to electric bikes in China: history and key reasons for rapid growth.* Transportation (2007) 34:301–318.

[4] http://www.economist.com/world/international/displaystory.cfm?story_id=13565800&fsrc=rss

[5] http://news.ddc.net.cn/ArticleShow/21111.aspx

[6] http://www.autobloggreen.com

Concept Overview

Definition

The partnership approach is a joint effort between the public and either the private for-profit or non-profit sectors. Both the public and private sectors **share risks and responsibilities**.

What is the goal for the partnership tool?

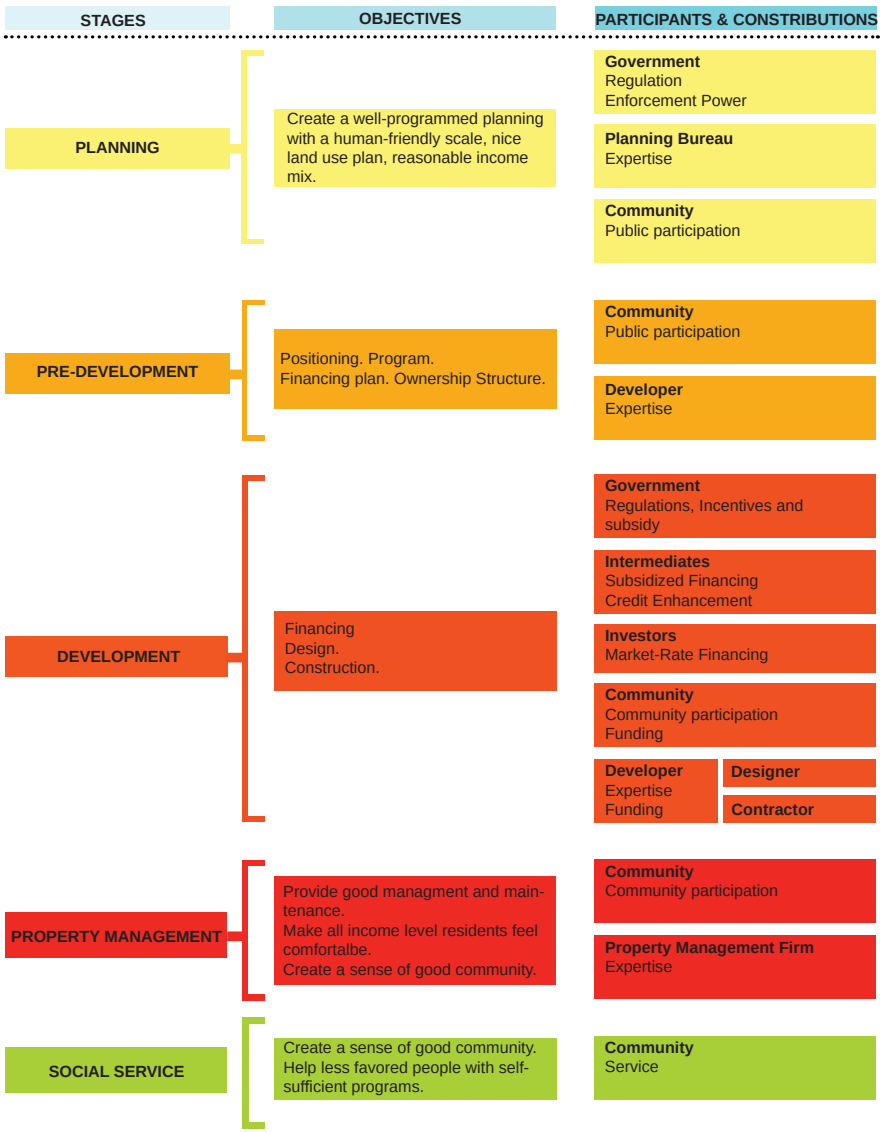
In order to meet the huge funding gap, affordable housing developers need to piece together different resources.
The diversity of participants is key to partnerships. It helps to utilize recources from both the public and private sectors:
Funding:
Partnerships help to piece together funding from different sources.
Expertise:
Partnership helps to utilize expertise from both sectors.
The participation of community-based organizations help to better fullfil the needs of local residents.

Who are the participants?

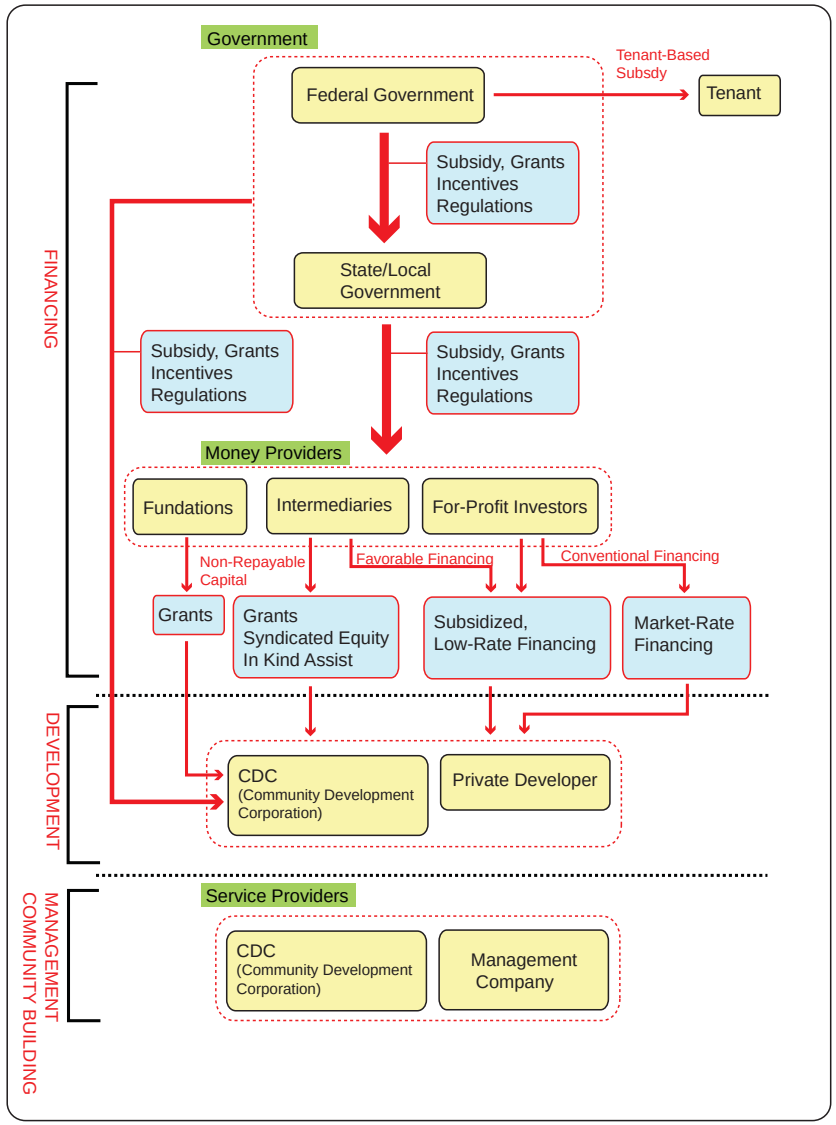
The participants include the government, financial intermediaries (usually quasi-governmental), investors, developers, community development corporations (CDCs), foundations, and other organizations.

Where does the partnership approach apply?

The partnership approach can be applied in each stage of the affordable housing development process. It can also be applied at all levels such as state municipal, and local.



Partnership Framework in Affordable Housing Development Process: the US System >Source: adopted from the development process diagram from 2008 report, "Density and Affordability" by Victor Eskinazi, Andrew Trueblood, and Torrey Wolff



Details about the US Affordable Housing System >

The US Model

In the US, the partnership model includes the government, financial intermediaries (usually quasi-governmental), investors, developers, community development corporations (CDCs), foundations, and other organizations.

The key instrument is the Low Income Housing Tax Credit (LIHTC). The federal government uses it to leverage capital from the private sector. Also, the community development corporations (CDCs) play a very active role. Many projects are sponsored by CDCs. The participation of CDCs ensures the needs of local people are met.

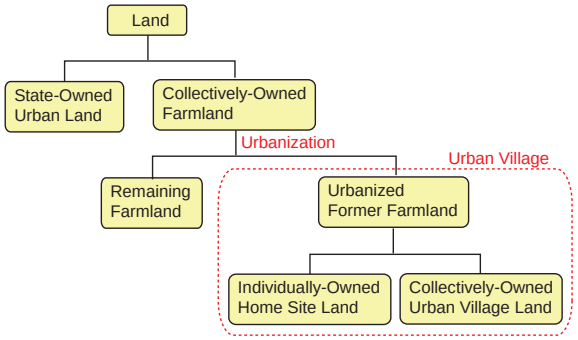
A positive aspect of the US sytem is that it is not only about building affordable housing. It helps community building by providing services such as job training. Therefore it is more like a comprehensive social service program based on affordable housing.

The problem with the US system is that it is too complicated. The partnership concept was designed with good intention, but it is getting more an more complicated by involving too many parties. The money is not always efficiently used.

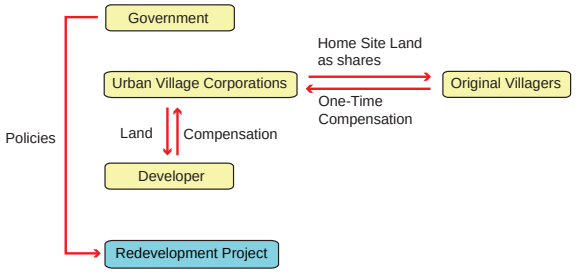
However, the most valuable experience that can be learned from the US system is the diversity of participating parties in both public and private sectors; and the active role of CDCs--the community-based organizations.

The Shenzhen Case

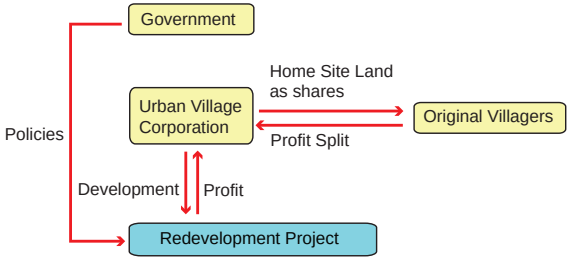
Origin of Shenzhen Urban Villages >



Shenzhen Urban Village Redevelop Model 1: Led by Developer > Gangxia Village Redevelopment



Shenzhen Urban Village Redevelop Model 2: Led by Urban Village Corporation > Xiasha Village Redevelopment



Special Role of Urban Village Corporations

In China, urban land is owned by the central government, while rural farmland is collectively owned by the vilalges. After urbanization, the former farmland remained collectively owned by the villages. The central government assign each family a certain size of site for them to build their homes. This land is owned by the individual families, but it cannot be traded in the market.

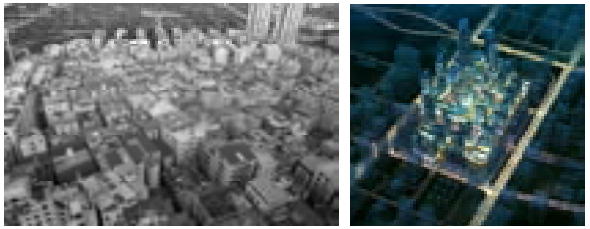
The urban village corporations are for-profit firms run by local residents, but they are the actual investors and administrators of the villages. Therefore, they can also play a leading role in the urban village development process.

Together with the fast urbanization process, China is facing a fast urban renewal process too. In Shenzhen, the government planned to redevelop all the urban villages in about ten years. However, due to the special land ownership land acquisition costs are huge. Currently, there are two major types of redevelopment. The first mode is led by a developer. The developer purchases the land from the urban village and develops it according to its own program. The second mode is led by urban village corporations. They develop the land according to the needs of the original residents.

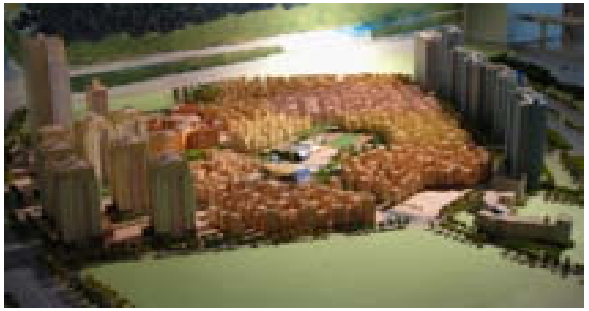
Project Facts>Data source: Shenzhen Planning Bureau

Total Buildable Land Area	23.2 Ha
Total Built Area	15.16 Ha + 1 Ha school land
FAR	4.5
Total Built Area	682,000 m2
Total Footprint Area	90,000 m2
Building Coverage	52.5%
Green Space (Excluding rooftop)	20%

Land Use	Built Area	Percentage
Commercial:	204,000 m2	30%
Office:	123,000 m2	16%
Residential:	355,000 m2	52%
Total:	682,000 m2	100%



Picture source: Kerry's blog: http://www.garlap.com/blog/article.asp?id=624



Picture source: by author

Problems of the Chinese Affordable System

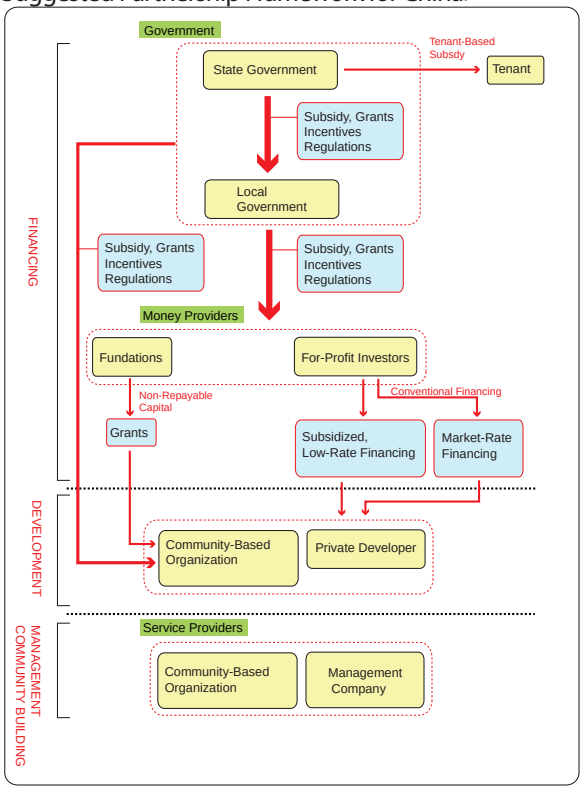
The biggest problem of the Chinese affordable housing system is the huge **"gap"** between the needs and supply (see affordable housing system report: background).

The reason for the gap is the **lack of funding**, since the affordable housing projects now are mainly directly subsidized by the government. **The lack of partnership** results in a huge burden on the government budget.

Learning from the US system, the establishment of a comprehensive partnership framework among public and private sectors, especially the improvement of the role of the community-based organizations could be a good solution for China.

Although the governmental and tax systems are very different in these two countries, the key concept of the partnership approach, **utilizing the resources of various parties to the maximum extend**, should never be different.

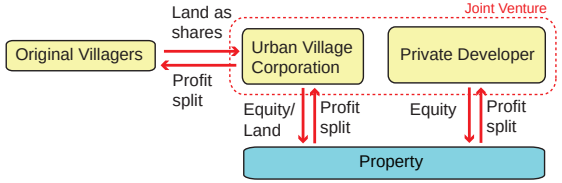
Suggested Partnership Framework for China>



Suggestions for China

Besides the direct subsidies, the government can also consider other subsidies such as grants and subsidized financing to both project sponsors and individual consumers. Also, the government can encourage the participation of non-profit foundations and community-based organizations. The project sponsor shouldn't be restricted only to the developers, those organizations could become potential project sponsor, too.

Suggested Partnership Structure for Shenzhen>



Suggestions for Shenzhen

Specifically, in Shenzhen, the key issue is the land ownership. The involvement of the urban village corporations could bring down the high demolition and relocation costs. The urban village corporations can contribute the land as a share and establish a joint-venture with developers for the project. Each party in the joint-venture will hold a piece of the ownership of the property.

After the project is done, the revenue genterated by the property will be split among the owners. The urban village residents who hold shares in the urban village corporations will then get divident from the profit.

The urban village corporation can use the revenue to manage the property, or it can hire a property management firm to do it. Also, using the revenue, the urban village corporation can invest in community facilities, social services, and other public goods for the community.

Best Case: the Metropolitan Project, Asian CDC, 2004

Source: Aisan Community Development Corporation, Boston, MA
http://www.asiancdc.org

Project Facts

>Location: 38 Oak St, Boston, MA 02111, USA
>Developer: Parcel C LLC
Asian Community Development Corporation
Edward A. Fish Associates
>Architect: the Architectural Team Inc.
>General Contractor: Suffolk Construction Company Inc.

History of Land Acquisition

>1960s: City of Boston used eminent domain to demolish the site for urban renewal. The site remained undeveloped for 30 years.

>1986 and1993: Boston Redevelopment Authority (BRA) rejected a garage proposal twice after receiving strong community opposition.

>1990: BRA approved the Chinatown Master Plan and zoned the site for residential use, forbidding institutional use.

>1995: 7 community organizations joined to proposed a community center. A national design competition was held.

>1999: BRA released Request for Proposal. Edward A. Fish Associates and Asian CDC won.

>2001: Height increased to 23 stories to accommodate affordability. Some residents were concerned that the height was above the Chinatown Master Plan.

Project Introduction

Source: Asian CDC, http://www.asiancdc.org

The result is a mixed use 23 story high-rise containing 251 rental and homeownership units, 115 (or 46%) of which are affordable to low and moderate income families. ACDC successfully incorporated an extraordinary number of affordable units by capturing and capitalizing on the intrinsic value of the site's desirable location in downtown Boston, access to a plethora of public transportation options, and existing diversity and density that allowed the market-rate condominiums to subsidize the affordable housing component.

ACDC partnered with for-profit developer Edward A. Fish Associates (EAFA) to complete development of The Metropolitan in 2004. The $89 million high-rise project includes 251 rental and homeownership units, 115 of which are affordable to low and moderate income families. The 133 rental units have rents ranging from $365 for the formerly homeless to luxury units renting at $2,600 per month and the 138 for-sale condominiums sold at prices affordable to families earning 80% of area median income to prices in excess of $1 million for the penthouse units, the first in the neighborhood.

Lessons Learned

>Community education is the key to engaged participation.
>Community understands tradeoffs when formulating goals.
>CDC decision-making rights is important to partnerships.
>Property management experienced with diverse residents is important.

Project Location>Source: googlemap

Project View>
Source: Asian CDC, http://www.asiancdc.org

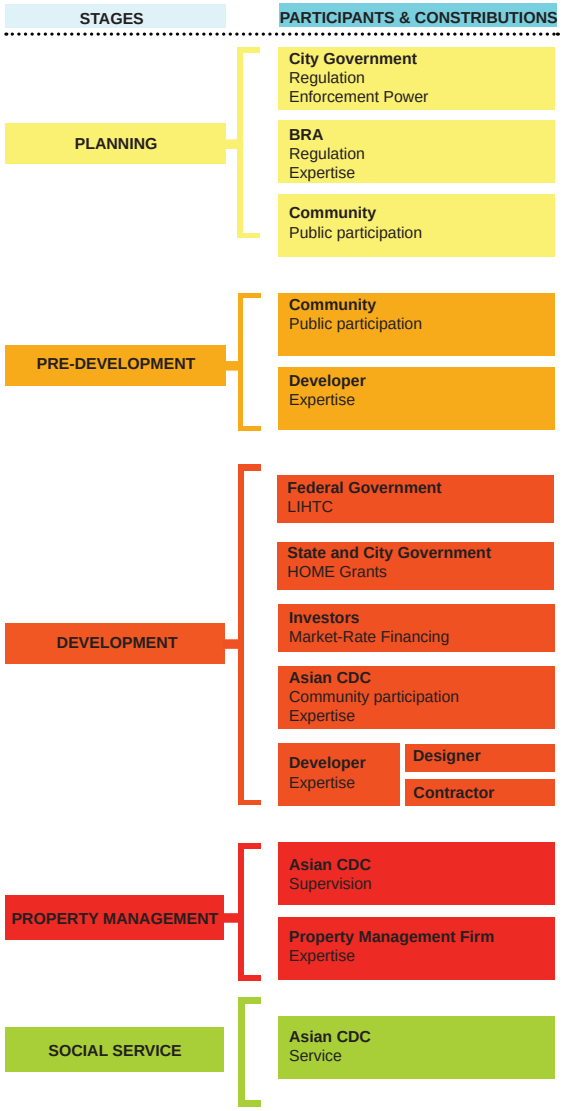
Partnership Structure

According to the capital sources, the majority of funding came from condo, parking, and other commercial property sales (65.08%) and loans (18.03%). The rest of the funding was a joint contribution from the city and state governments. The major constributions were:
>HOME grants from both the city and the state.
>Linkage money (see housing system report: housing innovations).
>BRA funding
>LIHTC
>Afforable housing trust

Capital Sources>Source: Asian CDC

Sources of Capital:			% of Total
Perm Loan - Residential	$	12,408,000	14.11%
Perm Loan - Parking	$	3,450,000	3.92%
Other	$	-	0.00%
City HOME	$	1,500,000	1.71%
State HOME	$	750,000	0.85%
City Demolition Contribution	$	300,000	0.34%
Linkage (Millenium)	$	1,810,758	2.06%
BRA Funding	$	750,000	0.85%
LIHTC (Federal)	$	7,748,024	8.81%
Affordable Housing Trust	$	2,000,000	2.27%
Net Condominium Sales	$	49,406,810	56.17%
Net Parking Sales	$	6,533,500	7.43%
Net Commercial Sales	$	1,304,135	1.48%
Total Sources	**$**	**87,961,227**	**100%**

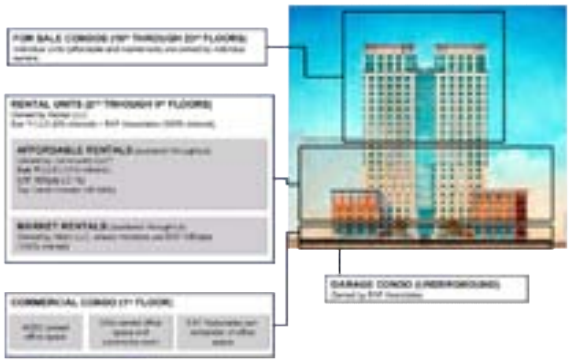
Partnership Framework Diagram>



Unit Mix and Affordability>Source: Asian CDC

Unit Type	# of Units	# and Types of Bedrooms	Affordability
		18 one-bedroom	
Market-Rate Condominium	84	58 two-bedroom	market-rate
		8 three bedroom	
		8 one-bedroom	26.5% at 80% AMI
Affordable Condominium	34	20 two-bedroom	47% at 100% AMI
		6 three bedroom	26.5% at 120% AMI
		8 one-bedroom	
Market-Rate Rental	52	20 two-bedroom	up to 60% AMI
		6 three bedroom	
		8 one-bedroom	
Affordable Rental	81	20 two-bedroom	market-rate
		6 three bedroom	
TOTAL		**138 condos + 133 retals**	**115 units affordable(46%)**

Ownership Structure>Source: Asian CDC



REFERENCES

What is Inclusionary Zoning? (2009). from PolicyLink. org. Retrieved March 30, 2009. < http://www.policylink. org/EDTK/IZ/>

Bai, Jie. (2008) Estate-Level Facility Provision and Management in Market-Rate and Resettlement Coexisiting Housing Compounds. Cambridge: MIT.

Fang, Yan Zhang and Ke. "Is History Repeating Itself?: From Urban Renewal in the US to Inner-City Redevelopment in China." Journal of Planning Education and Research.

Schuwartz, Alex F. (2006) Housing Policy in the United States: CRC Press.

Shusong Ba, Xu Zhang, Miao Wang. The Financing Characteristics of Rental Housing in China.

Canada Mortgage and Housing Corporation. (1998) "The Role of Public-Private Partnership in Providing Affordable Housing." Canada.

Wilkins, Jill Khadduri and Charles. (2007) Designing subsidized rental housing programs: what have we learned? Cambridge, MA.

Zhou, Le. (2002) Some Thoughts about the on-Going Old and Dilapidated Housing Redevelopment in Beijing. "*Beijing City Planning & Construction Review", 4*, 2002.

Wang, Yaping, Wang and Wu. (Unpublished). Urbanization and Informal Development in China: Urban Villages in Shenzhen.

Song, Yan, Zenou and Ding. (2008). Let's not Throw the Baby out with the Bath Water: the Role of Urban Villages in Housing Rural Migrants in China. "*Urban Studies*", 2008.

Ho, Paul. (2007).Development of Public-Private Partnerships (PPPs) in China. City University of Hong Kong. Hong Kong.

Brown, Andrew and Orr. (2006). The Suitability of Public-Private Partnerships in the Provision of Sustainable Housing in China. Heriot Watt University. Edinburgh, Scotland, UK. "World Review of Entrepreneurship, Management and Sust. Development", Vol 2, 2006.

Liou, Y. Thomas. (1998). Community Development Intermediary System in the United States: Origins, Evolution, and Functions. "Housing Policy Debate" Vol 9, Issue 3, 1998. Fannie Mae Foundation.

Goldstein, Ari Alowan. (2007). Municipal Strategies for Affordable Housing: Inceting and Exacting Public Goods from Private Developers. Massachusetts Institute of Technology. Cambridge, MA, USA. 2007.

Chung, Amy. (2004). Bridging Sectors: Partnerships Between Nonprofits and Private Developers. Joint Center for Housing Studies of Harvard University. 2004.

Chan, Abert. (2008). Application of Public-Private Partnership (PPP) in Hong Kong Special Administrative Region -- the Critics' Perspectives. First International Conference on Construction in Developing Countries. *"Advancing and Integratng Construction Education, Research & Practice"*. August 4-5, 2008, Karachi, Pakistan.