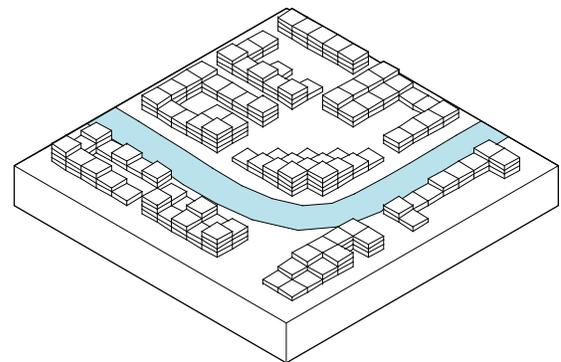


THE 3-D GRID 4

The primary objective of this prototype is to develop a 21st century, higher density, and more livable version of the traditional urban village form of development as represented by Zhang-Jia in Jinan. Such neighborhoods may seem disheveled, but possess qualities that could attract people of all income groups, including a fine-grained fabric, intertwined living, working, and commercial activities, all within 2-4 story buildings. Incorporating such characteristics results in a walkable environment where residents can fulfill their daily needs within the neighborhood. Low-rise buildings,

particularly prominent in this scheme, contribute to a human-scale character, minimize the excavation and embodied energy required for construction, and reduce the operational energy used for climate control, elevators, and utilities.

The 3-D Grid illustrates how all of these qualities could be achieved in a high quality, contemporary urban setting. The concept is based on controlled vehicular access to maximize livability and promote pedestrian circulation on several levels. Specifically, emergency and delivery vehicles are allowed to circulate on the





3.43. Rendering overlooking interlocking green spaces and circulation on different levels

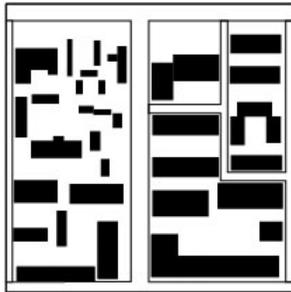


3.44. Cluster plan

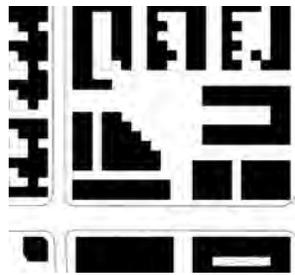
interior streets, which are not otherwise open to through traffic. At the same time, a complete multi-modal transit system complements the rich pedestrian realm.

Both building structures and open spaces are designed to optimize passive sources of energy. Additionally, generation of energy on site from renewable sources is integrated into the design in several forms. The design is also highly flexible, incorporating both interior private and exterior public spaces that can adapt to the seasons, changes in resident demographics, and transformations of space usage over time. This framework reduces the need for altering structures, enhances functionality by allowing for personal choice and customization, and provides for a livable environment by fostering place identity.

TRADITIONAL GRID



3-D GRID



	TRADITIONAL GRID	3-D GRID
size (ha)	53	65
residential units	6,879	8,683
pop density (1000 ppl/sq km)	38	47
parking spots/100 hh	16	21
avg building height	5.5	6
FAR	1.7	2.2
energy use/hh (MJ)	74,600	67,600

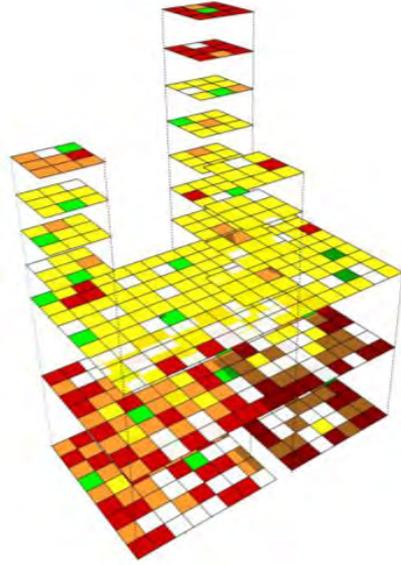
GENERATIVE IDEAS

The 3-D Grid is developed as a collection of small, highly permeable blocks each with its own character. The blocks contain low-rise 3-5 story buildings, designed to interpenetrate exterior spaces to allow for airflow, light, shading, and wind protection. This results in a complex hierarchy of green spaces – ranging from small individual gardens, to courtyards, neighborhood parks, and large greenswards along major waterways. The permeable environment also affords multiple paths of movement in and among buildings and spaces, much like a traditional village, that encourage walking and reduce the need for transportation. The combination of all these factors leads to energy conservation in the embodied, operational, and travel dimensions.

The intricate fabric is given larger form by an urban waterway system—developed from the existing canal



3.45. Bird's eye view showing cluster composed by compact, low rise, fine grained blocks



3.46. Generative diagram explaining multiplicity of uses

—which flows through the neighborhood. A main canal feeds smaller watercourses that help to define blocks and different zones within the grid, contributing to place identity. The system also provides the backbone for a water-born transportation system that services all parts of the site. For example, the center of the neighborhood is developed around a major station on the water transit system, where it intersects a principle thoroughfare in the road system, as shown in accompanying drawings. Here we find more intense development, including shops, offices, institutions and schools integrated within the ubiquitous residential matrix. The environment operates on multiple levels, allowing recreational uses along the canal, while urban activity goes on above.

LAND USE

The land use strategy fosters a fine-grain mix of uses such that a parcel may contain multiple activities horizontally as well as vertically. The mix is further complicated by the fact that the basic unit is a live-work loft in which residential functions may be combined with offices or small scale production, and are sufficiently flexible to accommodate change in use over time. In general, commercial and civic uses are concentrated on the ground floors with residential above, although any use may occur on any level. Over time, given sufficient flexibility, the 3-D grid would develop areas with different characters and distinctive mixes of activity arranged in three dimensions.

The transitional nature of the site, located between the downtown of the new city to the north and residential areas in the south, suggests the integration of commercial uses throughout the development



3.47. Plan showing commercial corridors

3.48. View showing open spaces and building envelope

rather than the creation of large shopping centers. As illustrated in the accompanying diagrams, retail spaces are developed along roads and paths of movement through the grid and may occur on, or extend to upper levels. In a similar way, recreation, services, planting, and amenities are scattered across the neighborhood in a more or less even pattern of development with equal levels of accessibility.

BUILDINGS AND SPACES

The consideration of natural systems and their form implication becomes more evident at the building scale. The building orientation allows for optimum ventilation while the courtyards on various levels are designed to provide a cooled microclimate for the interior rooms. Circulation at the ground, 2nd and 3rd levels means more options for pedestrian movement, so that moving between buildings or addresses need not require going to the ground.

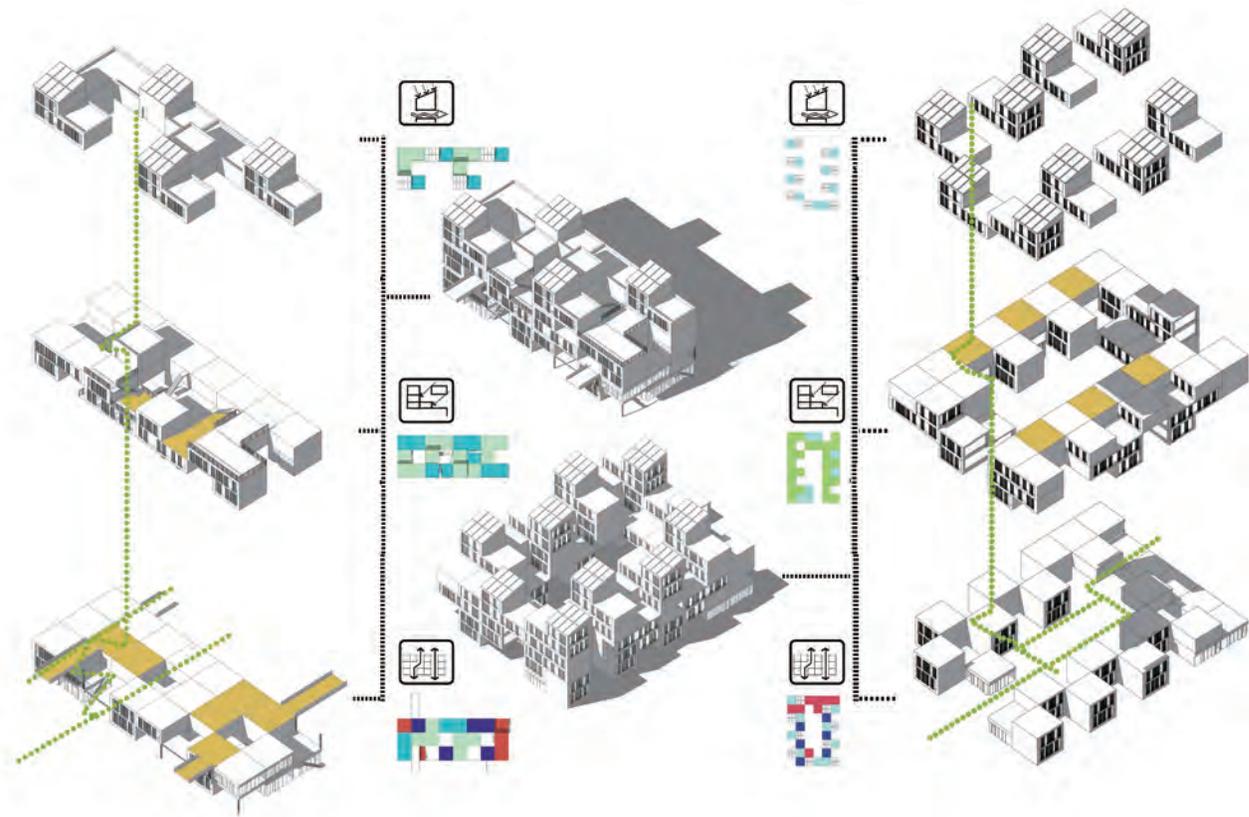
Individual units are designed to be easily adaptable to meet the needs of different lifestyles and changing family sizes. The core unit is a small-office/home-office (“SOHO”) live/work unit that can accommodate a range of home businesses. Modifications of the core unit result in units for larger families. All unit sizes are designed to be flexible and to expand and contract as necessary. Units are arranged into buildings that integrate uses, community space, green spaces and circulation three dimensionally. In addition to vertical green spaces, the buildings feature ground-level courtyards, which form cooling microclimates and are adaptable to the needs of the residents.



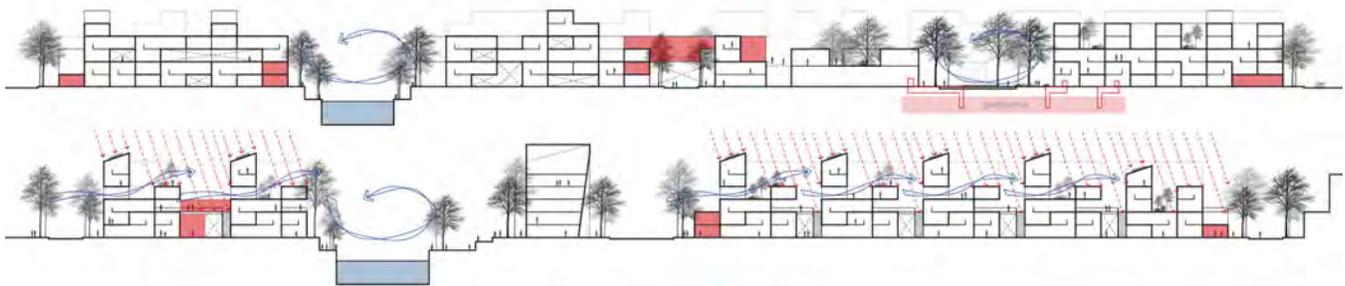
3.49. Multiple layers of movement and space

The proposed tree cover and vegetation scheme consists of evergreen trees located on the north sides of buildings to block winter winds and deciduous trees located on the south side to block the summer sunlight while allowing the winter sunlight when they lose their leaves. Groundcovers and shrubs diminish the amount of heat-absorptive surfaces for the sake of runoff. Pavement and building roofs are shaded by tree canopy coverage to reduce heat-island effects. The canal creates a channel between buildings resulting in cooled airflow to the adjacent buildings. In the residential areas, gray-water filtration zones that abut the canal serve the surrounding buildings.

The combination of low-rise buildings, mixed-use and high-density urban design form, controlled car use, alternative modes of transportation, integration of natural systems, and the creation of adaptable space result in the development of a livable modern development form that requires half the operational energy of high-rise projects at similar densities and less operational energy per household than even the traditional neighborhoods studied in Jinan.



3.50. Detail of form - energy strategies at the unit level

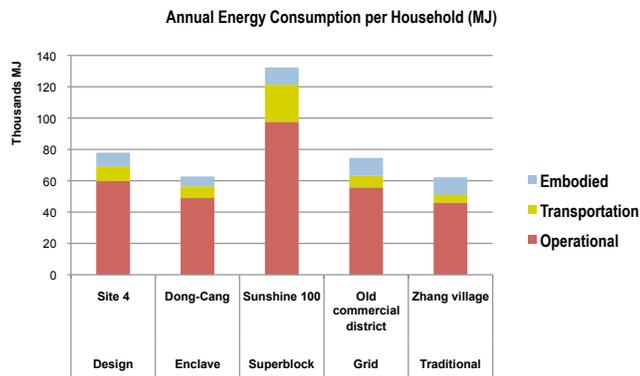


3.51. Section showing natural ventilation schemes, passive heating and heat island effect mitigation

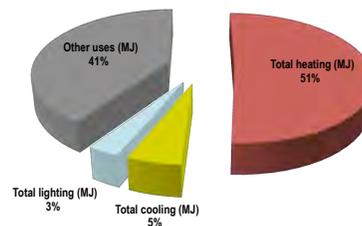
KEY FORM-ENERGY CONCEPTS: THE 3-D GRID

- The integration of mixed-use and high-density qualities, inspired by traditional urban villages, yields an urban environment in which neighborhood services are in close proximity to the inhabitants.
- Low-rise buildings are particularly prominent in this scheme in order to minimize excavation and embodied energy needed during construction, and to reduce the operational energy needed for climate control, elevator usage, and utilities.
- Controlled vehicular access, the availability of water transportation, and a rich, multi-level pedestrian realm throughout the site encourages pedestrian circulation.
- A network of canals and watercourses reaches all parts of the site, supporting water transportation and cooling airflow to adjacent buildings and spaces. In the residential areas, grey-water filtration zones that abut the waterways serve the surrounding buildings.

- Buildings structures and open spaces are intertwined for optimal operation of passive natural systems, and energy generation on site is integrated into the design.
- The core unit is a live-work loft that can accommodate a range of home businesses and is easily adaptable to changes in uses and size needs. The design accommodates seasonal climate, changes in the life stage of residents, and transformations of space usage over time.



Annual Operational Household Energy Consumption by Use (Site 4)



3.52. Annual energy consumption per Household (MJ)

3.53. Annual operational household energy consumption by use



mixed use | high density

- strategies
 - fine-grain | 3-D mixed use
 - focus on live | work units
- energy implications



low-rise

- strategies
 - majority of buildings <= 6 stories
 - human-scale buildings | streets | public spaces
- energy implications
 - reduces need for elevators
 - reduces embodied energy in building construction



limit car use | promote alternative modes

- strategies
 - small permeable blocks
 - trees + shading devices create pleasant pedestrian environments
 - many alternative transportation options
 - few parking spots [25/100 hh]
 - limited drive-up access
- energy implications
 - reduces transportation energy
 - reduces CO2 emissions from cars



natural systems

- strategies | passive
 - microclimates from canal | courtyards
 - different species of trees for different orientations
 - buildings designed for natural ventilation
 - shading devices | trees
 - southern exposure for residential areas
 - building stacking
 - on-site grey water treatment
 - rainwater harvesting
- strategies | active
 - solar + geothermal energy generation
 - canal water for building cooling
- energy implications
 - minimizes operational energy used for heating + cooling
 - reduces energy used for water treatment + transportation
 - reduces CO2 emissions



adaptable space

- strategies
 - units designed for easy expansion
 - personalized temperature control
 - customizable courtyards | public spaces create building + neighborhood identity
- energy implications
 - spaces adapt to needs | reduces unnecessary energy use

3.54. Overview of adopted energy strategies and their implications