#### **Executive Summary**

**Introduction.** Bearing in mind the refined direction of urban development adopted both by the Central and the local Chongqing government, and taking into account the strengths and pitfalls of similar developmental projects in China, we propose that the SOWeco-city be established in Wangjia and Mu'er, Liangjiang.

Project overview. The SOWeco-city will be divided into 5 zones, each featuring an industry to be developed.

Zones	Features / industries	Description
Qingqin Hu Eco-Leisure Habitat (書沁湖休閒生能區)	Agriculture	• Agriculture: Precision farming with advanced technology, urban farming
(月心研水閒生態區) Oinggu Villa (書絵林星)	Ecotourism     Residential	Eco-tourism: Resort notels, B&B, waterpark, naoitat trail, smartphone app
Qingyu Village (青渝村)	Residential	<ul> <li>Open space: urban greening, landscape parks</li> </ul>
Qingyu Town (青渝小城)		<ul> <li>Amenities: commercial streets, electric buses</li> </ul>
Qingyu Education, Research	<ul> <li>Education</li> </ul>	• High-tech industries, eco-laboratory (geothermal power research)
and Development Zone (青渝教育科學園)	• R&D (green tech, precision engineering)	Educational and technological institutes
Qingyu Airport Free Trade Area	Trading	Bonded processing, logistics, electronic maintenance
(青渝臨空自由貿易園)		Agricultural trade area
Grand Park (錦柏公園)	Social interaction	Pop-up Farmers' Craft and Flea Market
		· Barrier-free access and ageing-friendly environment for social integration

#### Policies and measures.

Aspects	Section	Policies	Implemented site	<b>Concerned stakeholders</b>
Environmental	2.3.1	<ul> <li>Geothermal power exploitation</li> <li>State subsidies (国家专项资金补助)</li> <li>Seek technological inputs from university- affiliated companies</li> </ul>	<ul><li>Power plant: near SOWeco-city</li><li>Heat pumping system: whole city</li></ul>	<ul><li>Developers</li><li>Developers</li></ul>
		<ul> <li>Dedicated eco-laboratory</li> </ul>	Qingyu Education, R&D Zone	<ul> <li>Scientists</li> </ul>
	2.3.2	Green transport Connect with Yuelai's electric-powered shuttle bus routes Induction Power Transfer System	Whole city	Local residents
	2.3.3	Smart green buildings • Recycled construction materials, solar panels • Grey water collection system, food waster recycling system	<ul> <li>Qingyu Education, R&amp;D Zone</li> <li>Qingyu Villa, Village &amp; Town</li> </ul>	Local residents
	2.3.4	Key Performance Indicators	Whole city	Government
Social	2.4.1	Rural-urban integration <ul> <li>Dual housing types: flats or villages</li> <li>Employment: farmers and/or eco-tourists</li> </ul>	<ul> <li>Qingyu Villa, Village &amp; Town</li> <li>Qingqin Hu Eco-Leisure Habitat</li> </ul>	Local residents (especially village farmers)
	2.4.2	Ageing-friendly designs <ul> <li>Barrier-free access, elderly facilities &amp; activities</li> <li>Smart housing: auto-detect sensors, safety bells</li> </ul>	<ul> <li>Qingqin Hu Eco-Leisure Habitat</li> <li>Grand Park</li> <li>Qingyu Villa, Village &amp; Town</li> </ul>	Local residents
	2.4.3	Eco-cells concept: promote walkability	Whole city	Local residents
	2.4.4	Smartphone app • 'CityBuddy' for eco-tourism • 'Big Event Calendar' for social integration • Users as sensors for crises management	Whole city	<ul> <li>Tourists</li> <li>Local residents</li> <li>Government</li> </ul>
Economic	2.5.1	<ul> <li>Regulations on free trade area</li> <li>Simplify customs procedures</li> <li>Comprehensive regulatory body for border check</li> <li>Flexible visa applications for frequent visitors</li> </ul>	Airport Free Trade Area	Investors, logistic workers
	3.2.2 3.2.3	Funds to attract investments <ul> <li>Joint-venture eco-friendly fund</li> <li>SOW Foreign Assistance Programme</li> </ul>	Whole city	Investors (especially small and foreign)
Political	2.5.2 2.5.3	<ul> <li>Supporting policies</li> <li>Strengthen environmental laws enforcement</li> <li>Education &amp; publicity on environmental awareness</li> </ul>	Whole city	<ul> <li>Government</li> <li>Students / local residents</li> </ul>
	3.4.1	Set up lead institution (市级生态城市建设工作领导小组)	Whole city	Government

**Conclusion.** With the "Spatial + Operation = Workable" concept, the SOWeco-city will be a pioneer in China.

## 1. Existing Realities and Constraints

The following is based on a SWOT analyses of the Yubei area, our targeted site of the SOWeco-city.

**1.1 Demographic**. Yubei has its inherent weakness in population structure: population ageing and migrant inhabitants. In 2013, more than 65% of its population is aged 35 and over<sup>1</sup>. We expect its local population pyramid to become even more inverted after the completion of the SOWeco-city. We have accordingly planned facilities for elderly in our residential and recreational areas. We will also develop high-tech zones to attract young talents and to alleviate the ageing problem. In terms of immigrants, up to 37% of residents in Yubei do not possess a local household registration (*hukou*)<sup>2</sup>, highest among the 9 areas in Chongqing. We have strategically placed educational facilities to ensure equal and fair upward social mobility for their descendents.

In terms of strengths, compared with the Central Government's goal to urbanize 60% of its population according to the "National New-Type Urbanization Plan (2014-2020)", Yubei already possesses an urbanisation rate of 78.7% among its 1.5 million inhabitants<sup>4</sup>. The urban population will support our trade and research zones, whereas the remaining rural population is crucial to the agricultural and eco-tourism industries.

**1.2 Geographical**. Wangjia and Mu'er where the SOWeco-city is located, is surrounded by 400m-tall mountains and is inherently inaccessible from the old city centre of Yuzhong. Located near the airport, the city is subjected to air and noise pollution. Our Free Trade Area, located in between the main city area in the SOWeco-city and the airport, may solve this and improve residents' quality of life.

**1.3** *Political*. The current Liangjiang Developmental Blueprint originally zones Wangjia as an 'industrial hub', and Mu'er as an 'agricultural base and rearing centre'<sup>5</sup> adjacent to other zones, which are proposed to house different strategic industries (more details in section 4.2). Instead of competing with other zones, we envision that our proposed eco-city will seize this opportunity and lead its neighbours to progress congruently. Together, they can enjoy the effects of economy of scale and a collective increase in competitive edge.

In terms of governance, the political culture of Chinese governments emphasises on individual competitiveness. Local departments or governments may pursue their own goals and targets, overlooking the overall mission. Structurally, when tackling issues that cut across policy portfolios, individual bureaus may also lack the capacity to steer inter-agency planning. To tackle this potential risk, we recommend a lead institution be set up to enhance multi-departmental communication. This holistic approach, connecting various agencies, can effectively resolve cross-cutting bureaucratic issues.

**1.4** *Economic*. Financial input to the eco-city may be a concern, as smart and green designs require huge funding. Prior to construction, various measures (detailed in section 3.2) can attract investments. After completion, we plan to utilize existing community resources, so that the SOWeco-city will be self-sufficient in urban farming, ecotourism and other industries, providing employment opportunities for all residents.

There are institutional constraints too. Firstly, a new tax policy has been issued for the transportation industry in 2013, which requires companies to pay added-value tax instead of business tax, posing significant economic pressure to small and medium-sized enterprises (SMEs). Secondly, as most Chinese logistic giants are stably operating state-owned enterprises (SOEs), they have little motivation to innovate and bring their business model to a higher level. These two factors lead to a large number of vacant logistic zones in China nowadays. However, having evaluated their pitfalls, we concluded that our logistic zone possesses a competitive edge as we will manage them professionally and allow companies of various sizes to enter easily.

## 2. Proposed Concept for the Eco-city 2.1 Overview

*2.1.1 Rationale.* Drawing from the pitfalls of other eco-cities, we emphasise less on spatial planning but more on actual operation. The project is named **SOWeco-city**, which means **"Spatial + Operational = Workable"**.

**2.1.2 Site specifics.** Taking up 61.5 km<sup>2</sup> of slightly hilly land, our chosen site in Wangjia and Mu'er currently mainly comprises greenfield sites with scattered villages nearby. Our targeted population density is  $5200/\text{km}^2$ , which is relatively low when compared to other eco-cities<sup>6</sup>, as we plan to house the inhabitants in a variety of housing options, ranging from village houses to buildings. The SOWeco-city will be divided into 5 zones:



- 1. **Qingqin Hu Eco-Leisure Habitat** (青沁湖休閒生態區): A green area around the Xinxing Reservoir, it supports precision farming and features a herb garden. Resort hotels and Bed-and-breakfast options will provide incentives for eco-tourists who will enjoy the Waterpark, Habitat Trail and a taste of urban farming, facilitated by a smartphone application ('app') for the SOWeco-city.
- 2. **Qingyu Villa (**青渝林居), **Qingyu Village (**青渝村), **Qingyu Town (**青渝小城): They collectively provide housing neighbourhood that are oriented with smart technologies and open-space (with the concept of eco-cells) to enhance livelihood.
- 3. **Qingyu Education, Research and Development Zone (**青渝教育科學園): High-tech industries and eco-laboratory are established, with one part of it dedicated to geothermal power research. There will also be a Creativity Centre where young entrepreneurs are nurtured to set up their own enterprises. The Youth Innovation Initiative encourages young residents to contribute back through scientific research.
- 4. **Qingyu Airport Free Trade Area (**青渝臨空自由貿易園): As with the original Developmental Blueprint, bonded processing, logistics, electronic maintenance will take place here. We also suggest an agricultural trade area for distributing produce from the Eco-Leisure Habitat.
- 5. Grand Park (錦柏公園): This is a park with novel concepts unheard of in China. There will be pop-up Farmers', Craft and Flea Market to encourage social interaction. The aforementioned app will include a 'Big Event Calendar' to remind residents of the events and enlist their participation. It will act as a 'ribbon park system' to interconnect/separate the three residential zones.

**2.1.3 Justification for site selection.** The present Liangjiang New Area sees urban development mainly in Jiangbei. We see a need to utilize the strategic locational advantages of Yubei as a "North Gate to the inland areas of China"<sup>7</sup>, for developing ecotourism and building regional resilience through ensuring food security.

Our proposal also pays reference to the Developmental Blueprint<sup>8</sup>. It announces that two railways be constructed in Yubei. Our eco-city, benefited from the enhanced internal connectivity in Yubei, could also capitalize the strong external connectivity of Jiangbei International Airport (2-minute drive away) and Konggang Xincheng 空港新城 (10-minute drive away maximizing the area's inherent developmental potential.

The Blueprint originally zones Wangjia as an 'industrial hub', and Mu'er as an 'agricultural base and rearing centre'. Having foreseen the high probability that local farmers will be relocated, and workers' commute time will be long due to the lack of residential areas nearby, we propose the SOWeco-city, which still develops the above industries but in a more environmentally-friendly way, to enhance rural-urban integration.

## 2.2 Economy

3 types of economic activities are highlighted in the SOWeco-city: industry and trade; education, research and development; and tourism. They are strategically developed in their respective zones. Detailed financial analyses can be found in Table 1.

**2.2.1 Trading**. Located in the *Qingyu Airport Free Trade Area*, this will feature target industries like aviation transport (空港物流园), agricultural produce packaging, IT, telecommunications, high end products export, etc. With favourable free trade policies listed in section 2.5.1, trading industries will flourish in the SOWeco-city.

**2.2.2** Education, research and development. Referring to successful examples in the Hong Kong Science and Technology Park, the *Qingyu Education, Research and Development Zone* will include R&D buildings, laboratories and MICE venues, technological institutes and schools. The target industries are green technology, materials and precision engineering, medicine and telecommunications.

**2.2.3** *Tourism*. Economic activities in the Qingqin Hu Eco-Leisure Habitat will generate revenue through hotels and tourists' spending in eco-tour guides and WaterPark etc.

**2.2.2 Housing**. Residential areas, divided into 3 zones of 'villa', 'village' and 'town', are carefully planned too, in terms of their GFA, greening ratio, parking space and suggested selling prices (refer to Table 2). They will be supplemented by commercial streets, electric buses and landscape parks. All housing designs, detailed in section 2.3.2, are expected to be certified as LEED Gold and 3-star-green (三星级绿色建筑). This may increase the construction cost by 120%, but will eventually lead to a greener and smarter neighbourhood.

## 2.3 Eco-features/standards/KPIs

**2.3.1 Geothermal power**. Geothermal energy is currently underused in China, which produced only 0.008% of that by the United States<sup>9</sup>. Chongqing's stratum, composed mainly of sand and mudstone with a conductivity of 2.0-3.8 W/(K·m), is optimum for developing geothermal energy<sup>10</sup>. A geothermal power plants can be set up near the SOWeco-city with a connecting heat pumping system. Referring to an example with similar geological features in Guatemala<sup>11</sup>, we project that the power plant platform will occupy an area of 50m×150m. According to the European Geothermal Energy Council (EGEC), it will take 8 years for the 5 stages of establishment from exploration to operation<sup>12</sup>.

Establishing geothermal power plants is advantageous to SOWeco-city. Environmentally, through utilizing resources at the Tongjingxia Scenic Spot, it can generate sufficient energy for the city while saving up to 60% of energy, realizing the efficiency goals set in the central Government's "Energy Efficiency Laws"<sup>13</sup>. Economically, it can reduce 30–70% operation costs when compared to non-renewable power plants<sup>14</sup>, hence

inhabitants can be relieved from high electricity costs in cold winters. For example, an Anhui geothermal power plant helped its households save ¥1600 per month<sup>15</sup>. ¥2.3 billion could be saved in the long run.

The high costs incurred in geothermal energy may be a concern. EGEC projects a total expense of ¥252 million to ¥468 million<sup>16</sup>, whose initial expenditure, we expect, could be subsidised by the State (国家专项资金补助), as in the case of Anhui<sup>17</sup>. Developers may receive further subsidies in the future according to China's renewable energy policies. Funding and technological inputs could be sought from energy companies supported by universities, such as the China University of Geosciences<sup>18</sup>.

We acknowledge that developing geothermal power requires high technological know-how and stringent environmental regulations. We will thus dedicate a part of the Education, Research and Development Zone on resources drilling and engineering, in order to prevent groundwater pollution due to excessive substandard exploitation of resources to support the city's booming economic development.

**2.3.2** *Green transport*. Our eco-city also encourages a lower reliance on automobiles. An interzonal autonomous bus route shall be set up to increase roadway capacity and better manage traffic flow. The route shall connect to the Yuelai Eco-city's electric-powered shuttle bus routes<sup>19</sup> to enhance inter-eco-cities' integration and connectivity. If financially and technically viable, the recently developed Induction Power Transfer System (IPTS) for electric vehicles shall also be applied on a city scale to increase transportation cost-efficiency<sup>20</sup>.

**2.3.3 Smart green buildings**. Eco-cities function by integrating environmental ideals and technology<sup>21</sup>. Green buildings, which abide by the principles of water conservation, energy efficiency and disaster prevention, will be constructed using recycled construction materials<sup>22</sup>. Solar panels will be planted on their roofs and buildings will have individualized indoor climate control to conserve energy. Within residential buildings, 'Grey water collection system' and 'Food waste recycling system' will be installed. Grey water refers to inorganic sewage from showers, bathroom sinks and washing machines, excluding that with faeces or from kitchen wastewater<sup>23</sup>. Upon collection, it can be processed for use in toilet flushing, irrigation and cleaning. Food waste can be treated and converted to biofuel or animal feed<sup>24</sup>. They support the establishment of a self-sufficient community.

**2.3.4 KPIs**. A set of "Integrated Evaluating Indices System" has already been developed for eco-cities in Chongqing, which aims at describing, monitoring and evaluating the eco-cities' performances comprehensively<sup>25</sup>. They not only keep the developmental plans in line with the Central government's expectations and prevailing international practices, but also keep the project on track according to deadlines. Noting the local context of our SOWeco-city in Chongqing, we will adapt it as our KPIs, which include subgroups of indices on greening, pollution, environmental quality; economy, demographic composition; quality of life and social security.

## 2.4 Society/Community Building

**2.4.1 Rural-urban integration**. Rapid city development has led to apparent bipolarisation of the urban and rural population. A healthy eco-city caters to the needs of the two types of household *hukou* holders through careful urban planning, giving them equal educational opportunities and infrastructural support<sup>26</sup>. Our mixed type housing in Qingyu Villa and Qingyu Village provides dually residential flats in high-rise buildings, and traditional village-type housings, making sure that migrant workers and local rural-dwellers can be housed according to their needs and financial abilities. This can, together with the multiple employment opportunities

in agriculture and ecotourism as aforementioned, hopefully provide a smooth transition for agricultural *hukou* holders who aspire to convert into urban residents.

**2.4.2** Ageing-friendly city. Barrier-free access accompany most housings in the city. The Grand Park and Eco-Leisure Habitat will be equipped with walking routes in slopes, instead of stairs, to promote healthy lifestyles even for wheelchair users. Similarly, senior citizens enjoy the benefits of our city safely and harmoniously. Meeting the goal of establishing responsive infrastructure systems, smart housing are designed with sensors auto-detecting household safety issues and virtual connection to a central emergency centre can be incorporated in selected flats. Elderly could report any case of emergency easily by pressing a button. Elderly-friendly facilities and activities in the Grand Park helps enhance social integration and let elderly live their sunset years fulfilled.

**2.4.3 'Eco-cells' concept**. By providing all basic necessities and public welfare facilities within a comfortable walking area of 400mx400m, we aim to enhance walkability in neighbourhood. We will make an effort to ensure that basic medical care is provided in walkable distance, so that our residents can live healthily under the safety net. As the housing areas are separated into eco-cells, we can better plan public space and urban greeneries in the city.

2.4.4 Smartphone technology. As mentioned in section 2.1.2, a smartphone application ('app'), 'CityBuddy' will be developed for the SOWeco-city exclusively. Smartphones are becoming increasingly popular among Chinese, with a market penetration rate of 92%<sup>27</sup>. This app will facilitate communication between the local government and residents, informing them of important dates through the 'Big Event Calendar'. It also supports a forum function to enhance social integration. Possessing first-hand information of the city, it will provide added value to eco-tourism, as tourists can glimpse into the day-to-day lives of our inhabitants, and obtain all travel information in the one-stop-shop. Eco-tour guides can be recruited using the app, which gives local farmers extra income to support their living. The government can also get first-hand information from users about emergency crises in city, facilitating resources deployment and immediate management.

### 2.5 Regulations

2.5.1 Economic. Other free trade areas in China could not maximise their potential because of inefficient management, e.g. too complicated procedures and stringent customs regulations; and a disparity from global standards on customs management, tax collection system and foreign exchange policies. In view of this risk, we propose the following upgrades on our Airport Free Trade Area ("一線放開、二線管住、區內自由")<sup>28</sup>: Firstly, simplify the customs procedure at border. Secondly, establish a comprehensive regulatory body composed of customs, marine, tax personnels at customs for one-off checking of goods. Thirdly, allow flexible visa applications for frequently visiting foreigners. These measures can ensure that our Free Trade Area will operate to its optimum, and will play a unique and leading role among other free trade zones in China.

2.5.2 Environmental. Urban development will inevitably pose risks on the environment. Several existing legislations in the Chongqing Municipality may regulate these potential environmental damage, on aspects of forest management, wetland protection, biodiversity preservation (《重庆市森林建设促进条例》,《重庆市 森林防火条例》,《湿地保护条例》,《重庆市生态效益补偿办法》)<sup>29</sup>. We will pay heed to them in the course of our development.

**2.5.3** Social. Education is essential in ensuring the ideals of our SOWeco-city are upheld by the inhabitants. Macroscopically, since 2004, the State Environmental Bureau has published information booklets about the

construction of eco-cities<sup>30</sup>. Locally, we will also reinforce bioethics education and enhance citizens' sense of responsible citizenship through promotion and publicity, taking reference from the Tianjin Eco-city. Since 2008 before the construction commenced, the government publicised its construction plans and measures (《生态市 建设规划纲要》) to the media regularly. Principles of sustainable development were incorporated into regular teaching and extracurricular activities<sup>31</sup>. Similar measures will be conducted in Chongqing, especially around the SOWeco-city, as soon as possible.

#### 3. Implementation Plan 3.1 Timeline

We expect the SOWeco-city will take approximately 30 years to complete its construction. The general phases of its development is depicted in Figure 1 in the Appendix.

### 3.2 Funding and Investments required

**3.2.1 Overall budget.** We estimate the budget of the SOWeco-city shall take ¥80 billion, on the grounds that compared to the Tianjin eco-city, our proposed development density is smaller but the size is doubled. We recognize that funding an eco-city full of cutting-edge sustainable technologies while reducing carbon emissions is challenging, and solely relying on the government to support large-scale developmental projects is insufficient and risky. It is therefore essential to guide social capital, both within and outside China, into the proposed SOWeco-city. Our strategy is two-fold: make use of State-owned Enterprises as start up companies, and attract large corporations worldwide.

**3.2.2** Joint-venture eco-friendly fund. To raise the financial resilience of the SOWeco-city, the captioned fund will be set up on the principle of "shared risk, shared revenue". Capital from mature investors, especially state-owned enterprises are first collected and concentrated, and then managed by an independent stock investment management organisation. The fund will then be used to support growing small companies through a transparent and closed fund flow system. Ideally, it can support the outsourced eco-features and urban infrastructure in the SOWeco-city, like the Eco-Leisure Habitat and green transport facilities.

As the fund will be handled independently from the government and stakeholders with vested interests, it is guaranteed to be secure, stable, mature and regulated. It will also be beneficial to the eco-city as using the new financing model, instead of state capital (as in China generally), will make financing easier and quicker. There will be less restrictions on the use of capital, and a lower risk in funding due to political reasons. The safer business environment and guaranteed stability can establish trust among investors, benefitting city branding.

**3.2.3** The SOW Foreign Assistance Programme (SOWFAP). Acknowledging that the huge difference in political structures (socialist versus capitalist) usually deters foreign investors from venturing into the Chinese market, the captioned programme shall help foreign corporations launch their first platform project in the SOWeco-city. Its long-term goal is to let foreign enterprises firmly understand the local business environment of Chongqing, hence integrate with their Chinese counterparts more easily. It is characterised by 4 elements:

SOW Aspect	Components	Objectives	Features
Spatial	Marketing office	Encourage establishment of     physical marketing presence	<ul> <li>Office rental, linked up through b2b platforms</li> <li>Telecommunications office equipment on utilities analysis</li> </ul>
Operational	Human resources training	<ul> <li>Help develop staff's experise in the SOWeco-city market</li> <li>Cultivate further business interests in SOWeco-sity</li> </ul>	<ul> <li>Pre-departure training for approved trainee(s) in language, etiquette and culture, export tariff knowledge, etc.</li> <li>Mentor-led in-market training for start-up foreign companies</li> </ul>
Operational	Market access	• Reduce initial market entry barriers faced by foreign ventures	• Subsidies on production costs (professional legal and registration fees, product listing fees, in-market certification costs, etc.) if local labour force is utilised / branch is established in R&D or free trade zone
Operational	Local business opportunities	Promote business between local and foreign investors	<ul> <li>b2b and c2c eCommerce platform for either party to locate their business partners, decreasing time and acquisition costs.</li> </ul>

#### 3.3 Stakeholders

Users are key to the success of the SOWeco-city. So, apart from being spatially and operationally sound, our eco-city is also humanistic. We strive to ensure all parties' vested interests are met. A conceptual interpretation of the roles and interactions of individual stakeholders is found below:



We will demonstrate our emphasis on stakeholders' well-being using village farmers as an example. To improve living standard, the most feasible way for him is to convert to an urban *hukou*. Within the local Chongqing context, a *hukou* system reform has commenced since 2010, which encouraged farmers to switch to an urban *hukou*. Recent attempts will include a point system that allows migrants and rural inhabitants to claim permanent urban residential permits<sup>32</sup>. However, what matters more is how he sustains livelihood afterwards.

The SOWeco-city model caters to everyday aspect of life. The SOWeco-city provides him with two housing options: a pleasant mixed housing neighbourhood at Qingyu Villa, Village and Town, or traditional farmhouses at Qingyu Hu Eco-Leisure Habitat. For employment, if he wishes to continue his rural lifestyle, he can practise precision farming at the Eco-Habitat, which is equipped with smarter farming technologies to elevate product yield. The surplus of agricultural production could supply nearby residents' needs through sale at the Grand Park's pop-up farmers' market, which also facilitate intra-city social interaction, or be exported regionally at the Qingyu Airport Free Trade Area for profit. On the other hand, if he prefers an alternative way of living, he can share his farming experiences with tourists from the urban areas, by being an eco-tour guide at the revitalized XinQing Reservoir (新興水庫) inside the Eco-habitat, which will be developed into a recreational water centre with urban farming simulation. As he ages, ageing-friendly designs in housing zones, as detailed in section 2.3, will provide him with a safe post-retirement living environment. The open space in the Grand Park provides him opportunities to interact with his fellows in the community, through taichi and plaza dance.

Farmers' children are ensured an upward social mobility, with the emphasis on smart learning and rural-urban integration in our the Qingyu Education, Research and Development Zone, which accommodates quality education institutions from primary to tertiary level. Strategically located between the two residential areas, it aims to provide equal educational opportunities for children living in the farming area and the mixed housing neighbourhood. They shall enjoy an array of employment prospects in the industries within the eco-city, including logistics, specialised farming, R&D, tourism management. From life to death to the descendents, the farmer's experience exemplifies how our SOWeco-city take care of all stakeholders.

### 3.4 Support required from the government

The government is expected to give full support to the SOWeco-city. The following summary will direct readers to the details of the measures scattered over this proposal.

**3.4.1** *Political.* A lead institution (市级生态城市建设工作领导小组) should be established to direct the developmental goals and timeline for any eco-city development<sup>33</sup>. Our similar suggestions in section 1.3 and 4.3 will also help to alleviate bureaucracy and stagnant implementation, seen in other eco-cities in China.

*3.4.2 Economic.* The government should provide financial incentives and favourable investment conditions to nurture the booming eco-cities<sup>34</sup>. The setting up and outsourcing of the joint-venture eco-friendly fund and the SOWFAP, detailed in section 3.2) will facilitate financial input to the SOWeco-city.

*3.4.3 Social.* Education on environmental awareness and know-how on sustainable development should begin once the construction is confirmed, to ensure that ideals in the eco-city is upheld (refer to section 2.5.3).

#### 4. Risk Management

**4.1** Attracting incoming population and economic activities. When establishing new districts, it is important to develop incentives for attracting people and fund. To prevent insufficient investment and immigration, which might halt the construction of the SOWeco-city like the failure of Caofeidian<sup>35</sup>, we will adopt the strategy demonstrated in China's own Special Economic Zones (SEZs). China has inclined to use an infrastructure-led approach in providing incentives for talents and investors, which will then enrich the composition of population in the area. Innovation and entrepreneurship is subsequently nurtured. Apart from basic facilities, fiscal measures such as preferential treatment and tax holidays can be useful as well<sup>36</sup>. Should the influx of people and investments slow down to cause unfavourable outcomes, we will consider the aforementioned measures.

**4.2 Regional competition**. Liangjiang New Area will undergo massive development in the coming years, causing rapid expansion and urbanisation in districts near Konggang Xincheng 空港新城. For example, Yuelai focus on the Conference and Exhibition industry, together with shopping malls and commercial buildings; Lijia will be an outlet for trading and retail industries, housing over 500 international brands; and Caijia will develop advanced high-tech manufacturing and ecological industries<sup>37</sup>. This will vigorous intra-regional competition. However, as mentioned in section 1.3, our eco-city, specialising in advanced agriculture and logistics development, will lead, but not compete with nearby regions.

**4.3 Operational failure**. The top-down institutional system in China gives higher-level officials more authority and power than those who work to carry out developmental plans. Many guidelines and rules in China, including those guiding city development, are prescriptive. They might pose an institutional barrier to the establishment of the eco-cities, which are starkly different from other conventional Chinese cities at its core. One example is the Dongtan eco-city in Shanghai, which failed partly because of its failure to abide by the proposal, as officials were more inclined to follow practices in precedent non-eco cities<sup>38</sup>. To mitigate this, we hope the lead institution established especially for the SOWeco-city, as stated in section 1.3, can monitor the practical operation and prevent any deviation from the proposal, or any bureaucratic customs impeding its development.

#### Appendices

Table 1. Detailed financial analyses and projections of the economic activities in the SOWeco-city.

Economic activities	Area and specific details	Expected year of completion	Expected investment (¥)	Expected return (¥)	Job opportunities	Remarks
Industry and trade (Qingyu Airport Free Trade Area)	13km <sup>2</sup> Green space: 40%	7 years	0.95 billion	<ul> <li>Expected: 11 billion in 5 years</li> <li>Future tax revenue: 0.47 billion</li> </ul>	120,000- 150,000	<ul> <li>Structure: &gt;50 standard industrial buildings</li> <li>Possible Rent: 35 million/km<sup>2</sup></li> </ul>
Education Research and Development (Qingyu Education, Research and Development Zone)	<ul> <li>R&amp;D and university: 5.5km<sup>2</sup></li> <li>Education: 0.5km<sup>2</sup></li> <li>Amenities: 1.5km<sup>2</sup></li> <li>GFA: 13 750 000m<sup>2</sup></li> <li>Average plot ratio: 2.5</li> </ul>	<ul> <li>15 years</li> <li>3 phases (phase 1 will be completed in 2019 and comprised of 20 buildings)</li> </ul>	<ul> <li>R&amp;D: 12 billion</li> <li>Phase 1: 4 billion</li> <li>Infrastructure and school: 1.6 billion</li> </ul>	<ul> <li>Expected Foreign investment: 0.5 billion</li> <li>Expected Gross Industrial Output Value: 23 billion (phase 1)</li> </ul>	84,889 in phase 1	<ul> <li>Net development: 60%</li> <li>Amenity / greenspace: 40%</li> <li>Maximum height limit: 40m from mean ground level</li> </ul>
Tourism (Qingqin Eco-Leisure Habitat)	10 km <sup>2</sup>	5 years	<ul> <li>Eco-tourism: 0.75 billion</li> <li>Hotel and B&amp;B: 0.6 billion</li> </ul>	<ul> <li>Value of agricultural output: 1.59 billion</li> <li>Amount of tourists: 2 million</li> <li>Expected income: 1 billion</li> </ul>	40,000 in farming and tourism	

Table 2. Detailed financial analyses and projections of the residential zones in the SOWeco-city.

Residential zone	Area	Expected time of construction	Expected investment (¥)	Flat information	Suggested price (¥/m <sup>2</sup> )	Remarks
Qingyu Villa	<ul> <li>8km<sup>2</sup></li> <li>GFA: 20,000,000m<sup>2</sup></li> <li>Plot ratio: 2.5</li> </ul>	2017-2020	3 billion	<ul> <li>Number: 7448</li> <li>Size: 179m<sup>2</sup> (3-4 rooms)</li> <li>Storey: 15</li> </ul>	<ul><li>Management fee per month: 3</li><li>Price: 8500</li></ul>	<ul> <li>Greening ratio: 50%</li> <li>Parking space: 1:1 (7448 underground spaces)</li> </ul>
Qingyu Village	<ul> <li>5km<sup>2</sup></li> <li>GFA: 10,000,000m<sup>2</sup></li> <li>Plot ratio: 2</li> </ul>	2018-2020	0.5 billion	<ul> <li>Numbers: 16666</li> <li>Size: 120m<sup>2</sup> (2-3 rooms)</li> <li>Storey: 5</li> </ul>	<ul> <li>Management fee per month: \$ 2.5</li> <li>Price: 5000</li> </ul>	<ul> <li>Greening ratio: 50%</li> <li>Parking space: 1:10 (120 spaces)</li> </ul>
Qingyu Town (Workers' homes)	<ul> <li>2.5km<sup>2</sup></li> <li>GFA: 10,000,000m<sup>2</sup></li> <li>Plot ratio: 4</li> </ul>	2016-2020	0.1 billion	<ul> <li>Numbers: 6250</li> <li>Size: 80m<sup>2</sup> (1-2 rooms)</li> <li>Storey: 20</li> </ul>	<ul> <li>Management fee per month: \$1.6</li> <li>Price: 3200</li> </ul>	<ul> <li>Greening ratio: 40%</li> <li>Parking space: 1:20 (188 spaces)</li> </ul>





	Initial stage: 0-5 yrs	Development stage: 6-10 yrs	Rapid growth stage: 11-14 yrs	→ Mature stage: >15 yrs
nent period	2016-2020	2021-2025	2026-2030	Beyond 2030
opulation	Approx 140,000	Approx 200,000	Approx 330,000	Approx 350,000

Planned population Approx. 140,000		Approx. 200,000	Approx. 330,000	Approx. 350,000	
Performance	<ul> <li>Good planning vision</li> <li>Basic infrastructure</li> <li>Site formation</li> </ul>	<ul> <li>Centralised development on free trade</li> <li>RES enhancement of urban amenities and connectivity</li> </ul>	<ul> <li>Trade and R&amp;D development promotes economic growth</li> <li>Comprehensive ancillary facilities</li> <li>Development of ecotourism</li> </ul>	<ul> <li>Mature development of the SOWeco-city</li> <li>Serve as a new core for Liangjiang Area</li> </ul>	
Core driving force	<ul><li>Policy inclination</li><li>Expected future development</li></ul>	<ul> <li>Proximity to airport as locational advantage</li> <li>Gradual increase in maturity</li> </ul>	<ul> <li>Upgraded labour force</li> <li>Increasing economic power and district influence</li> </ul>	<ul> <li>Internal and external recognition</li> </ul>	
Urban Landscape	<ul> <li>Transformation to green urban infrastructure</li> <li>Site formation</li> <li>Low-dense development</li> </ul>	<ul> <li>Completion of infrastructural transformation</li> <li>Greening</li> <li>Medium dense development</li> </ul>	<ul> <li>Formation of functional clusters</li> <li>Human- and eco-friendly environment</li> </ul>	• Formation of an spatially and operationally sound eco-city with reasonable development density	

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