

# HIGH LOW RISE 2

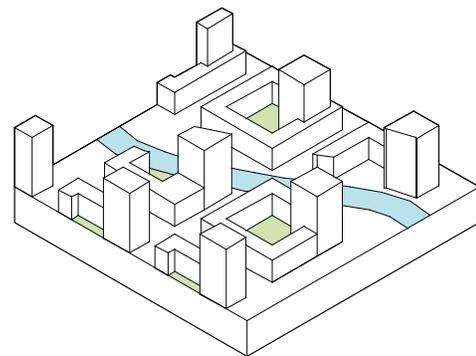
Traditional low-rise development can create high quality, low energy, places to live and work but cannot satisfy the density currently demanded in China. High-rise typologies have the potential for greater density but, as currently observed in the Chinese urban landscape, are not particularly dense, or energy efficient, because the buildings must be widely spaced. Dependent on the car, such developments do not typically incorporate convenient access to employment or any of the other necessities of daily life found in traditional, more integrated urban environments. In response to these

contradictions, the new High-low Rise prototype exemplifies how urban form can simultaneously address energy consumption and livability considerations.

The High-low Rise prototype is inspired by the traditional urban village form as seen in the Zhang-Jia Village and Furong Hutong in Jinan. As noted in the previous chapter, these traditional urban forms are characterized by low energy consumption patterns directly attributable to a highly mixed-use development of the ground plane with housing on the floors above. This arrangement offers the residents of the neighborhood



3.13. Shopping on a street well defined by perimeter blocks





3.14. Bird's eye view showing a mixed typology of towers and perimeter blocks, green roofs and courtyards

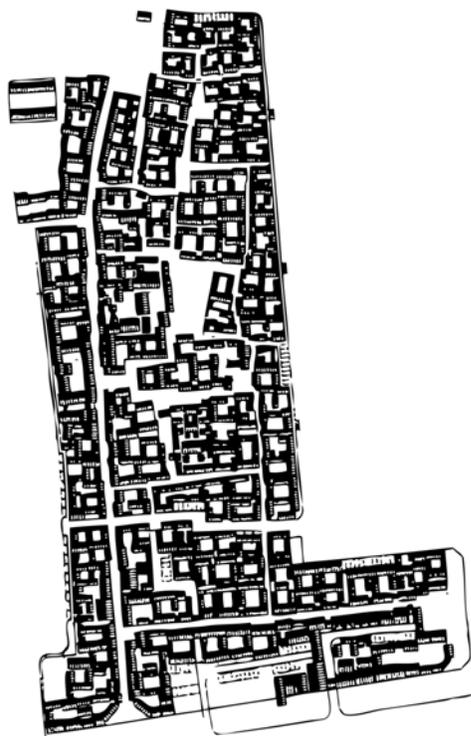
easy access to employment opportunities, shopping, neighborhood services, schools, and even recreational offerings (in the natural springs and pools) reducing travel and operational energy consumption.

These neighborhoods can accommodate such diverse kinds of activity yet still deliver good living conditions because of the courtyard arrangement of the buildings. A fabric of courtyards can accommodate intense activity along public streets, while at the same time providing relaxed semi-private living space within the courts. These courts also moderate the microclimate increasing comfort in the summer and

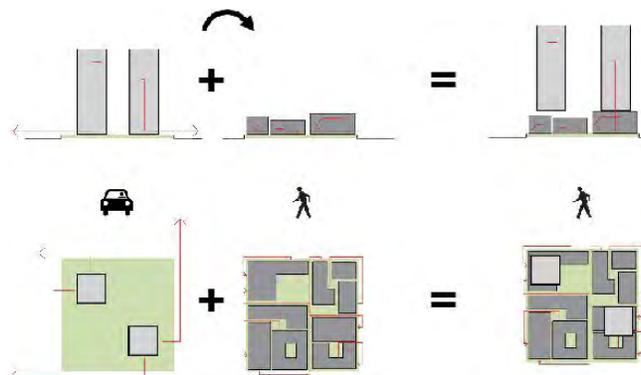
winter and reducing energy consumption. To capitalize on these advantages the new prototype integrates a contemporary adaptation of traditional fabric with high-rise structures.

### GENERATIVE IDEAS

As shown in the accompanying diagrams, the High-low Rise urban form is composed of distinct building clusters. The prototypical cluster consists of a perimeter of low-rise structures defining an interior courtyard, and includes at least one high-rise tower. The central courtyard provides semi-private open space for



3.15. Traditional porous plan texture



3.16. Generative diagrams



3.17. Mix of uses in a well proportioned streetscape



3.18. Cluster plan showing how perimeter blocks adapt to landscape features and a variety of open spaces

the residents and moderates the microclimate. It also provides space for geothermal wells that assist heating and cooling. To minimize casting shadows on adjacent structures, the high-rise buildings are strategically placed to take advantage of the courtyard spaces.

Added together, the clusters yield a fine-grained, mixed-use environment that includes high-rise development within a conventional grid of human scaled streets and blocks. The density of this new

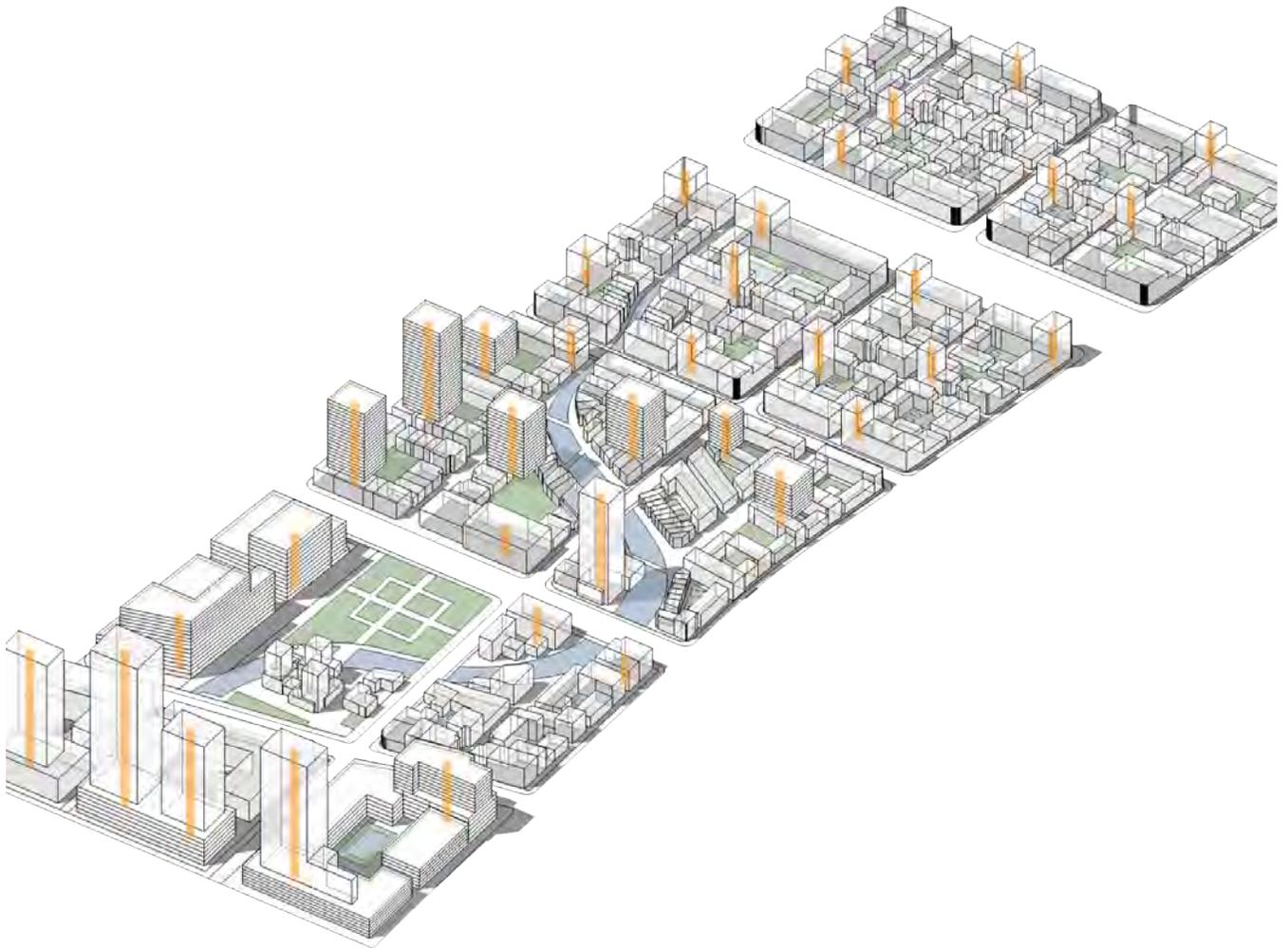


prototype is considerably higher than the “tower-in-park” developments of Jinan, such as Sunrise 100. Yet the new design offers a pleasant urban experience, characterized by increased livability, walkability, and activity options. The cluster plan illustrates a section of the proposed neighborhood along the canal, near the center of town. There is a clear hierarchy of access and public spaces, ranging from intense retail, restaurant and entertainment activities along the canal, to services developed on the streets, to semi-private interior courtyards for residents and school children.

### SITE ORGANIZATION

Moving up in scale, the neighborhood site plan demonstrates how the system can be adapted to serve various uses and densities. Overall, the neighborhood is unified by the canal, which meanders north-south across a loose grid of streets and blocks, providing a distinctive, continuous public realm. Along the way, it passes through three distinct zones of activity. The north is primarily a residential district with supporting community services and shopping. The center of the neighborhood is characterized by highly mixed land uses, pedestrian, and tourist activity oriented mainly around the canal. The southern portion—close to the center of town—is predominantly commercial, containing offices and several key cultural institutions. In all areas, the courtyard cluster and the integrated High-low Rise building pattern is prominent.

Note that the courtyard form is loosely applied, adapted in scale and shape to fit local conditions and the demands of different types of uses. In the north, the pattern is fine grained, with a smaller scale grid of streets and building footprints. To the south, the



3.20. Site axonometric view showing elevator shafts

grain becomes coarser to accommodate larger scale structures. Looking more closely, in one case two courts have been combined to create a larger interior space, elsewhere there is no space at all or the perimeter form has been broken to admit sunlight. As a result, while the pattern is consistent overall, each courtyard, street and public space is unique: the pattern is fractal.

At all scales, the theme of water is carried across the site. In addition to the canal, water dots the landscape of courtyards, moderating the microclimate and sustaining vegetation. This also harkens back to the traditional fabric of Jinan where the courtyards were developed around natural springs.

## BUILDINGS AND SYSTEMS

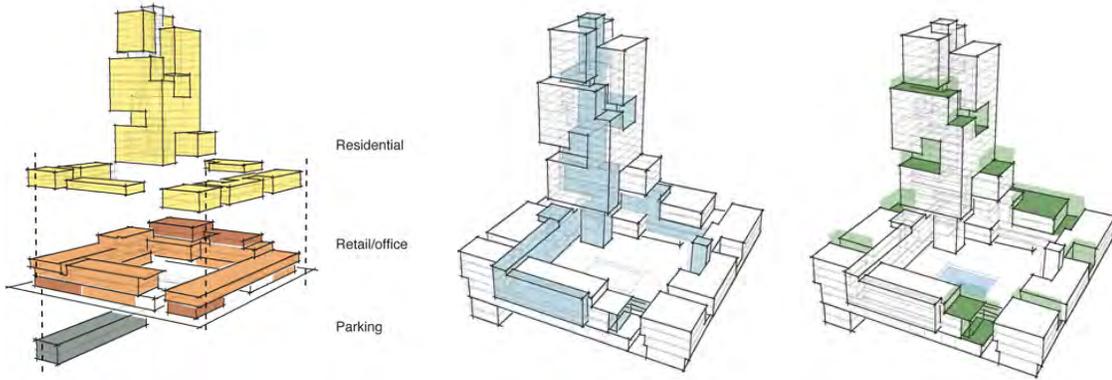
An unusual feature of the scheme is that high and low rise elements of each courtyard cluster are designed to act as an integrated unit from an energy perspective. Thus each tower is designed with an interior ventilation atrium that can naturally draw air from the entire complex. Through an integrated building-heat exchange system, spaces connected to the atrium expel either hot or cold air depending on the season and the time of the day. Additionally, floor plates constructed of concrete core slabs provide for unit-to-unit exchange of conditioned or heated air. The open floor plan allows for adaptability as the needs of residents or other users change and offers a way to divide space to create discrete temperature zones. The combination of the open floor plan with the central atrium offers natural ventilation, limiting the need of HVAC usage and decreasing operational energy consumption.



3.21. Rendering of typical tower - perimeter block

The functionality of the system is enhanced by the creation of multi-level interior gardens, which like 3-D courtyards help to clean and moderate the atmosphere inside the building. Centralized heating, plumbing, mechanical, and electrical systems that serve the entire cluster contributes to material efficiency, the maximization of the usable space volume and the adaptability of the units. Finally, integrating a high-rise tower with walk-up buildings on the periphery minimizes the use of elevators.

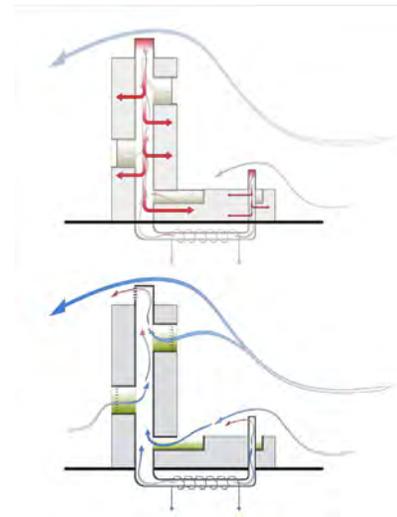
The High-low Rise typology yields a dense mixed-use neighborhood of high accessibility that provides residents with daily amenities, sufficient FAR, and meets sunlight requirements, all within a realistic design that can be replicated throughout the city at different scales. This new prototypical urban form outperforms the energy consumption of “typical” high-rise developments in Jinan at a rate comparable to the older, lower-density developments of the city, partly by encouraging pedestrian and non-automobile travel.



3.22. Cross section showing green roofs, planted terraces and courtyard

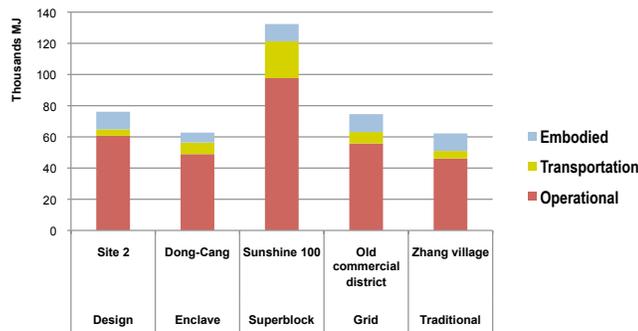
## KEY FORM-ENERGY CONCEPTS: HIGH-LOW RISE

- The integration of high-rise with low-rise forms creates a high density neighborhood that is human scaled and energy efficient, combining valuable qualities of the two prototypes.
- The new urban form provides services and amenities that residents need daily within close walking proximity creating a highly functional and livable environment.
- The basic unit of development consists of a mixed-use perimeter block of 4-6 stories enclosing an interior courtyard, and includes one or more high-rise towers. The courtyard provides semi-private space for residents (or workers) in the cluster, and moderates the microclimate. It also provides space for geothermal wells which can supplement heating and cooling.
- Towers are carefully placed in each cluster to insure adequate sunlight in all residential units and beneficial shade in the summer months.
- Clusters are organized into a semi-grid of streets and pathways defining an active public realm. This basic pattern is loosely applied across different uses and scales, adapted to conform to local conditions.

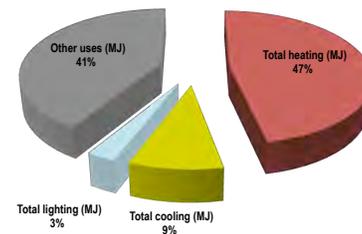


### 3.23. Natural cooling scheme

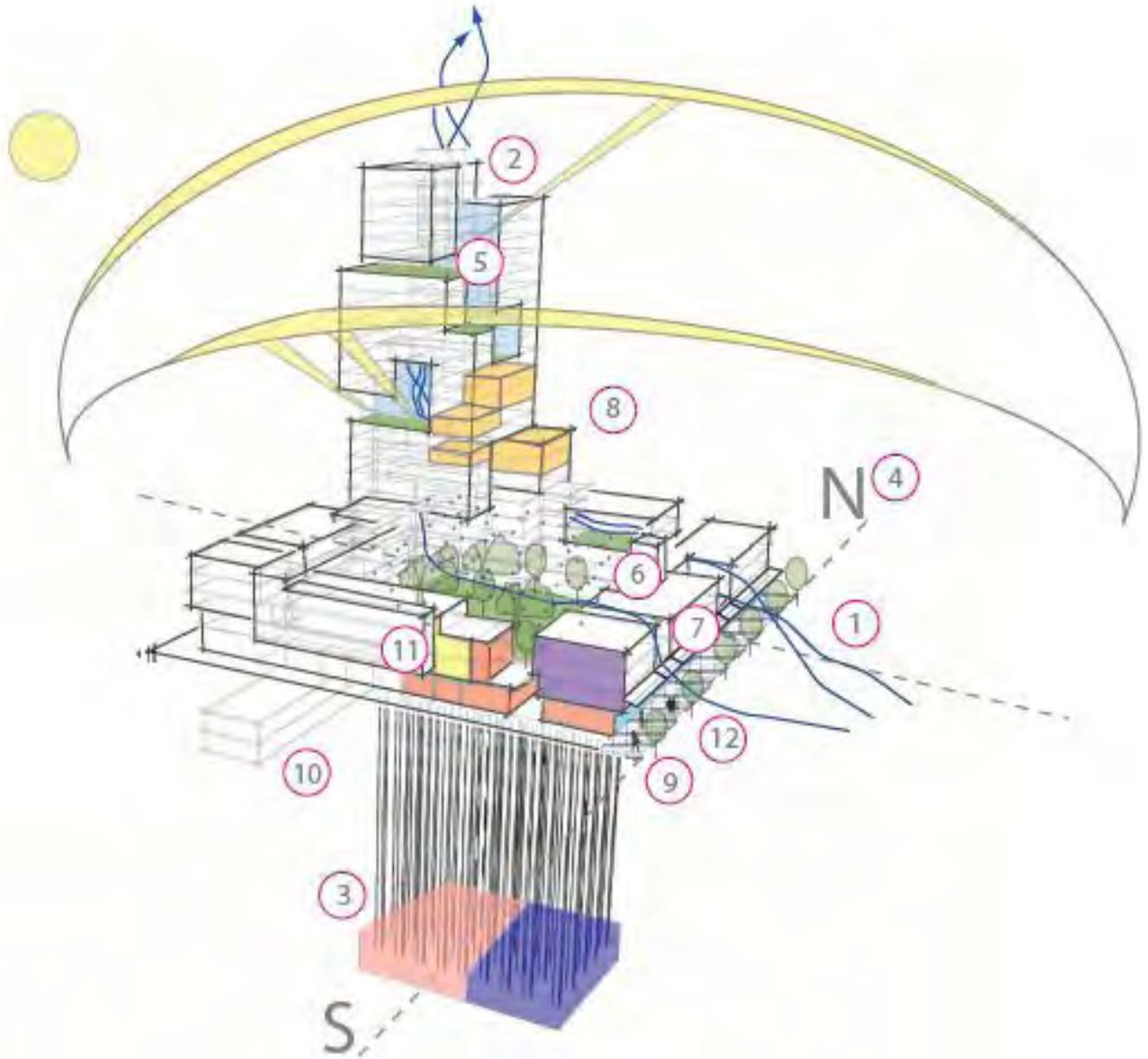
- A canal meandering across the grid creates a zone of special spaces and activities, while connecting all zones of the neighborhood. Water is a theme throughout.
- High-rise buildings in the cluster are designed with interior vertical spaces that serve as wind towers, drawing air naturally from all parts of the cluster. The high-low rise concept includes an integrated heating and cooling system among commercial areas in the bottom and the residential areas in the top, balancing energy demands and reducing overall consumption.



3.24. Annual energy consumption per Household (MJ)



3.25. Annual operational household energy consumption by use



3.26. Form - energy components