# MAKING A NEW DISTRICT CENTER USING EIGHT PRINCIPALS

## CHENGGONG, A NEW TOWN NEAR KUNMING, CHINA

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Chenggong overview.
Courtesy of Chenggong Land Service Center

## INTRODUCTION

*Kunming, the capital of Yunnan Province, has been the focus of tremendous urban expansion over the past decade. To accommodate this growth, four new planned towns will be constructed. These new towns and Kunming will be inter-connected by a robust transit network consisting of several bus rapid transit (BRT) lines and two Metro lines.*

*Chenggong, the largest of the four planned new towns, will become the new provincial capital. The site for this new town, located 15 km southwest of Downtown Kunming, has an area of 160 square kilometers which extends east to west from the foothills of Liangwang mountain range to the banks of the picturesque Dianchi Lake. Within this area there are several cultural sites of local and regional importance as well major natural landmarks (see Figure 1), such as Kuige Tower, Dianchi Lake and Longtan Mountain. The area has a strong local tradition of horticulture, and the Dounan Flower Market in Chenggong is reputed to be Asia's largest wholesale flower market.*

*In recognition of the ecological wealth of the region, the development of the new town was intended to promote a low carbon footprint by achieving an overall jobs/housing balance and the provision of rich transit opportunities.*

*The program for Chenggong New Town calls for the creation of an education focused center which would include nine universities and colleges, a major new center for education, as well as research and related centers. It will establish Chenggong as a knowledge base for the entire region. In addition to a comprehensive mix of academic and research facilities, the 1,500 hectare education center program includes residences for approximately 20,000 teachers, a total student population of 150,000 and houses for displaced villagers. .*

*An indication of the importance of Chenggong is its planned high speed rail hub at Kunyu Rail Station which will ultimately serve an estimated 200,000 passengers each day. Its three high speed rail lines will connect Kunming to Shanghai, Chongqing and Guangxi. It is estimated that by 2020, the annual number of passengers would reach 31.2 million and by 2030, 44 million. There are also proposals to extend the rail network across the border to South East Asia.*

## FEATURES OF THE EXISTING PLAN

Construction of Chenggong began about 12 years ago. At present, the population of Chenggong is estimated to be 300,000 but is expected to reach 1,500,000 over the next twenty years, with over 625,000 jobs incorporated into mixed-use districts.

The future city center, which is called the Central Area of Chenggong is an area of 8km2 (see Figure 3). It will be Chenggong's future commercial and activity center with a high development capacity.

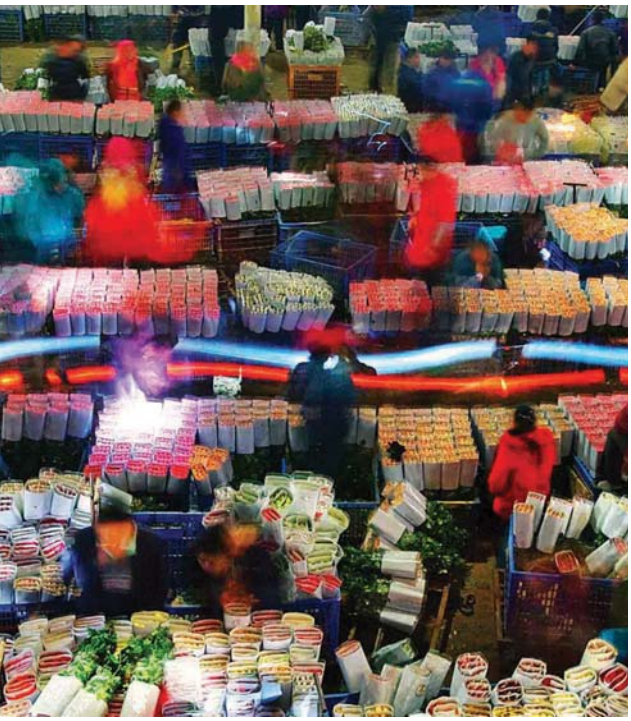

Figure 1: Natural and cultural landmarks

THE GOVERNMENT CENTER PARK AREA

YUNNAN UNIVERSITY

THE GOVERNMENT CENTER

KUNYU RAIL STATION

Figure 2: Chenggong existing conditions


Figure 3: Chenggong Central Area

Like the whole District, the City Center's original design was quite car oriented. Little had been built except segments of primary roads. The planned urban form was a super block road system (the scale of blocks was around 300 to 500 meters and roads were 40 to 80 meters wide). Figure 4 shows some of the built-up blocks surrounding the area.

After the construction of Chenggong began, an analysis of the existing plan and built areas was conducted. This study found that while its physical footprint respects the natural environment, preserving and enhancing the lake edge as well as the natural topography of local hills and the surrounding mountains, and that the overall development is dense and served by multiple transit lines and technologies, the plan lacks walkable, mixed-use neighborhoods and transit centers. The analysis also found the following problems which are typical of a car oriented development approach:

1. The wide roads and giant intersections are major barriers for pedestrian and bicycle movement;
2. Large mono-functional blocks make connections between origins and destinations difficult, which encourages automobile travel;
3. Big building setbacks along roads block interactions between pedestrian and buildings thus make streets lack of human touch;
4. Distantly spaced buildings and large open spaces reduce urban compactness, waste valuable urban land and make the city center economically less viable; and,
5. Low road network density tends to make auto-traffic concentrate on limited large-scale roads, which will cause traffic congestion and deadlocks.

See Figure 4, a giant intersection that becomes a major barrier for pedestrian to cross.

Figure 4: Built up roads inside the central area and blocks next to it

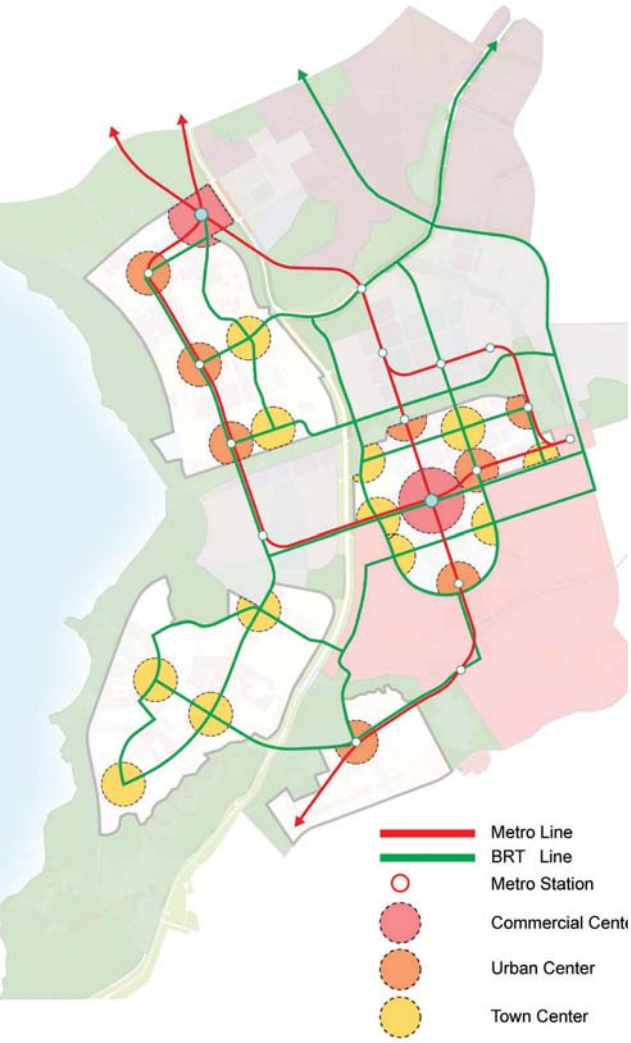


Figure 5: The centers inside and outside the central area

## DEVELOPING NEW PLANNING PRINCIPLES

Aiming to correct the problems in the previous plan, a new center city conceptual plan was developed by a consulting team headed by Calthorpe Associate[1]. Based on this conceptual plan, the consulting team then made a Regulatory Plan, which is the legal land use code for future development.

The planning objective was to build a walkable, bike-able city center. From this objective, eight planning principles were derived:

1. Develop neighborhoods that promote walking;
2. Prioritize bicycle networks;
3. Create dense networks of streets and paths;
4. Support high quality transit;
5. Zone for mixed-use neighborhoods;
6. Match density to transit capacity;
7. Create compact regions with short commutes; and,
8. Increase mobility by regulating parking and road use.

These principles can tailor the urban form to transit use, biking and walking. Compared to the dominant superblock and single use practice in China, which results in auto dependence, they will lead to cities where people are able and willing to take transit, bike or walk to their daily destinations, thus reduce fuel consumption, congestion and air pollution. These principles also reflect some of the key features of Transit Oriented Development (TOD), which is widely accepted as a sustainable urban development approach.

Figure 6: Rendering of the central area


Figure 7: Illustration of Caiyun Road

Figure 8: One way couplets

Figure 9: Auto-free streets

## Applying the Principals to the Center City

Given this basic framework, the central area was selected for modification to demonstrate how sustainable development approach can be applied to an 'in-progress' development area.

The central area is bounded by an expressway to the west, open space and existing development to the north, and the universities and colleges on the other sides. It has two metro lines with 6 stations, one of which is a major multimodal station combining the two metro lines. In addition there are multiple BRT routes and stations along with the high-speed rail station. In order to maximize the transit service, the consulting team tried to match the development density to the transit capacity (Principle # 6) by designating 3 types of centers by transit capacity: 'Commercial Center' is an area covering 800 meters around metro transfer stations that have 2 or more lines; 'Urban Center' is an area covering 600 meters around metro station that has only 1 line; and, 'Town Center' is an area covering 600 meters around a BRT station that has 2 or more bus routes. In all, the site has a rich transit network that creates one 'Commercial Center', four 'Urban Centers' and seven 'Town Centers' (see Figure 5). These station areas and their transit capacity then sets the hierarchy of density and mix within the overall central area TOD.

After designating the TOD area with large capacity transit stations, the overall plan for the area is developed using the dense network street system and detailed small block zoning (see Figure 6).

As construction of the old super block street network was already underway, the street easements and in some cases the completed street sections were modified. Foremost the central boulevard, Caiyun Road, a ten-lane arterial measuring over 80 meters was modified into a series of 'park blocks' (see Figure 7) with small one-way streets on each side. Rath-

| Control Measures | Requirements |
|---|---|
| Max. building height | 10 stories |
| Total max. FAR | 2.7 |
| Non-residential Max. FAR | 0.12/0.4 |
| Max. site coverage (net) | 40% |
| Min. green coverage | 30% |
| Street frontage | 70% - 90% for buildings fronting East/West streets; 60% - 80% for buildings fronting North/South streets |
| Max. and Min. street setbacks | 0-5m for buildings fronting East/West streets but 0-2m for at least 15m from street corner 0-2m for buildings fronting North/South streets. |
| Solar interval | Northside - building height limited to ROW dimension plus setback. Interior - 1:1 ratio between building height and distance to bottom of first residential floor |
| Tower max. floor plate | N/A |
| Primary pedestrian entry | Several entries are allowed. Primary entry must be located on and directly accessible to the most important public space or street that a parcel fronts. |
| Parking structures | Below grade parking structures are preferred in all cases and should be combined to reduce the height of any above grade structures |
| Parking ratio | Max. 1 spot/ dwelling unit |
| Parking entry/exit | Parking entry/access should not be located on 50m wide street, and be less than 20m from intersections |

Table 1: Multi-story residential site development standards

er than a central axis dominated by traffic and cars, the area now centers on green space that is pedestrian, bike and transit friendly.

Other major through roads were modified into pairs of one way couplets to provide for large volumes of cars without becoming barriers to the pedestrian (see Figure 8). Numerous auto-free streets were added to provide more opportunities and convenience for bikers and pedestrians (see Figure 9). Finally local narrow streets were added to increase access to the individual blocks. These changes produced a human scaled street and block system which averages 50 intersections per square kilometer and blocks that average 1.5 hectares each. The pedestrian never has to walk more than 70 meters to reach an intersection and the crossing of travel lanes is never more than 12 meters.

In all cases the redesigned street sections provide generous areas for pedestrians and safe, protected lanes for bikes. And perhaps just as important, the zoning requires street-level buildings, shops, cafes, and useful ground floor activities. Street-life and walkability are at the heart of the new street network.

Next the human-scaled blocks are zoned using six proto-typical small blocks ranging in density from 4.0 to 2.7 Floor Area Ratio (FAR) for residential blocks and 8.0 to 4.0 for commercial. Each of these 'small blocks' have a series of design standards which establish development controls. The design standards also detailed urban design criteria that ensures each development will contribute to the human scale character and low carbon goals of the district (see Table 1 for an illus-

Figure 10: Development near the station where two metro lines intersect

tration of residential blocks with FAR 2.7).

By clustering high density and commercial 'small blocks' at the key transit stations, the district gains a varied skyline as it rationally distributes jobs and housing close to transit opportunities.

Foremost is the commercial area of approximately a million square meters located at the crossing of the two Metro lines (see Figure 10). This area becomes effectively the focal CBD of the new town and the new town's regional retail destination.

Finally civic elements such as parks, schools, and public facilities are located to enhance their accessibility without auto use. The end result is that no child must walk more than 400 meters to a school or local park and residents never more than 400 meters to a transit station.

## GETTING EXCEPTIONS TO THE REGIONAL GUIDELINES

Planning rules in China are very hierarchical. Therefore guideline contained in the "Kunming Urban Rural Planning Management Technical Guideline" (hereafter called the Guideline) would also apply to the planning for Chenggong. However, this regulation defines many technical details in local land use planning which are very much pro-car standards and which directly conflict with the concepts that the 8 principles propose. As a result, these technical requirements had to be violated in order for the plan to be human scale.

The central area plan sets up a number of new standards in land use control, which broke the rules of the Guideline where they were not

| Road Width D (m) | Building Setback (m) |
|---|---|
| Express way | 50 |
| D>50 | 40 |
| 35<Dffi50 | 30 |
| 25<Dffi35 | 20 |
| 15<Dffi25 | 10 |
| Dffi15 | 5 |

Table 2: Building setback requirements in the Guideline

consistent with the 8 principles. The following are some of the breakthroughs comparing to existing requirements of the Guideline:

*1. Building setbacks are made much smaller*

The Guideline stipulates that building setbacks are principally linked to the width of the roads next to the buildings. In effect, wider roads have bigger building setbacks. As shown in Table 2 that is cited from the Guideline.

The standard may work without too much problem in the context of super blocks. However, it will cause major problems when the land blocks are small. For example, when block size is less than 150 meters, which is the case of Chenggong central area, the big setbacks may "eat up" all the land block and make any building type unfeasible to fit in the block. In addition, big building setbacks are the enemy of street vitality. Urban areas built under such standard are less compact, which makes land development economically less viable. Learnt from the urban morphology of traditional Kunming city center, a new standard requiring much smaller building setbacks were adopted, as shown in Table 1.

*2. Building frontage is controlled to ensure active street wall*

In additional to smaller setbacks, the continuity of street walls also has significant impact on street vitality. Instead of single point high-rise buildings, the plan proposes court-yard style block types, which call for a high percentage of building edges to cover the lines formed by the minimum building setback. As shown in Figure 11, the coverage rate is 70%-90% for buildings facing an East-West street, and 60%-80% for buildings facing a North-South street. This reflects the fact that East/West oriented properties, especially residential units, are less popular in the Chinese market.

*3. Building coverage and green coverage were allowed to have more flexibility*

Like many other Chinese new towns pursuing large scale open space, establishing large green areas in residential blocks is an important goal for the planning management authority, the developer, and the market. However, under the configuration of small blocks, meeting the open space demand is challenging. For example, the Guideline ,"... encourages raising building height, lowering building density so that there can be higher road density, more green coverage, and more open space". It further requires that green coverage shall not be lower than 30% for residential and 20% for commercial. This can be realized without causing much problem for large blocks, but will create very boring urban form for small blocks since buildings may be forced to be single slim high-rises. This is against the 8 principles. In order to increase the compactness, the building coverage and green coverage were relaxed.

*4. Intersections are smaller*

Large intersections are big barriers for pedestrian and bicycles. They are caused by a few factors, including non-human scale road width, big curb radius for right turns, and the typical practice of widening road near intersections to create additional traffic lanes, so called "channelization". These are all car-oriented treatments that violate the 8 principles. As mentioned before, one way couplets were used to replace the previously planned giant roads. In addition, curb radius were limited up to 10 meters based on a lower design speed for turning movement; and channelization is strictly limited to only a few built intersections.

*5. Mixed land use is allowed*

Mixed use in block level is not encouraged by the Guideline especially in the case of ground level commercial in residential buildings. The rationale is that it is detrimental to a healthy living environment due to noise and air pollution. However, a mix of commercial, residential and other uses is critical for creating 24 hour activity. Proofs of this are ubiquitous in Kunming's old city center. In the new plan, the rule of the Guideline was ultimately broken. Residential block are allowed to have 10%-20% commercial and commercial blocks are allowed to have up to 40% residential where necessary, and vertical mix uses are allowed in buildings.

*6. Parking supply is restricted*

Rapid urbanization and motorization made the practice of providing "enough" car parking mainstream in new urban development. Car parking requirements in the Guideline are linked to land use types. Each type has a minimum requirement, no limit for maximum, and does not allow variation by location. This is clearly problematic. For example, based on the 8 principles, some land blocks around metro station are assigned very high


Figure 11: Sketch block development templates in a small road network

Figure 12: Mix use block under construction

development capacity. If parking is allocated according to the Guideline, these blocks have to develop parking deep into the ground for no less than 5 building stories. This is not economically viable. To solve the problem, a differentiated parking strategy was introduced. The land blocks inside the Chenggong central area were divided into two types of sub areas according to their proximity to metro stations. The blocks that are closest to metro stations are allowed to cut their parking requirement by half. In addition to this, for the whole Chenggong central area, car-parking is capped and there is no minimum requirement.

*7. Pedestrian, bike and bus exclusive streets are introduced*

The use of public transit, walking and bicycles are considered low carbon green transportation modes and are given the highest priority for the Chenggong central area. In addition to two metro lines and several BRT lines every 600-800 meters, a bike and pedestrian only street network was planned. One street was designated to bus, pedestrian and bicycle only. The use of streets is not usually controlled in the city's legal land use code but the central area was made an exception.

The above exceptions to the Guideline are not trivial given that the mainstream approach of planning new cities is very much car-oriented as China is undergoing rapid motorization. Thanks to an article in the Guideline to allow "special areas" under certain circumstances, the central area of Chenggong was designated a "special zone" that applies its own standards.

## IMPLEMENTATION

In order to ensure that the road network is implemented in strict accordance to the new plan, a road network constructional planning was done later on. This specified every road section, intersection layout, under-ground parking access, road side parking, and the network wide traffic operation plan. All the built roads are expected to be adapted according to the new plan in the near term except for the Caiyun Road, as it is the primary road for through traffic before the area is fully built. Once the couplet along Caiyun opens, it might be ne-

cessary to reconsider the original proposal to change it into a park road.

Much work is underway to implement the new plan. At the end of year 2014, there were 5 sites under construction and 4 in the process of acquiring construction approval. Figure 11 shows the built condition for one of these projects.

Due to a major slowdown of the economy and cooling down of real estate market, the central area has been developed quite slowly. Developers who wanted exemptions from the plan, such as removing a road or changing its functionality (which is a typical practice in China) were rejected by the local government. The government has persevered in preserving the plan.

## CONCLUSION

China's urban area is expanding at an unprecedentedly fast pace. The built-up area has been increasing by an annual rate of 5.8% in the past two decades, which represents 1230 km2 new development on average each year, predominantly car-oriented and much in the form of superblock and giant roads. Making sure that the urban area is formed with the right gene is critical as it will have a long term impact on the sustainability of Chinese cities and a global impact on carbon emission, given the magnitude of development and population of China. The experiment in Chengong's central area deviates from the typical urban planning practice in the country. The 8 principles form a new urbanization paradigm that cares about people and urban vitality. The breakthroughs from traditional technical standards are essential to make the area human scale, transit oriented, walkable, and bike-able. It could be a milestone in the transformation of Chinese new urban development.

ENDNOTE

1 This plan was partially funded by the Energy Foundation.