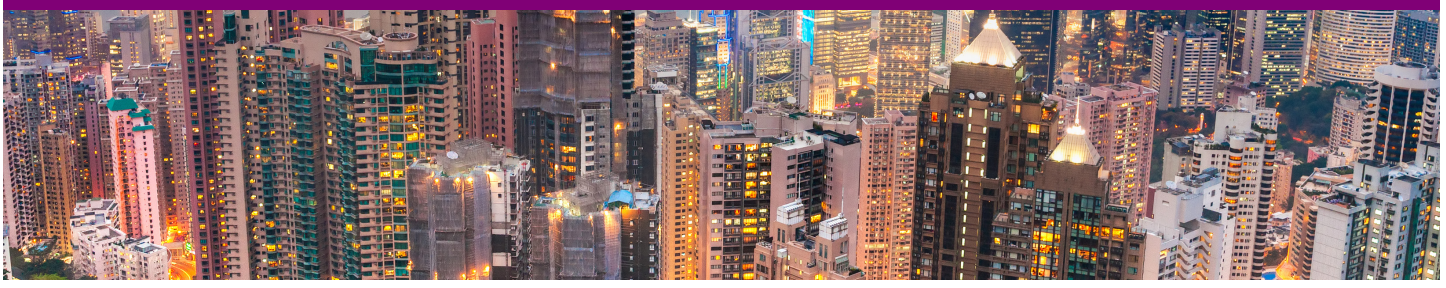
The Initiative on Financing for Resilient and Green Urban Global Solutions (FRUGS)

Financing for Resilient and Green Urban Solutions in Zhoushan, China



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Zhoushan Dinghai aerial view
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Executive Summary

City Profile

Zhoushan is located at the estuary of Yangtze River and south to Shanghai, consisting of 1,309 islands, with a land area of 1,440 km^2 and a permanent population of 1.152 million. Zhoushan bears prominent advantages in terms of coastline, oceanic resources and ecological environment while also facing weaknesses such as water and land deficiency, and difficulty in administration due to scattered islands.

Zhoushan is the first State-Level New Area in China with a focus on marine blue economy and has been approved to establish Pilot Free Trade Zone, thereby enjoying policy incentives. In recent years, Zhoushan's economic aggregate has increased steadily. By the end of 2015, Zhoushan's GDP reached 109.5 billion RMB (17.6 billion USD) with per capita GDP being 95,272 RMB (15,296 USD); increased -value of marine economy during the same time was 76.6 billion RMB (12.3 billion USD), taking up about 70.0 percent of total GDP. According to previous investigations and analyses, Zhoushan's urban development still relies on traditional industries like shipbuilding and port logistics, however, which are under great declining pressure. In addition, cultivation of emerging industries and introduction and implementation of key projects are slow in progress. As a result, Zhoushan need to fully increase opening-up policies to the world and promote comprehensive industrial power in order to enhance urban competitiveness and comprehensive strength.

Zhoushan's urbanisation rate of permanent population was increased from 60 percent in 2005 to 66.9 percent in 2015, higher than average level for Zhejiang and China during the same period. But the increase rate has been slowing gradually. After many years construction in housing and infrastructure, Zhoushan is basically equipped with the foundation to build a garden and livable city. As of end of 2015, Zhoushan's urban built-up area was 71.7 km^2, having formed a prototype for grouped city, with continuously improved municipal supporting facilities and both outward and urban transport facilities, initially established energy guarantee network and water resource guarantee capacity; Zhoushan's per capita building area for urban residents was 34.2 m^2, with a proper level of housing security and housing security coverage rate of 21.7 percent, and increasingly improved habitat environment. Zhoushan's low-income housing and infrastructure construction are mainly invested by government currently, with monotonous financing channel, i.e., bank loans, so that risks are easily concentrated in the banking system. Urban development objectives for Zhoushan are to build a free trade port and a seaside garden city, which imposes higher requirements for future housing and infrastructure development.

Executive Summary

China's urban area is less than 1%, but cities account for 85% of national GDP, 90% of the service industry & 75% of total Chinese energy use[i].

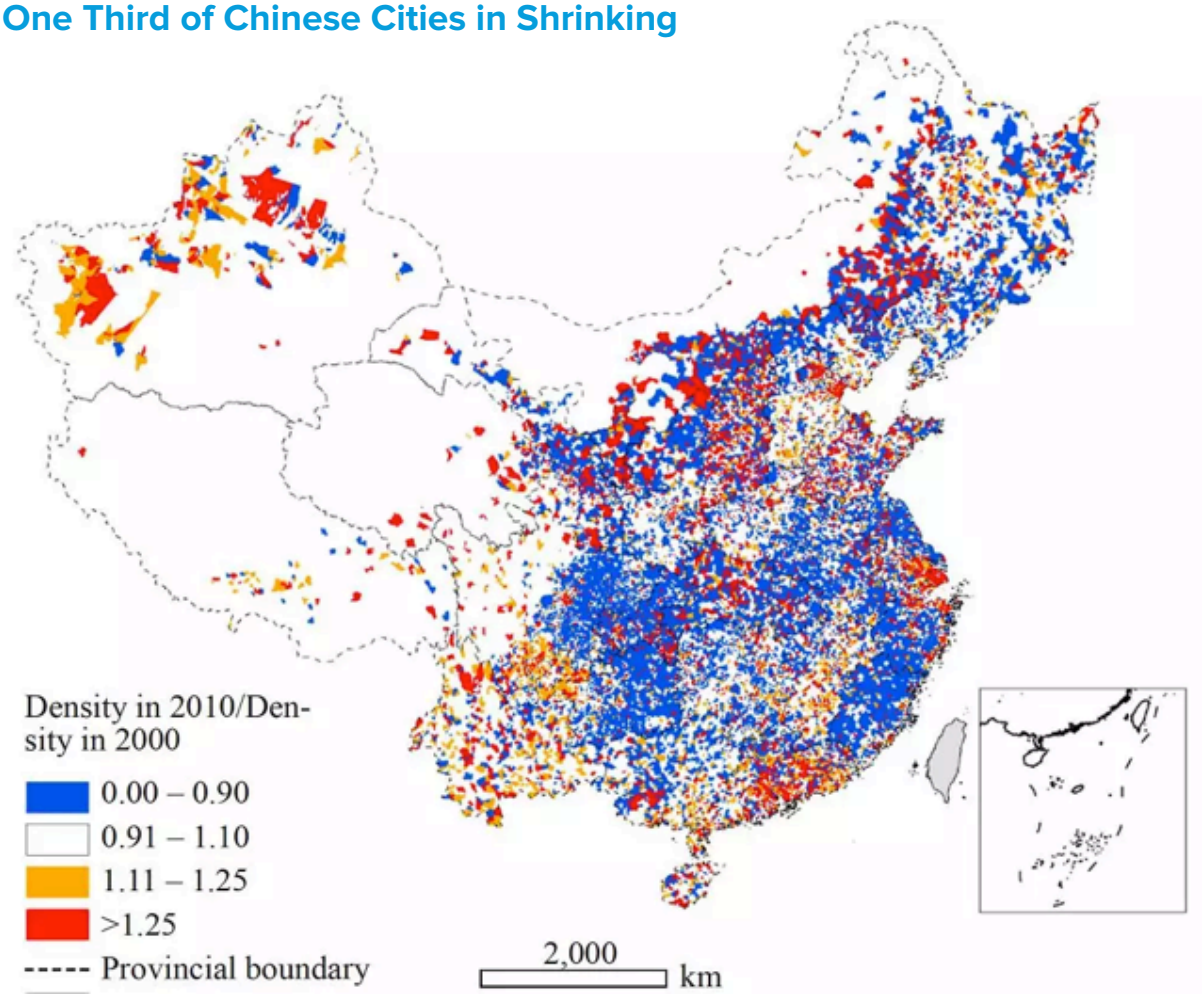
There are significant shifts in the destinations of urbanisation in different economies and between Africa and Asia. In contrast to many other countries where medium-sized cities grow faster than large cities in Africa, In China, large cities are more attractive and often grow faster than small and medium-sized cities.

In the medium-sized city of Zhoushan which is one of the FRUGS study cities, its population had experienced continuous negative growth since 1997 until 2013[ii], despite the low growth during the last decade.

In the entire sample of 3,000 cities and towns in China, about one third of the cities are facing shrinking (see the Figure below), they experience decline while the overall Chinese urbanisation is growing. These declining cities do not catch up with the growth trends experienced in China. It will be very interesting to further research on these shrinking cities. This can be regarded as an over-urbanised phenomenon. Zhoushan city is one of them.

In the Figure below, the blue colour areas represent the location of cities which are experiencing urban population decline. The scale and distribution of decline is massive.

One Third of Chinese Cities in Shrinking

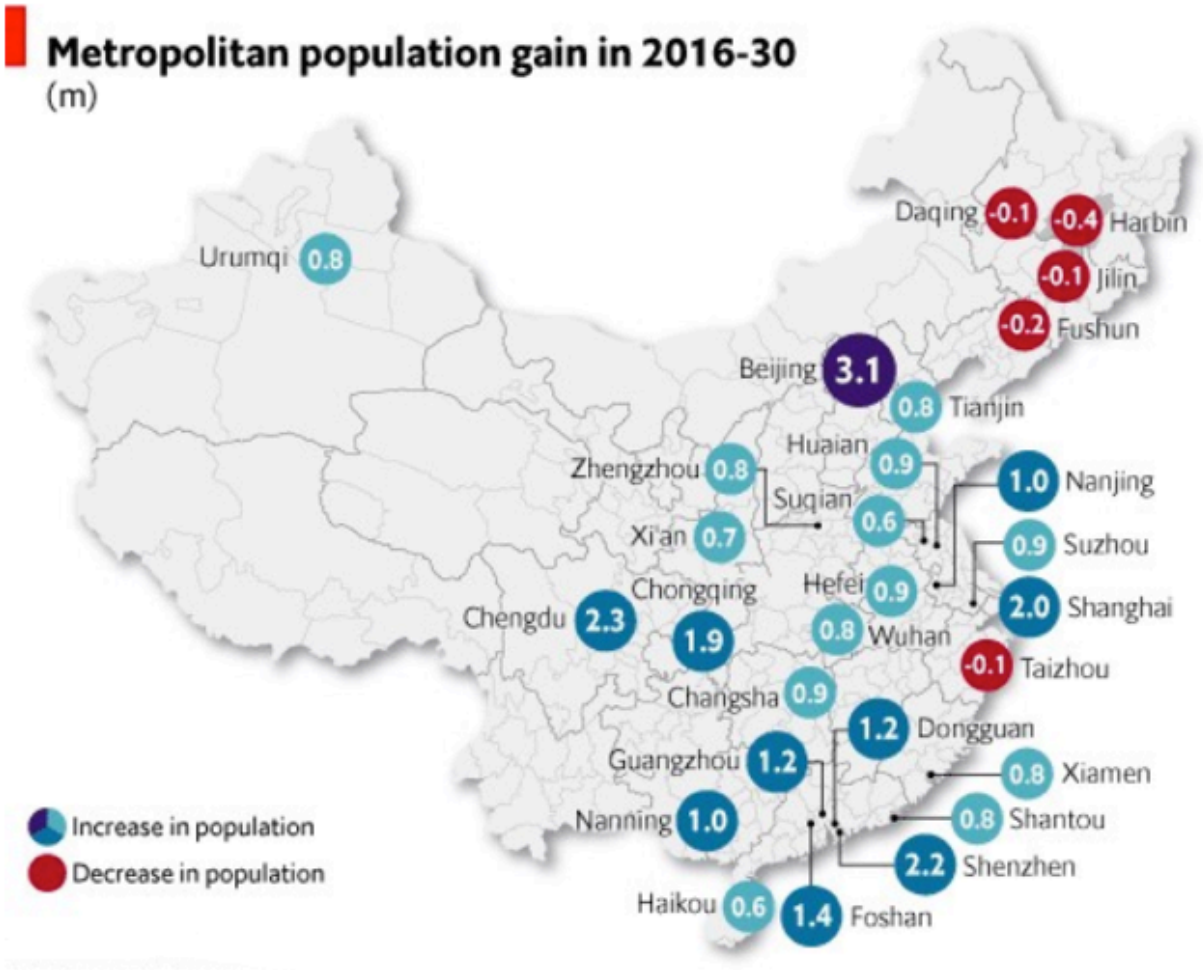


Source: https://mp.weixin.qq.com/s/m63V9CH3QGWm9lXXsOAwBw

It shows that large cities continue to experience steady expansion in their metropolitan populations, despite the shrinkage of many small and medium-sized cities in China. In our study, Zhoushan is a medium-sized declining coastal city, which faces both declining pressure and low carbon and resilient development challenges.

Zhoushan's urban development objective is to build a free-trade port and a sustainable coastal garden city, which imposes higher requirements for future low carbon and resilient development of urban housing and infrastructure. In the future, Zhoushan's housing and infrastructure development provided the following opportunities and findings:

- **The city needs technical support for resilient, green and smart urban development.** The city has traditional means for urban development. However, it lacks in-depth knowledge and tools for promoting resilient, green and smart urban development and for integrated development in these areas. Therefore, introducing pilot FRUGS projects in the city will be having demonstrative effects for achieving resilient and green and smart urban development for cities in the middle-income categories and development stages. Therefore, more in-depth and/or instruments-specific studies and conduct pilot projects in the city are strongly recommended.



Source: Economic Intelligence Unit

- **Green and resilient housing enjoys market opportunity.** With the increasingly improvement of Zhoushan people's living standards, residents demand for higher requirements for housing quality. Zhoushan Archipelago ecological conditions and air quality are ranked as the first class in China, and very suitable for developing and building low carbon, smart, green and resilient housing. Consequently, residential housing developers need to change ideas and actively promote design and construction of green and resilient housing in order to meet the high quality requirement from market.

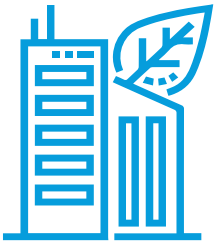
  There are huge opportunities for green housing development. For example, in 2017, Zhoushan municipal government prepared "Special City-wide Plan for Developing Green Buildings in Zhoushan City". The city will promote green buildings and industrialization of construction in Zhoushan City, promote resource conservation and utilization, and improve the living environment.

  The city-wide plan requires by 2020 that the city's two-star and above certified green buildings will account for more than 11% of all the newly-built buildings. **By 2025, the proportion of new buildings with the two-star green buildings certifications should reach more than 15%**

of all newly built buildings. By 2020, the proportion of newly-built buildings in the city's prefabricated buildings will reach 30%. The new residential buildings in the downtown area of Zhoushan will be fully renovated and the finished products will be delivered to meet the green building requirements. By 2025, the proportion of new constructions with the prefabricated building technologies will reach 50% to reduce construction waste and promote green buildings. This is a massive scale of green buildings development.

- **Comprehensive transport system is urgently to be improved.** As an archipelago city and being located at the end of Yangtze River Delta Region, Zhoushan needs to reinforce its transport connections with cities within Yangtze River Delta region, especially to Shanghai and Ningbo, in order to better immerse into Yangtze River Delta economic circle. In the meanwhile, Zhoushan urgently needs to optimize internal transport system, improve inter-island transport between Zhoushan Island and other islands, and increase public transportation efficiency. Therefore, Zhoushan needs to accelerate constructing a comprehensive transport system and reinforce the urban integration with Shanghai and Ningbo.

The Zhoushan Municipal Government announced the Comprehensive Transport System Plan in late 2018. Among the transport development initiatives, the Plan will massively promote rapid public transport system which include rapid public bus system and rapid light rail system. The Figure below shows the rapid public transport system planned to be developed with the next 10-year period.



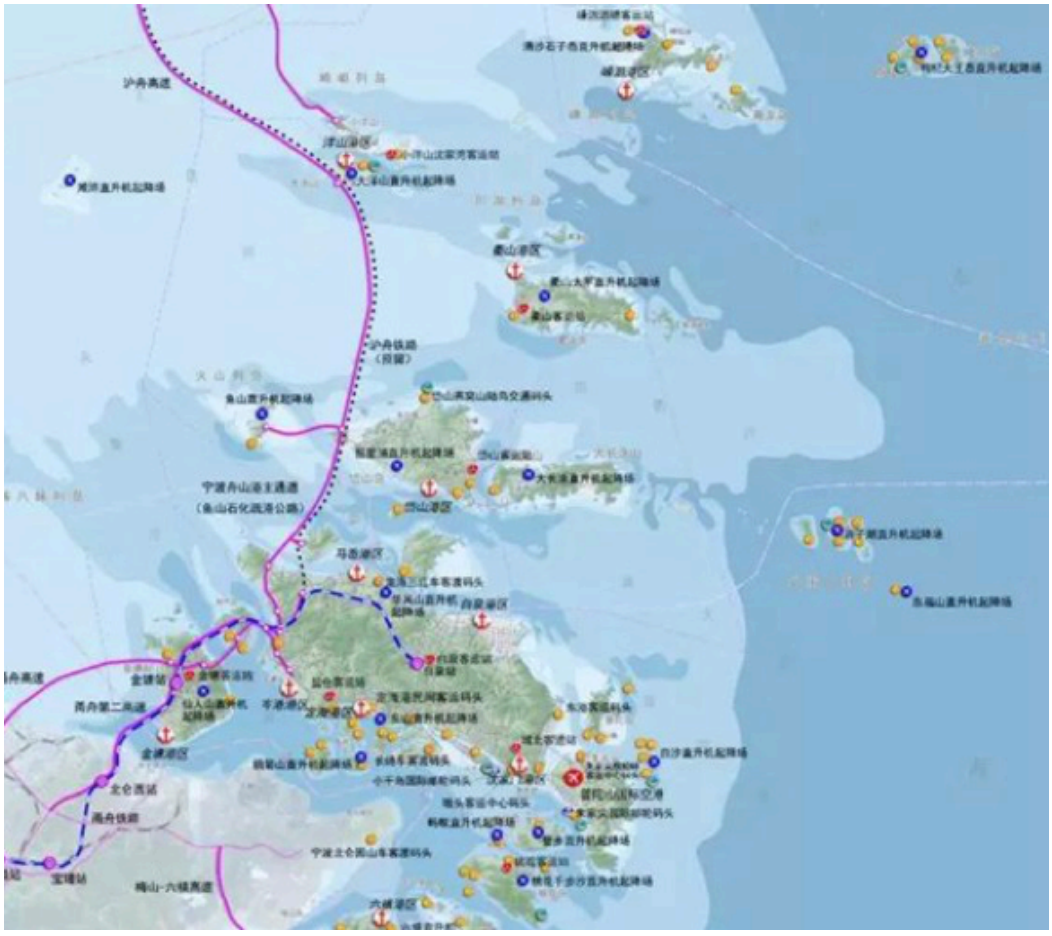
By 2025, the proportion of new buildings with the two-star green buildings certifications should reach more than **15%** of all newly built buildings.

Plan for Rapid Public Transport System in Zhoushan City

Source: http://www.zhoushan.cn/zdzt/wdhz/xwsd/201809/t20180909_898193.html

The Plan will improve the inter-city connection transport system between Zhoushan city and Ningbo city and Shanghai city through high speed train system and highway system (see the Figure below).

Plan for Inter-City Connection Transport System between Zhoushan, Ningbo and Shanghai: High Speed Train System and the Highway System



Source: http://www.zhoushan.cn/zdzt/wdhz/xwsd/201809/t20180909_898193.html

- **Increase the renewable energy use, and improve the energy supply structure of the city.**

  On one hand, due to lacking of energies, raw materials and resources, Zhoushan's all required non-renewable energies are supplied by the mainland, being obviously restricted by market and transport conditions. On the other hand, Zhoushan is bestowed with good marine resources, and therefore may accelerate developing new energies, such as wind energy, tidal energy and solar energy, to optimize energy supply structure and increase energy efficiency and guarantee capacity. Therefore, Zhoushan needs to enlarge investment in marine new energies and renewable energies, and increase financial and fiscal supports.

  The Zhoushan municipal government requires to reduce the use of coal. In 2014, Zhoushan started to upgrade the coal power generation plants and introduced **the zero emission power generation technology.** From 2013, the city began to scale up the development of **wind power plants/facilities** along the coast[iii].

- **Water resource development and utilization should be diversified.**

  Zhoushan is severely lack of water resource, and its water quality is not good enough, thereby leading to huge anti-flood and disaster reduction pressure. In order to increase water resource guarantee ability, Zhoushan needs to implement diversified strategies. First, Zhoushan should conduct multi-source water supply project based on local water resource and by strengthening mainland water diversion, increasing sea water desalination and pushing non-regular water utilization. Second, Zhoushan needs to reinforce water ecological environment protection, comprehensively overhaul reservoirs and riverways and improve its defense against “typhoons and floods”. Third, Zhoushan needs to increase civil water source protection, renovate and improve water processing technologies, build water quality monitoring and measuring facilities in order to achieve the all-around improvement of drinking water quality and efficiency.

  Zhoushan city plans to strengthen the monitoring and protection of hydrology through systematic and long-term, continuous observation of flow, water level, precipitation, evaporation, sediment, water quality, groundwater, water temperature, ice, and etc., collect systematic and comprehensive hydrological data, and through hydrological information forecasting, water resources analysis and calculation, water resources evaluation, water quality assessment to make scientific decisions for comprehensive river basin development, flood control and drought relief, engineering construction, water resources development and sustainable use and protection in Zhoushan.

- **Develop A City-wide Sewage and Sanitation Strategy**

  Further FRUGS work can assess major challenges for improving service delivery in urban areas: under-investment in sanitation works, low coverage and lack of wastewater treatment facilities, excessive subsidies for sanitation recurring costs, and an ineffective administrative structure due to extremely dispersed development patterns. The new Sewage and Sanitation Strategy will aims to (a) opitimise the system design; (b) rehabilitate existing networks and facilities; (c) develop policies and institutions to promote a more market-oriented system; (d) develop, through public education, better awareness on the importance of more effective sewage and sanitation services; and to avoid direct discharge of sewage and wastewater to the sea without treatments; (iv) gradually phase out subsides and replace them with user charges and pollution taxes. The strategy can include measures to decentralize septage and solid waste collection to the local level, commercialize public utilities, and encourage more cost recovery for the service providers.

- **In-depth Assessment of Shrinking Cities, and Tackling Population-Declining Challenges facing Cities:**

  About one third of Chinese cities are facing population decline. Zhoushan is one of the population-declining cities. In the middle of rapid urbanisation and economic growth, one third of Chinese cities began to decline. City growth is a key concern of national economic policy in China, but some cities are falling behind and failing to keep up with national trends of urban growth and urbanisation. Cities coping with such relative decline have particular economic, social and spatial conditions needing policy attention and intervention. The decline becomes a new and urgent issue to city governments and Central Government to tackle this problem.

  Further FRUGS work can conduct in-depth studies into what evidences to show the decline of cities, what types of cities are declining, what types of cities are likely to decline; what policies and strategies and solutions should be devised to revitalize the declining cities and use Zhoushan as a case study?

About **one third** of Chinese cities are facing population decline

- **Area-wide Integrated and Sustainable Urban Development Project**

  Zhoushan Municipal Government has planned to develop a new 6 square kilometres area of an island about 2 kilometres away from the current CBD and it is very pleased to develop this area into a Resilient, Green, Smart and Mixed Use Integrated Development Pilot under the framework of FRUGS - financing for resilient, green, smart and integrated urban solutions. The total investment of this project is estimated to be around USD 8 billion. Technical assistance on how to protect ocean front environment and eco-system on land reclamation and develop infrastructure and facilities which are resistant to floods and cyclones, and also on fundraising for the whole cycle of the project. The project promotes PPP.

- **Capital sources for infrastructure facilities should be diversified.**

  Zhoushan's infrastructure projects are dominated by governmental investment currently, leading to insufficient total investment, monotonous investing channel, non-separation of government administration and enterprise management in infrastructure field, low investing efficiency for some projects and overburden of fiscal subsidy, thereby failing to meet requirement of social and economic development. The city has strong municipal finance capacity. It is relatively easier for the city government to support various innovative urban solutions and innovative urban finance and green finance solutions.

- **Huge financing needs for urban development**

  Zhoushan's financial system is dominated by credit market, financial institutions by banks and financial instruments by bank loans. Zhoushan's financial sector faces new challenges. From urban construction aspect, during the "13th Five Year Plan" period, Zhoushan's total planned investment in fixed assets is 850 billion RMB (129.2 billion USD), of which, total investment in infrastructure facilities is over 425 billion RMB (64.6 billion USD). Based on the current status of Zhoushan's financial development, existing problems and future plan, the following measures could be used to increase financial supports.

  Promoting green finance and supporting commercial banks to release green loans. Zhoushan needs to guide commercial banks to conduct green credit loan and promote energy saving and emission reduction under the instructions of banks' head offices. Zhoushan municipal government actively promotes green finance and "green finance for blue ocean economy". Zhoushan Government may support by fiscal discount, properly increase fiscal discount rate and reasonably determine discount period or assume a certain ratio of default loss for green credit loan projects during operation to give guarantee for green credit projects.

- **Promoting state-owned financing platform to make direct financing.**

  Zhoushan will build Zhoushan Ocean Investment, Zhoushan Communications Investment and Zhoushan Urban Investment into leading enterprises to raise money for infrastructure construction, and support long and medium term green projects through issuing long and medium-term green bonds. Additionally, Zhoushan will try to lower the financing cost of green bonds by credit-increasing methods including fiscal discount and guarantee.

- **Enlarging development and policy financial supports.**

  On the current basis, Zhoushan will actively apply for loan supports from financial institutions such as China Development Bank and Agricultural Development Bank of China, in order to

obtain more preferential loan policies in terms of loan conditions, interest rate and term, and enlarge credit supports for green infrastructure projects

- **Building PPP green industrial fund.**

  Infrastructure facilities are mostly low-profitability, so green industrial fund imposes strong demand for government investment. Establishment of PPP green industrial fund cooperated by fiscal capital and private capital is an important approach to push green industrial fund development, which can play the leverage role of fiscal capital and guide and encourage long-term capital such as social security capital and insurance capital to engage in urban infrastructure construction.

It is concluded in this Report that during the "13th Five Year Plan" period, Zhoushan's total planned investment in key planned projects in indemnificatory housing, infrastructure and public service fields is 114.36 billion RMB (17.38 billion USD) with a market financing scale of between 33.86 and 79.19 billion RMB (5.15 and 12.04 billion USD). Of the total planned investment, 3.415 billion RMB (519 million USD) is for new indemnificatory housing projects with possible market financing range between 16.518 and 40.321 billion RMB (between 2.51 and 6.13 billion USD), 50.4 billion RMB (7.66 billion USD) for traditional infrastructure and public service projects, with a possible market financing range between 16.518 and 40.321 billion RMB (between 2.51 and 6.13 billion USD), 60.547 billion RMB (9.20 billion USD) for projects promoting urban green and resilient development, with a possible market financing range between 16.314 and 36.138 billion RMB (between 2.48 and 5.49 billion USD). The selecting criteria and specific contents of 25 key projects are detailed in section 7.4 to section 7.6 of the report.

Major financing characteristics of 25 critical projects are large capital demand, long duration and low financing cost. Considering the existing financing market in Zhoushan, the possible financing methods and instruments in the future mainly include bank loans or syndicated loans, corporate bonds, project financing and PPP mode.

By applying to FRUGS, Zhoushan may obtain advanced urban development concepts, measure its own advantages and disadvantages according to assessing standards for global green, smart and resilient cites, while trying to get urgently needed green financial and technological supports, in order to help Zhoushan achieve sustained development with Chinese characteristics and island features.

Chapter 1

Status of the City Urbanisation and Economic and Financial Systems

1.1 Brief History of Accra and Tema

Zhoushan City situates between 39°32'N and 31°04'N as well as between 121°30'E and 123°25'E, in the east of Zhejiang Province, China, at the exterior margin of Hangzhou Bay and to the south of Shanghai. The total area of Zhoushan is 22,200 km^2, including 1,390 islands and neighboring sea areas, of which, land area is 1,440 km^2 and sea area is 20,800 km^2. Zhoushan City is the first prefecture-level city in China with an organizational system of archipelago, currently administers two districts and two counties, i.e., Dinghai District, Putuo District, Daishan County and Shengsi County. By the end of 2015, permanent population in Zhoushan City was 1,152,000.

Figure 1-2 Zhoushan City's Map


SHANGHAI
Shengsi County
Hangzhou Bay
Daishan County
Dinghai District
NINGBO
Putuo District
East China Sea
10 km

1.1 Brief History of the City

Zhoushan is a city famous for its deep and long sea island culture. According to archaeological findings, as early as the Paleolithic age of about more than 6000 years ago, Zhoushan Archipelago was inhabited by human beings. Zhoushan was reputed to be "the land in the sea" in ancient times and "Yongdong" in Spring and Autumn Period (BC770 to BC476). Zhoushan was established as "Wenshan County" in Tang Dynasty's Kaiyuan 26th year (AD738) and "Changguo County" in North Song Dynasty's Xining 6th year under Xizong's reign (AD1073). Later, after vicissitudes of many years, Zhoushan was set as "Dinghai County" in Kangxi 26th year of Qing Dynasty (AD1687). During long history river, Zhoushan has formed the unique sea culture in China. Zhoushan's Madai has created wonderful and splendid "Hemudu Culture", being regarded as "the first village in East Sea". The Avalokitesvara bodhimanda in Putuo Mountain initially built in Tang Dynasty started the long and well-established Avalokitesvara culture whose influence has been spread to the whole world, especially Southeastern Asian countries. When Xufu went to Japan in Qin Dynasty, monk Jianzhen traveled to Japan in Tang Dynasty, tributary ships from Korea and Japan came to China after Tang and Song Dynasties, as well as Zhenghe traveled around the Indian Ocean, they all berthed in Zhoushan.

Zhoushan is an international trading port city full of dreams. Zhoushan has always been an important trading portal for China. Zhoushan in Tang and Song Dynasties was an important estuary for the east route of ancient Maritime Silk Road. Shuangyu Port in Jiajing reign during Ming Dynasty was the largest international trading port and witnessed the large change of global trading in the 16th century. Since 1949 when People's Republic of China was founded, especially since 1978 when China started its reform and opening-up policy, Zhoushan has stepped into a rapid development stage, establishing its city on the base of port, and having become the bridgehead for China to develop marine economy and build into a marine power.

On June 30, 2011, the State Council officially approved to establish Zhejiang Zhoushan Archipelago New Area whose coverage was same as the administrative area of Zhoushan City[1]. The establishment and development of Zhoushan Archipelago has been elevated to national strategy, and it has become the fourth state-level new area followed after Shanghai Pudong, Tianjin Binhai and Chongqing Liangjiang, and also the first state-level new area themed with marine economy.

On January 17, 2013, the State Council reviewed and replied *The Development Plan for Zhejiang Zhoushan Archipelago New Area*, by specifying that "Zhoushan Archipelago New Area is strategically positioned as the pioneering area for Zhejiang marine economic development, pilot area for comprehensive marine development and an important growth pole for Yangtze River Delta economic development. Its development aim is to build China bulk commodity center for warehousing, transportation, transshipping, processing and trading, an important marine portal in East China, an important modern marine industry base, a comprehensive model zone for protecting and developing sea and islands, and the pioneering zone for land-sea coordinated development".

On August 31, 2016, the State Council approved to establish Pilot Free Trade Zone in Zhoushan in order to promote bulk commodity free trading and enhance global allocation capacity for bulk commodity full steam ahead.

1.2 Geographic Characteristics of the City

Zhoushan Archipelago is the largest archipelago in China, located in the middle of China coastline, and bears obvious advantages in terms of location, shoreline, marine resources and ecological environment among others.

Distinctive location advantage. Zhoushan Archipelago is located at the "T"-shape

Ningbo-Zhoushan Port

Source: https://www.cruisemapper.com/ports/ningbo-zhoushan-port-13305

intersection formed by China east golden coastline and Yangtze River golden water way, in front of large and middle cities such as Shanghai, Hangzhou and Ningbo and the vast land of Yangtze River Delta and faces to the Pacific Ocean, is a major marine portal to achieve river-and-sea coordinated transport and help Yangtze River basin come to the world, and an important pillar to implement the Belt and the Road Initiative and Yangtze River economic belt.

Advantages coastline and port conditions. Zhoushan Port has vast bay, unblocked waterways, unique deep water port resources and good natural conditions for port establishment. There are 54 deep water coastal sections suitable for construction and development, with a total length of 280km, equivalent to 18.5 percent of China's total deep water coastline length, which therefore can meet the trend that ships for international shipping become larger and require deep water berths.

Abundant marine resources. Zhoushan fishing ground is the largest inshore fishing ground in China, being listed into Four Large Fishing Grounds together with Hokkaido fishing ground, Newfoundland fishing ground and Peru fishing ground, with abundant fishery and aquaculture resources. In recent years, the annual offshore fishery output from Zhoushan has taken up more than 20 percent of China's total output. In Zhoushan's maritime space, relatively rich offshore oil and gas, ores, and renewable energies such as wind energy and tidal energy are available. As a pilot city for China's marine high-tech industrial base, Zhoushan is of great potentials in terms of developing and exploiting wind power generation, tidal power generation and sea water desalination among others.

Good ecological environment quality. Zhoushan Archipelago has good air environment, ranking fourth in *Urban Environment Air Quality Rank-list* among 74 cities released by Ministry of Environmental Protection in 2015. Zhoushan's forest coverage rate is higher than 50 percent and its greenery coverage rate of urban built-up area is 40.7 percent. Zhoushan has typical northern subtropic south edge's marine monsoon climate, with annual average temperature of 16.6 °C, warm in winter and comfortably cool in summer.

However, at the same time, Zhoushan is obviously deficient in some resources, such as land and water. Most of Zhoushan's islands have the features of hills in the middle, plain at coastline and wetland in intertidal zone, resulting in a limited land area proper for construction. Therefore, Zhoushan is not appropriate for full development through large scale industrial expansion. Annual average precipitation in Zhoushan is 1,292 mm; precipitation is lowered from southeast to northwest gradually. But water resource per capita in Zhoushan is only 607m^3, equivalent to 1/3 of China's per capita level. So Zhoushan is a typical water shortage region with respect to water resource and engineering water.

1.3 The Population Growth and Urbanisation Patterns

1.3.1 Current status of population and household structure

With the rapid economic development and urban-rural coordinated development of Zhoushan, in recent years, Zhoushan's permanent population keeps growing and its household structure is smaller while disadvantages such as "demographic dividend" disappears gradually and aging population comes into a high-speed growing period are also encountered. The demographic features of Zhoushan are as follows:

Permanent population keeps growing but its growth rate is slowed. According to statistics, permanent population of Zhoushan increased from 1.025 million in 2005 to 1.152 million in 2015. If the permanent population of 1.121 million in 2010 is used to divide the last decade into to two periods, we should note that annual average population growth in the first five years (2006-2010) was 19,200 while that in the second five years (2011-2015) is 6,200, indicating an obvious drop in population growth rate.

Registered population shows a negative growth. In 2015, Zhoushan's registered population is 973,600, newly-born registered population was 5,990 and death toll was 7,309, resulting in year-on-year change rate of -0.135 percent for a natural population growth rate. Compared with the registered population of 984,200 in 2002, current registered population has decreased by 10, 600, showing a downward trend.

Migrant population promotes employment obviously. Migrant population has always contributed a lot to Zhoushan's permanent population growth. Being attracted by Zhoushan's economic development, migrant population are mainly engaged in industries including manufacturing, wholesale and retailing, and fishery, specifically, focusing on operating work and services. They are mainly distributed in economically developed areas within Zhoushan.

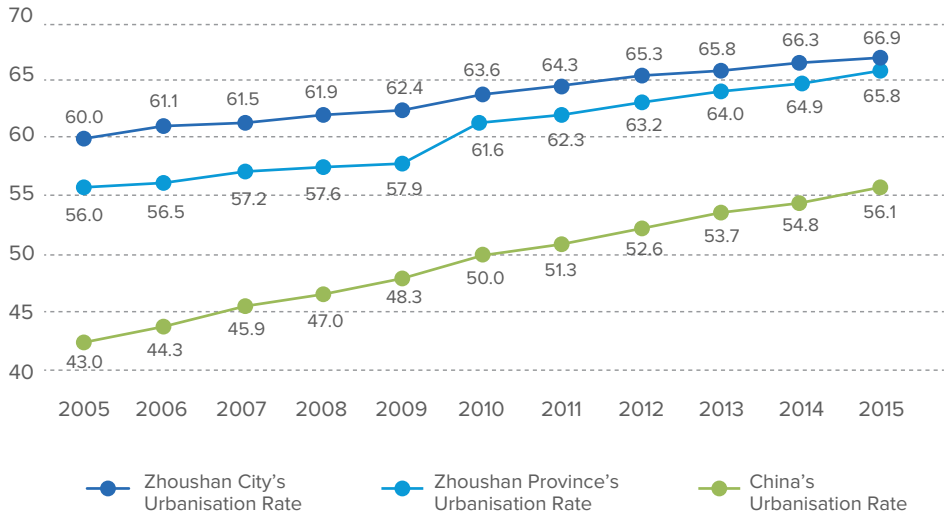
Population aging speeds up. The portion of elderly population in Zhoushan's total population continues to increase, with the percentage of people no younger than 65 years old increasing from 5.28 in 3rd Census made 1982 to 10.50 in 6th Census made in 2010. This has indicated that population structure of Zhoushan has transformed from "adult-type" structure to "elderly-type"structure, and come into a speeding-up period for population aging.

Household size becomes smaller. It is found from Zhoushan's six censuses data that average household members decreased from 3.55 in 1982 Census to 2.39 in 2010 Census, by a decrease of 1.16 people, indicating an obvious decrease of average permanent household size.

1.3.2 Current status of urbanisation

Urbanisation is a population shift from rural to urban areas, accompanied by expansion of towns and cities, and a series of subsequent economic and social changes. The nature of urbanisation is change of economic structure, social structure and space structure and its core is population urbanisation. Permanent population urbanisation rate is used in this Report to measure the urbanisation development level of Zhoushan City. On one hand, Zhoushan's urbanisation level is enhanced stably, higher than average level of China and Zhejiang Province during the same period. According to statistics, Zhoushan City's urbanisation rate of permanent population was enhanced from 60 percent in 2005 to 66.9 percent in 2015, showing a growing trend and an annual increase rate of 0.69 percent. Compared with China's and Zhejiang's urbanisation rates during the same period, its urbanisation rate is higher (Figure 1-3). According to Bulletin of Main Data from Zhejiang Province's One-Percent Sample Census 2015, in 2015, permanent population urbanisation rate of Zhoushan City ranked fourth among all the cities in Zhejiang Province.

Figure 1-3: Comparison of Zhoushan City's, China's and Zhejiang Province's Urbanisation



Source: plotted based on relevant data from websites of National Bureau of Statistics of the People's Republic of China, Statistics Bureau of Zhejiang Province and Statistics Bureau of Zhoushan City.

However, at the same time, Zhoushan City has not finished the planned task for permanent population urbanisation rate during "12th Five Year Plan" period, namely, the urbanisation rate by 2015 would reach 68 percent. According to Figure 1-3, permanent population urbanisation rate of Zhoushan City in 2010, i.e., 63.6 percent could be used to evaluate the overall change. This index (permanent population urbanisation rate) was increased by 0.72 percent annually during the five years before 2010 and by 0.66 percent annually during the five years after 2010. It is shown that the annual increase rate in the later five years was slightly lowered, and therefore Zhoushan City's urbanisation growth trend is somewhat.

1.3.3 Future projection of urbanisation by 2030

Zhoushan faces both opportunities and challenges for future urbanisation. On one hand, replying on distinctive location and resource advantages, Zhoushan is exploring an archipelago urbanisation path with its own features, and will make great achievements in realizing the strategic positioning and development aims defined by the State Council. On the other hand, Zhoushan needs to overcome a series of difficulties, i.e., shortage of infrastructure construction and public services, outdated concepts, extensive management and monotonous financing actively and to create new prospect for green, intelligent and resilient urban development. Under the new circumstance, strategies and key points for Zhoushan urbanisation development by 2030 are proposed below based on Zhoushan City's existing overall plan or development plan.

Three Major Purposes. Firstly, for urbanisation, Zhoushan needs to implement national strategies actively and construct an economically efficient urban system focusing on "Four Islands, One City and One Center" (i.e. international logistics hub island, opening up portal island, marine industry cluster island, international leisure ecological island, sea garden city, river-and-sea coordinated transport service center) . Secondly, for urbanisation, Zhoushan needs to prioritize ecological construction and build a sea-garden city to promote harmonious and green development of people and sea. Thirdly, for urbanisation, Zhoushan needs to guide population and industry distribution among different islands and choose a development path of resource saving, environment-friendliness and resilience.

Main Indexes. By 2020, for Zhoushan Archipelago New Area, the permanent population should reach 1.5 million, urbanisation rate 70 percent and urban population 1.05 million; by 2030, the three indexes should reach 1.8 million, 80 percent and 1.44 million, respectively.

Three Big Strategies. Firstly, defining urban hierarchical structure, classifying and optimizing urban functions and serving marine economic development. For urban hierarchical structure, Zhoushan needs to establish "one downtown, three sub-downtowns and six key towns" in which, one downtown means one downtown area, three sub-downtowns refer to Daishan County, Shengsi County and Liuheng Town, and six key- towns are Jintang Town, Yangshan Town, Qushan Town, Changtu Town, Taohua Town and Shengshan Town. Based on core resource scale and carrying capacity, and employment driving force of and service demand from dominant industries, towns in Zhoushan are classified into three types, i.e., comprehensive service type, supporting service type and professional service type.

Secondly, building sea garden city, promoting comprehensive strength and strengthening competitiveness of this state-level new area. Building a sea-garden city is the core aim and key content of implementing Zhoushan's urbanisation strategies. On one hand, urban environment quality and urban image should be improved to attract emerging industries and high-end industries, and to promote comprehensive strength and regional competitiveness. On the other hand, it is required to build a public city to offer affordable housing and convenient and efficient public transport, promoting public service ability, lowering living cost, improving attraction to various professional talents, thereby making Zhoushan a green and livable city.

Thirdly, selecting and fostering key aspects to showcase marine features, and building a green, smart and resilient infrastructure service network. Zhoushan Archipelago New Area bears the strategic task of leading marine economic innovations, and therefore needs to make strategic breakthroughs with respect to key fields and emerging industries such as international logistics, marine equipment, marine research and development, free trading and international leisure. Therefore, it is required to explore unique advantages of different islands in industry, culture and location and build improved and networked infrastructure and public service facilities, thereby establishing a group of "championed" islands in professional fields and focusing on construction of some functional modules with specific industrial features, clear functions and improved services.

Figure 1-4: Zhoushan City's GDP and its Growth between 2005 and 2015.

Source: plotted based on relevant data from website of Statistics Bureau of Zhoushan City.

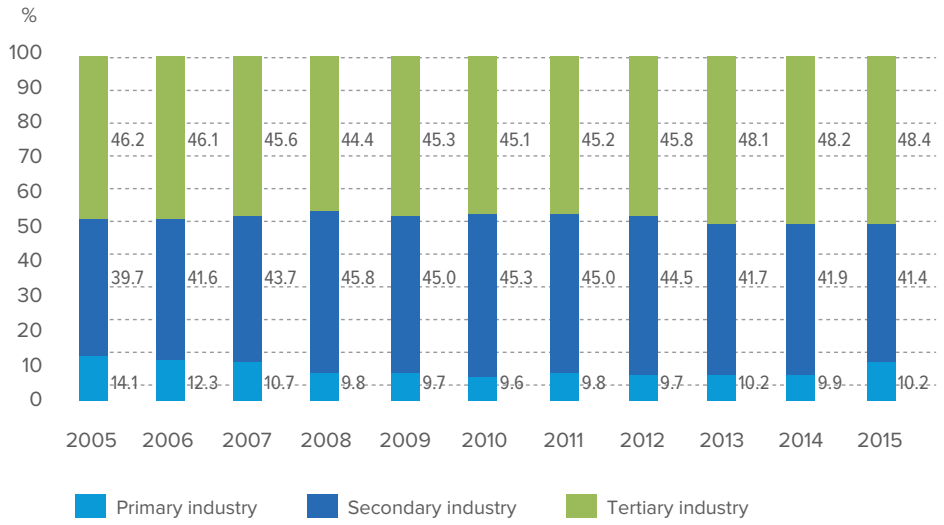
1.4 The Economic System, Structure and Development

In recent years, Zhoushan City's economy has undergone a stable and relatively rapid growth, with its economic running quality being increased continuously, and economic transformation and livelihood improvement being promoted stably, with the following characteristics

Economic aggregate has been enhanced stably. Zhoushan GDP in 2015 was 109.5 billion RMB (17.6 USD)[2], with a year-on-year growth rate of 9.2 percent based on comparable price, 2.3 percentage points higher than national GDP during the same period. Compared with other cities in Zhejiang Province during the same period, although Zhoushan's GDP ranked relatively lower, its growth rate ranked second, 1.2 percentage points higher than Zhejiang Province's average level. From 2005 to 2015, Zhoushan City's GDP grew at an annual average rate of about 12.1 percent, showing good growing momentum (Figure 1-4). Taking permanent population into consideration, Zhoushan City's per capita GDP in 2015 was 95,272 RMB (15,296 USD), increasing by 8.7 percent.

Three industries' development is balanced. In 2015, increased value of primary industry was 11.2 billion RMB (1.8 billion USD), with a weight in GDP of 10.2 percent; that of secondary industry was 45.3 billion RMB (7.3 billion USD), with a weight in GDP of 41.4 percent, that of tertiary industry was 52.9 billion RMB (8.5 billion USD), with a weight in GDP of 48.4 percent. From 2005 to 2015, the dynamic structure of Zhoushan's three industries was optimized and balanced, primary industry's weight was decreased, secondary industry experienced upward trend first and then downward trend, while tertiary industry showed an overall rise trend (Figure 1-5).

Figure 1-5: Structure Changes of Zhoushan City's Three Industries between 2005 and 2015



Source: plotted based on relevant data from website of Statistics Bureau of Zhoushan City.

Marine economic features are obvious. Focusing on the aim of building an internationally competitive modern marine industry base, in recent years, Zhoushan has been actively fostering new marine industries, and upgrading and improving traditional marine industries, having formed a preliminary opening-up economic system with distinctive marine features, with port industry, port logistics, marine tourism and marine fishery as pillars (Table 1-1),and having become the prefecture-level city whose marine economy takes up the largest weight in China's overall marine economy. In 2015, Zhoushan's total marine economy output was 265.3 billion RMB (42.6 billion USD), with a year-on-year growth rate of 10.0 percent based on comparable price; increased value of marine economy was 76.6 billion RMB (12.3 billion USD), with a year-on-year growth rate of 9.6 percent; marine economy's increased value took up 70.0 percent of Zhoushan City's overall GDP, with a year-on-year growth rate of 0.2 percent.

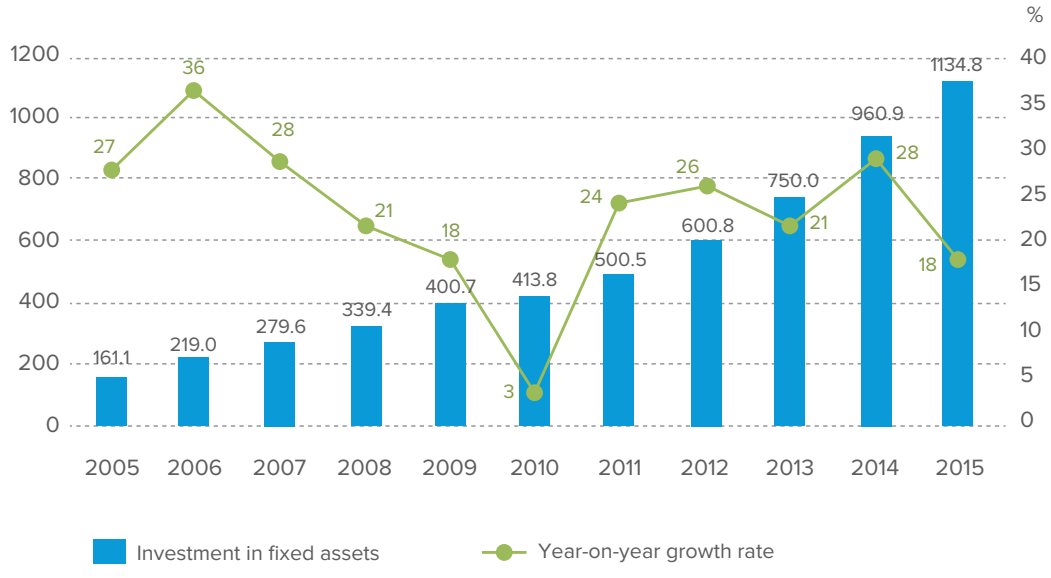
Investment in fixed assets is increased rapidly. In 2015, Zhoushan's total investment in fixed assets was 113.476 billion RMB (18.219 billion USD), with a year-on-year growth rate of 18.1 percent. From 2005 to 2015, investment in fixed assets showed a rapid growth trend, with an average year-on-year growth rate of 22.7 percent (Figure 1-6). According to investments in fixed assets of three industries, primary industry investment was 855 million RMB (137 million USD), with a year-on-year growth rate of -11.3 percent, secondary industry investment 31.855 billion RMB (5.111 billion USD), with a year-on-year growth rate of 7.1 percent, and tertiary industry investment 80.785 billion RMB (12.970 billion USD), with a year-on-year growth rate of 23.5 percent (Table 1-2). It is indicated that investment into primary industry was relatively small and showed a negative growth, investment into secondary industry showed a stable growth while that into tertiary industry grew rapidly.

Table 1-1 Current Status of Marine Industrial System in Zhoushan Archipelago New Area

Characteristic industry	Industry introduction	Current development (2015)
Marine fishery	Zhoushan, a strong city in fishery, whose offshore fishery is rapidly developed, has formed a relatively complete industrial chain covering fishing and breeding, manufacturing and processing, special markets and brand marketing, etc.	Zhoushan City's total aquaculture output was 1,764,600 tons. The weight of offshore fishery output has continued to grow and its annual output took up over 20 percent of national output.
Port industry	Including shipbuilding, petrochemical engineering, aquaculture processing and marine electronic information among others. Ship-building is the first largest pillar industry for Zhoushan, the weights of shipbuilding's three indexes in national data are higher than 10 percent.	Total port industrial output value was 142.003 billion RMB (22.799 billion USD), with a year-on-year growth rate of 13 percent, and taking up more than 84.4 percent of total output value of Zhoushan's industries larger than a certain level. .
Port logistics	Zhoushan Port is one of top 10 Chinese ports, has 5 deep-water berths accommodating 250,000 or higher-tonner vessels, the largest port for trans-shipping ores in Asia, the largest petroleum storage and transport base in China and the largest terminal to trans-hipping coal in East China.	Zhoushan has finished port cargo throughput of 379,250,000 tons and waterway freight ton-kilometers of 236.968 billion.
Marine tourism	Zhoushan is one of first tourism comprehensive reform pilot cities in China, and is promoting construction of sea island tourism, developing characteristic tourism products like sea island hotels offered by local residents, sports and leisure, sea food, and fishing experience, and expanding leisure tourism ecology.	Zhoushan City received 38,762,200 person-times of tourists, with total revenue of 55.218 billion RMB (8.866 USD).

Source: plotted based on relevant data from information website of Government of Zhoushan City.

Figure 1-6: Investment in Fixed Assets and its Growth of Zhoushan between 2005 and 2015.



Source: plotted based on relevant data from website of Statistics Bureau of Zhoushan City.

It should be noted from 2015 investment structure of three industries in Zhoushan, that investment into infrastructure was relatively more while productive investment was less. According to further analysis of investment in fixed assets by specific sector, regarding about investment amount, investment into transport, storage and post, management of water, conservancy, environment and public facilities, real estate development, and culture, education, health, sports and entertainment was comparatively higher, being responsible for about 81.5 percent of total investment; regarding about investment growth, the four top sectors were information transmission, ecological protection and environmental governance, management of water, conservancy, environment and public facilities, and culture, education, health, sports and entertainment, each of these year-on-year growth rate was higher than 90 percent.

Table 1-2 2015 Investment in Fixed Assets and Growth Rate by Sector in Zhoushan City

	Amount (100 million RMB)	Amount (1 million USD)	Year-on-year growth rate
First industry	8.55	137	-11.3
Fishery	8.00	128	-0.6
Secondary industry	318.35	5,111	7.1
Manufacturing	318.30	5,110	8.7
Shipbuilding	88.51	1,421	43.1
Tertiary industry	807.85	12,970	23.5
Transport,storage and post	223.39	3,587	16.3
Information Transmission	3.89	62	284.1
High-tech services	20.76	333	67.8
Wholesale and retail trades	11.87	191	14.0
Hotels and catering services	15.67	252	-45.3
Culture, education, health, sports and entertainment	42.44	681	90.5
Management of water, conservancy, environment and public facilities	199.02	3,195	180.0
Ecological protection and environmental governance	6.03	97	230.0
Real estate development	193.59	3,108	-14.3

Source: plotted based on relevant data from website of Statistics Bureau of Zhoushan City.

1.5 Jurisdictional Design/Environment, e.g. decentralization, local governance system

Zhoushan is the first prefecture-level city in China with an organizational system of archipelago, and the only state-level new area themed with marine economy. Since Zhoushan development is elevated into national strategy level, Zhoushan has borne the policy advantage of playing the pilot and pioneer role. Therefore, based on archipelago development practice, Zhoushan has formed some characteristics in administrative governance, as shown in the following aspects.

A"province-administered" new area leadership and management system is constructed. The State Council approved to establish Zhejiang Zhoushan Archipelago New Area, and

granted it economic and social management authorities of provincial-level, and set joint meeting of inter-ministry and province for the new area. The provincial committee of the Communist Party of China in Zhejiang Province, and Zhejiang Provincial Government have established a Leader Group for Construction of Zhoushan Archipelago New Area, set a work committee of Communist Party of China and a management committee in the New Area, the leader team and two committees adopt the "joint office" mode together with municipal committee of Communist Party of China in Zhoushan City and Zhoushan Government. On one hand, this joint-office mode is beneficial for strengthening the coordinating function of New Area Management Committee by using the efficient feature of it. On the other hand, the existing prefecture-level city system is reserved to ensure that major decision making, execution and supervision be separated, showing the scientific feature of New Area construction.

Management framework for economic functional zones of the "archipelago" new area is rationalized. Zhoushan Archipelago New Area Management Committee has established five economic functional zones in accordance with the features of isolated islands, separation and relative independence in this archipelago area, and given double-functions of "economic development and social management" to each functional zone by adhering to the basic mode of "combination of development zone and administrative zone" and highlighted the dominating function and major role of Development Committee in development and construction for each functional zone. Also, Zhoushan has tried to explore the mode in which functional zones focus on development and construction while towns(streets) focus on social affairs, rationalizing the relationship between functional zone and city,county (district) and towns in terms of responsibilities and authorities, and their obligation boundaries.

"Late-developing" bodies for the New Area are established. When optimizing and integrating bodies under Zhoushan Archipelago New Area, it highlights regional feature and "marine strategy" feature, gradually shifts body function from "power-centered" to "function-centered", having formed a governmental structure with scientific function allocation, streamlined and comprehensive bodies and clearly defined responsibilities and authorities, to push the comprehensive management by "super bodies".

1.6 The Municipal Financial System

1.6.1 The public financial system

Currently, China adopts tax-sharing fiscal system for its public finance management, namely, at the premise that fiscal powers of all-level governments are reasonably allocated, budgets and revenues of all-level governments are mainly classified by taxes, budgets of different levels are relatively independent and with clear balance responsibility, the differences among different levels and different regions are mainly adjusted by fiscal transfer payment system. Although as the first state-level new area authorized with the economic and social management powers of provincial level, Zhoushan still needs to handle its relationship with Zhejiang Province within fiscal system. The Implementation Opinions on Deepening Fiscal System Reform issued by Finance Department of Zhejiang Province in 2015 provided the relationship between Zhejiang Province and Zhoushan City with respect to responsibility, power and interest. The main points of the Opinions are described below:

Fiscal powers and spending responsibilities are shared between Zhejiang Province and Zhoushan City. The spending responsibilities corresponding to fiscal powers of Zhejiang Province alone or Zhoushan City alone shall be assumed by provincial government or Zhoushan city respectively. The spending (or financing) responsibilities corresponding to fiscal powers shared by Zhejiang Province and Zhoushan City shall be allocated proportionally. Zhejiang Provincial government may delegate part of provincial powers to Zhoushan City government by arranging transfer payment.

Zhejiang Province and Zhoushan City mainly share the increased part of revenue. The increased part of Zhoushan City's fiscal revenue

in 2015 compared with fiscal revenue in 2014 was shared by Zhejiang Province and Zhoushan City by a ratio of 20:80.

Zhoushan is classified into the first category and the third scale in terms of transfer payment. Generally, a shortfall in local government due to major expenditure increasing policies issued by Zhejiang Provincial Government shall be filled by general transfer payments. Based on factors including economic and social development level, economic mobilization capacity and fiscal status, Zhoushan City is classified into the first category and the third scale, with a transfer payment coefficient of 0.8. The capital from transfer payment is mainly used for accelerating national strategics including marine economy and a series of combined policies for upgrading and transformation issued by Zhejiang provincial committee of Communist Party of China and Zhejiang Government.

1.6.2 The financial market system

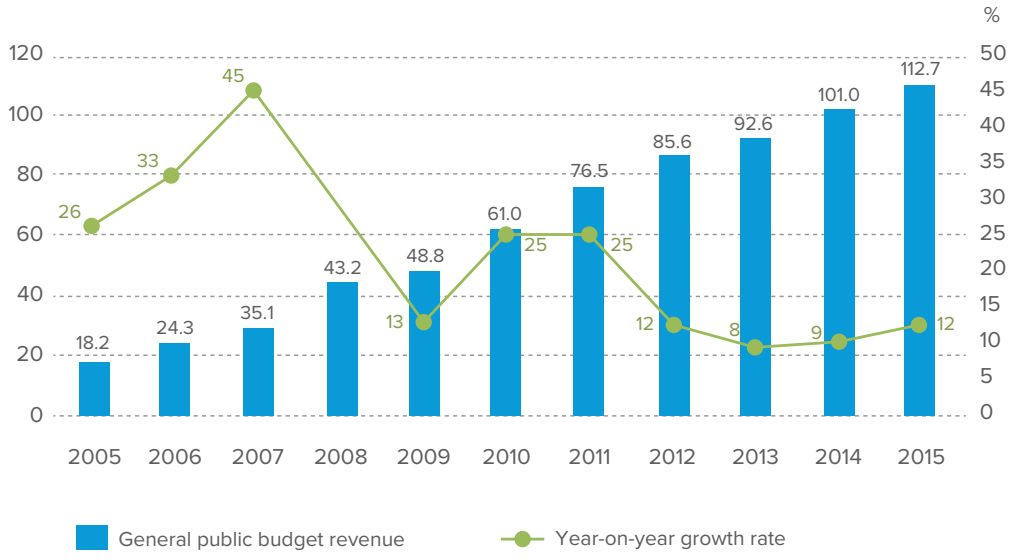
In recent years, Zhoushan City has achieved the healthy and steady development of financial industry and continuously promoted marine economy's innovative level and capability of serving real economy by implementing developmental strategy themed with marine economy, thereby offering good financial guarantees for economic and social development. Zhoushan City's current financial market is characteristic of the following aspects:

Financial system is improved continuously. Zhoushan City has formed a diversified financial system covering banks, securities, futures, insurances, leasing and funds, with national and regional financial institutions (organizations) being coordinated developed. By the end of 2015, Zhoushan City had 7 corporate banks, 18 bank branches, 23 municipal-level insurance companies, 12 securities offices, 3 futures offices and 10 financing guarantee companies.

Financial industry is developed steadily. By the end of 2015, financing aggregate balance was 280.741 billion RMB (45.074 billion USD), of which, financing aggregate from financial institutions was 265.574 billion RMB (42.639 billion USD). Balance of deposits in local and foreign currencies in Zhoushan City's financial institutions amounted to 179.108 billion RMB (28.757 billion USD), while balance of loans in local and foreign currencies amounted to 149.984 billion RMB (24.081 billion USD). Financial industry in Zhoushan City realized an increased-value of 6.6 billion RMB (1.060 billion USD), increasing by 2.073 billion RMB (333 million USD) compared with 2013. Such increased-value was responsible for 6.03 percent of GDP growth and 12.48 percent of service sector growth.

Direct financing has made great progress. By the end of 2015, direct financing balance of Zhoushan reached 14.029 billion RMB (2.252 billion USD), with a growth of 12.592 billion RMB (2.012 billion USD). During "12th Five Year Plan" period, Zhoushan completed direct financing of 23 times, having raised 15.582 billion RMB (2.550 billion USD), of which, various bonds of 15.33 billion RMB (2.461 billion USD) were issued, securitization of 547 million RMB (88 million USD) assets were achieved, China's first non-listing company debenture was successfully issued and the first securitization of financing and leasing assets in Zhejiang was conducted. Also, equity investment has developed rapidly. By the end of 2015, Zhoushan had 3 government industrial investment funds with a total scale of 9 billion RMB (1.4 billion USD) and 8 equity investment funds with a total scale of 10.108 billion RMB (1.623 billion USD).

Figure 1-7: General Public Budget Revenue and its Growth Rate of Zhoushan City between 2005 and 2015



Source: plotted based on relevant data from website of Statistics Bureau of Zhoushan City.

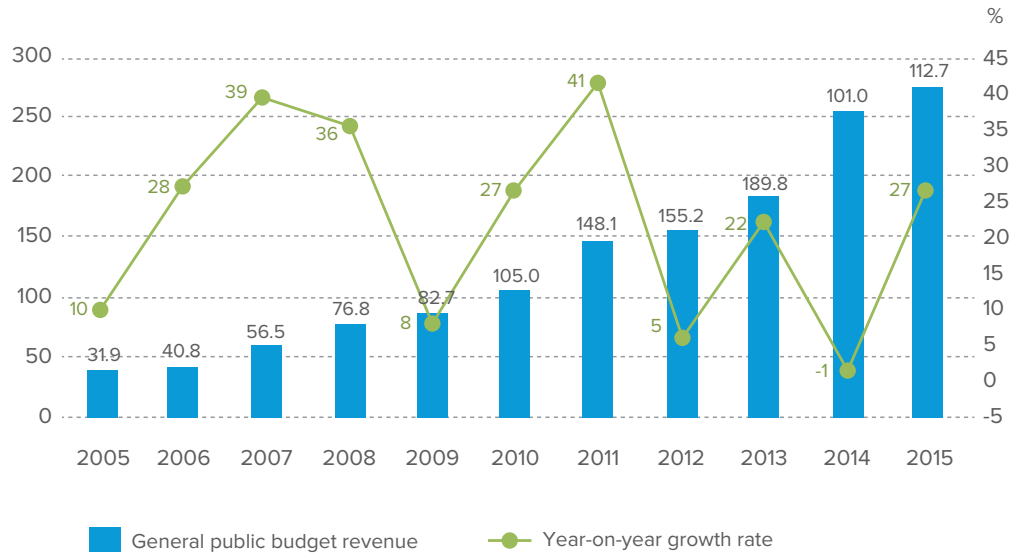
1.7 Municipal Revenue and Expenditure by Categories/Types

In recent years, with the relatively rapid development of economy, Zhoushan City's financial strength is enhanced prominently, its fiscal budget is well executed, therefore showing more supports and guarantees to social and economic development

Fiscal revenue is increased sustainably. The total fiscal revenue of Zhoushan City increased from 2.852 billion RMB (348 million USD) in 2005 to 15.959 billion RMB (2.562 billion USD) in 2015, and breaking 10 billion RMB (1.52 billion USD) in 2011, and with an average annual growth rate of 19.1 percent. Of such revenue, general public budget revenue increased from 1.820 billion RMB (222 million USD) in 2005 to 11.272 billion RMB (1.810 billion USD) in 2015, breaking 10 billion RMB (1.52 billion USD) in 2014 and with an average annual growth rate of 20.5 percent (Figure 1-7).

Fiscal spending capability is improved. Zhoushan City's general public budget spending increased from 3.193 billion RMB (485 million USD) in 2005 to 23.965 billion RMB (3.848 billion USD) in 2015, with an average annual growth rate of 23.1 percent, 2.5 percentage points higher than national growth rate during the same period (Figure 1-8). Considering the overall conditions for general public budget revenue and spending of Zhoushan City from 2005 to 2015, on one hand, with the increase of fiscal strength, Zhoushan City has shown growing fiscal supports to social and economic development. However, on the other hand, general public budget revenue has always been lower than general public budget spending. Therefore, it is required to both increase tax revenue and optimize fiscal spending structure in order to improve the use efficiency of capital granted by fiscal body for supporting economic and social development.

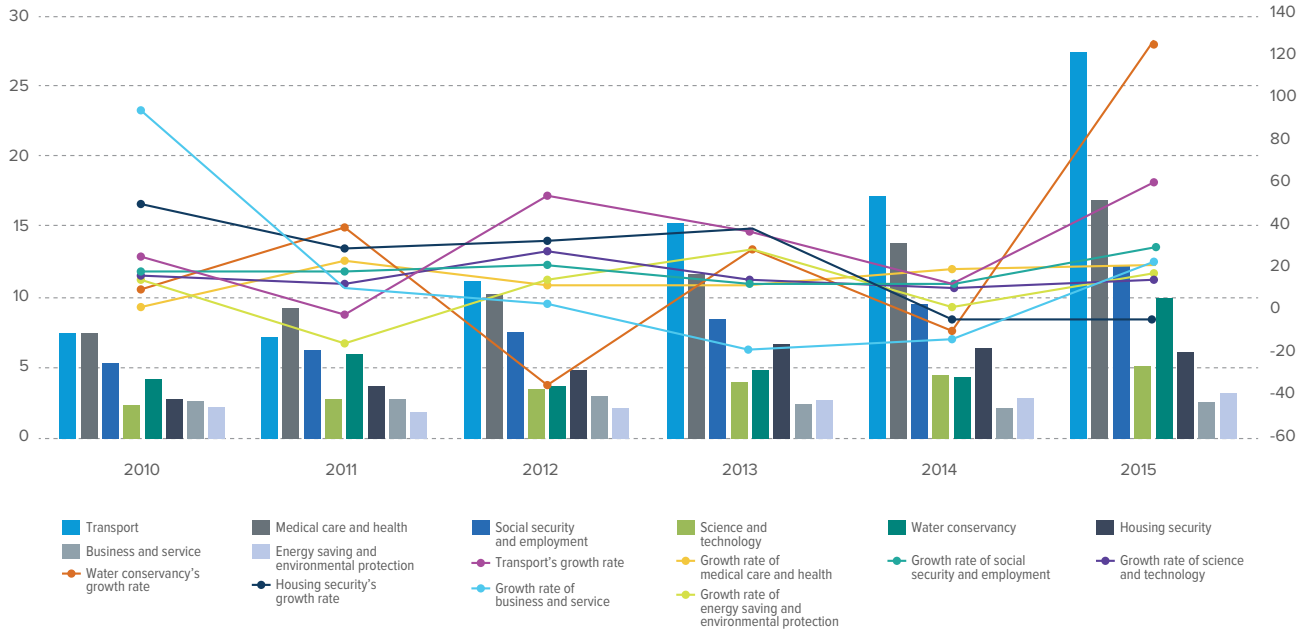
Figure 1-8: General Public Budget Spending and its Growth of Zhoushan City between 2005 and 2015



Source: plotted based on relevant data from website of Statistics Bureau of Zhoushan City.

Livelihood spending in key fields is well guaranteed. By analyzing the spending on 8 livelihood projects out of general public budget spending of Zhoushan City from 2005 to 2015, we should note that transport, medical care and health, social security and employment have taken up a relatively larger weight, with an average annual increase rate of 29.6 percent, 17.3 percent, and 18.2 percent respectively, being the key directions for Zhoushan City to supports and develop. The spending on science and technology has shown a growing trend while spending on water conservancy, housing security, business and service, and energy saving and environmental protection has shown fluctuations all the time (Figure 1-9).

Figure 1-7: General Public Budget Revenue and its Growth Rate of Zhoushan City between 2005 and 2015



Source: plotted based on relevant data from website of Statistics Bureau of Zhoushan City.

1.8 Financing Sources and Flows for Housing, Infrastructure and Urban Services

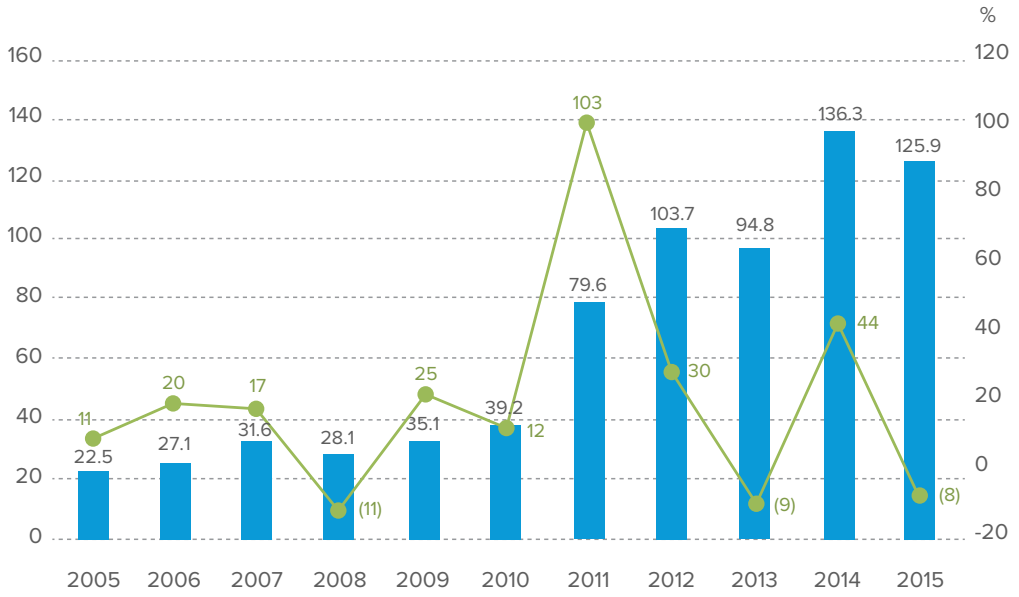
In recent years, Zhoushan has been promoting the urbanisation process of Zhoushan Island and other small islands by classification, trying to build Zhoushan Archipelago into a sea garden city with well-known mountain and sea, coordinated land and sea, and harmonized human and sea. Improved urban infrastructure facilities and public services will provide foundation and guarantee for sustainable development of Zhoushan City, while improvement of housing environment offers necessary space carrier for Zhoushan people's happy and quality life. These are all the necessity for Zhoushan's urbanisation. Capital and its sources used for housing and infrastructure are described below.

1.8.1 Financing sources and flows for housing

According to requirement of building a moderately prosperous society in all respects, by adhering to principles of "strengthening guarantee, stabilizing market and optimizing structure", with the aim of "residents have access to housing", Zhoushan City has formed a double-track housing supply system combining commercial residential housing and low-income housing. Because investment in commercial residential housing development takes up a major portion of the total housing investment in Zhoushan, commercial residential housing is chosen to represent the whole housing market in this Report, in order to analyze the total housing investment and capital source. The investment in Zhoushan's commercial residential housing development increased from 2.25 billion RMB (275 million USD) in 2005 to 12.59 billion RMB (2.021 billion USD) in 2015, with an average annual growth rate of 21.4 percent and showing a continuous growing trend (Figure 1-10).

According to relevant information provided by Zhoushan City's Bureau of Statistics, capital used for Zhoushan commercial residential housing development is mainly from domestic loan, self-raised fund and other financing channels. In terms of capital source structure, domestic loan was responsible for about 36

Figure 1-10: Investment in commercial residential housing Development and its Growth of Zhoushan between 2005 and 2015



Source: plotted based on relevant data from website of Statistics Bureau of Zhoushan City.

percent, most of which was commercial bank loans; self-raised capital about 27 percent, of which, self-owned capital took up about 50 percent; other capital about 37 percent, including commercial residential housing sale deposit and advance payment , of which, house mortgage loan took a large part, as well as money raised from non-banking financial institutions such as insurance companies, securities companies, trust companies and financial companies. In conclusion, currently, Zhoushan City's major commercial residential housing investment is banking system, with a weight of higher than 50 percent. Current financing channel is too monotonous and highly dependent of commercial banks.

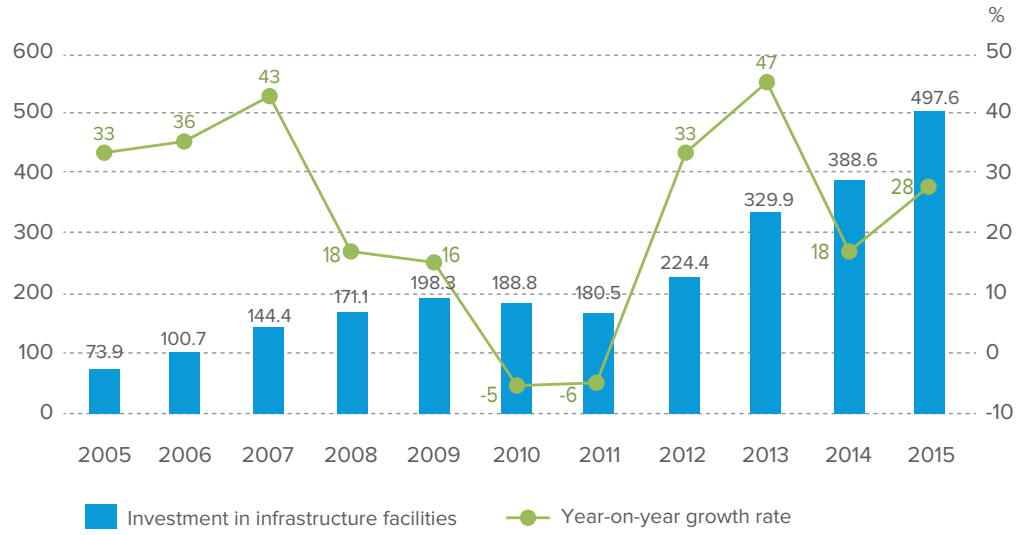
1.8.2 Financing sources and flows for infrastructure and urban service

In recent years, Zhoushan's investment in infrastructure facilities and public services has shown an overall rapid upward trend, increasing from 7.46 billion RMB (911 million USD) in 2005 to 48.762 billion RMB (7.990 billion USD) in 2015, with an average annual growth rate of 23.7 percent (Figure 1-11).

Similar to other cities, Zhoushan's most infrastructure facilities require long investment and construction period, large early-stage investment and result in obvious external economy, leading to long payback period and high risk. Additionally, social capital is not actively involved in infrastructure facilities, so it is required to have government-dominated investment. In view of that urban infrastructure projects take up a large portion of Zhoushan's total investment in fixed assets (generally, higher than 50 percent), therefore, in this Report, the investor structure and annual capital source for Zhoushan's investment in fixed assets in recent years are analyzed to determine the capital source for investment in infrastructure facilities and public services.

Taking data related to investment in fixed assets of Zhoushan City from 2008 to 2014 into consideration, in terms of investor structure, state-owned or state-controlled took up the largest weight, with an average annual weight of about 52 percent, followed by private investors, with an average annual weight of about 43 percent and again followed by foreign investors and investors from Hong Kong, Macao and Taiwan, with an average

Figure 1-11: Zhoushan's Investment in Infrastructure Facilities and its Growth from 2005 to 2015



Source: plotted based on relevant data from website of Statistics Bureau of Zhoushan City.

Table 1-3 Fixed Asset Projects' Investor Structure of Zhoushan from 2008 to 2014

Year	2008	2009	2010	2011	2012	2013	2014
total investment of the year (100 million RMB)	339.43	400.66	413.84	476.09	570.60	750.02	960.09
state-owned and state-controlled investment (100 million RMB)	170.00	158.34	183.18	168.17	220.37	377.20	466.78
private investment(100 million RMB)	147.19	191.14	208.22	282.46	328.14	350.52	466.95
Hong Kong, Macao,Taiwan and foreign investment (100 million RMB)	22.25	24.18	22.45	25.45	22.10	22.30	27.16
total investment of the year (100 million USD)	48.87	58.65	61.13	73.71	90.39	121.10	156.30

Source: plotted based on relevant data from website of Statistics Bureau of Zhoushan City.

annual weight of less than 5 percent. It is noted that state-investment plays a major role in Zhoushan City's infrastructure facilities and public services, private capital also plays an important role, but foreign capital is quite less currently, showing a certain development room in the future (Table 1-3).

In terms of capital source, domestic bank loan is the dominating source for domestic loan, with an average annual weight of about 20 percent and relatively stable; government dominated capital is generally provided by two ways. The first way mainly refers to national budget capital, including general budget,

government-managed fund budget, state capital operation budget and social security fund budget, with an average annual weight of about 4 percent. The other is off-budget spending, which is the capital not listed into national budget but used for government investment, mainly related to various charging items, including land sale fee among others. Self-raised capital was responsible for about 70 annually, but after considering that more than half of investors for infrastructure facilities and public services are from state-investment, and they more or less have some governmental background or support. So broadly, some of self-raised capital was also from government's indirect investment. Capital from bonds and foreign investment was rather less and therefore ignored here (Table 1-4). This shows that capital used to investment in urban infrastructure facilities and public services in Zhoushan is dominated by governmental investment and domestic bank loan, a quite narrow financing channel. Therefore, in order to satisfy the development needs of future urban infrastructure facilities and public services in Zhoushan City, and realize the construction purpose of "four-island, one-city and one-center" smoothly, Zhoushan Government needs to make continuous institutional innovations, make use of market mechanism and coordinate both domestic and foreign markets, and lead more social capital to make investment, building a new pattern with diversified financing modes and channels.

Since infrastructure facilities and pubic services involve various contents of different forms, according to united work framework issued by United Nations Human Settlements Programme, in this Report, transport facilities, energy and power facilities, water resource and waste disposal facilities are incorporated into discussion.

Table 1-4 Source of Capital Used for Investment in Fixed Assets in Zhoushan from 2008 to 2014

Year	2008	2009	2010	2011	2012	2013	2014
Total capital of this year(100 million RMB)	358.49	350.07	345.95	391.45	456.01	590.75	726.43
(1) national budget capital	3.28	20.90	10.99	16.06	14.93	46.90	38.77
(2) domestic loans	103.10	98.80	78.59	77.90	93.87	80.08	96.28
(3) bonds	-	0.18	-	-	-	-	-
(4) foreign capital	0.18	-	0.76	1.05	0.31	2.31	4.89
direct foreign investment	0.18	-	-	-	-	-	-
(5) self-raised capital	223.49	220.95	241.31	283.30	328.92	429.00	557.79
Self-owned capital by enterprises and public institutions	58.79	25.00	17.27	31.49	27.24	43.21	20.69
(6) other capital source	28.44	9.24	14.30	13.14	17.97	32.46	28.67
Total capital of this year(100 million USD)	51.62	51.25	51.10	60.61	72.24	95.39	118.26

Source: plotted based on relevant data from website of Statistics Bureau of Zhoushan City.

Note: self-raised capital——According to the financial management system in our country, funds to invest in construction except the formal use of non-budgetary funds, which was raised by all departments and enterprises and administrations, institutions

END NOTES

[1] *Because since 2011, Zhoushan City has covered the same administration area with Zhoushan Archipelago New Area, the two is deemed as the same concept in this Report.*

[2] *The USD to RMB exchange rate (E) used in this Report is annual average exchange rate, for which, 2016 exchange rate is the average of first three quarters,* E_{2005}*=8.1917,* E_{2006}*=7.9718,* E_{2007}*=7.604,* E_{2008}*=6.9451,* E_{2009}*=6.831,* E_{2010}*=6.7695,*E_{2011}*=6.4588,* E_{2012}*=6.3125,* E_{2013}*=6.1932,* E_{2014}*=6.1428,* E_{2015}*=6.2284,* E_{2016}*=6.5792. For the exchange rates used for 2015 and previous years in this Report are the annual exchange rates of respective years, and the exchange rate for 2016 is the 2016 exchange rate. Exchange rate for five year plan data is the exchange rate of that five-year-period's last year.*

[3] *Zhoushan City's financing aggregate=balance of on and off-balance sheet financing by banking institutions within Zhoushan+financing balance of banking institutions out of Zhoushan+direct financing balance within Zhoushan+small-loan financing balance*

Chapter 2

Financing Needs and Status of for Housing, Infrastructure and Urban Services

2.1 Financing Needs for Low and Medium Income Housing

2.1.1 Status and planning of urban housing security

Zhoushan Government attaches high importance to construction of low-income housing by regarding it as an important step to build a harmonious society. Until the end of 2015, as many as 58,900 households and 16,492 people were benefited from urban comfortable housing project in Zhoushan, with a coverage rate of 21.7 percent. Currently, a multi-layer urban housing security system of "two-housing and one-renovation" is basically established, i.e., public rental housing, affordable housing and urban run-down area renovation (Table 2-1).

Low-income housing	Public rental housing	Affordable housing (housing co-owned by individual and government)	Urban run-down area renovation (government supported resettlement housing)
Targeted people	Lower-middle and lower income families with difficulty in housing , new employees without housing and introduced talents that satisfy certain requirements and migrant workers conforming to provided requirements and with stable employment	Urban low income families with housing difficulty that satisfy certain requirements	Urban families whose houses are incorporated into dilapidated housing renovation, focusing on grade D and grade C dilapidated housing renovation
Purpose	Solve temporary housing difficulty.	Solve long-term housing problem	Compensate and resettle the families due to urban run-down area renovation
Method	Physical housing provision, rent subsidy and rent reduction and exemption; rent period is 3 to 5 years	Mainly through house sale	Physical housing provision and ownership security
Construction standard	Newly built single apartment's area is no larger than 60m^2; For the second-raised public rental housing source, single apartment's area could be up to 80m^2.	Single apartment's building area is no larger than 60m^2 while for high-rise and small high-rise building, the apartment area could be up to 70m^2.	From 2016, for renovation of urban run-down area, monetary housing compensation should take up a ratio of 65 percent or higher in order to unblock the path between commercial residential housing and resettlement housing, and encourage people to buy houses themselves.
Operation and management	Government-dominated and social parties including enterprises-supported	Government dominated	Government dominated
Actual progress	By the end of 2015, the newly developed public rental houses in Zhoushan were 14,288 units with a total building area of 726,000m^2; of which, 10,331 units were completed, with a total area of 460,000 m^2; 9,035 unites were delivered, with a total building area of 412,000 m^2. A total of 9,162 families received physical public rental housing (including low-rent housing) and 2,233 families received rent subsidy for public rental housing.	By the end of 2015, newly developed affordable housing in Zhoushan were 4,938 units, with a total building area of 345,000m^2; of which, 3,346 units were completed with a building area of 241,000 m^2, 2,614 units were sold with a building area of 200,000m^2,and 2,614 units were delivered, with a building area of 230,000m^2.	By the end of 2015, Zhoushan completed urban run-down area renovation projects involving 39,736 households and with a total building area of 4,564,000m^2, of which, 6,860 households received monetary compensation with a building area of 696,000m^2. A total of 43,691 houses were newly developed, with a building area of 4,770,000m^2. Additionally, 5,155 houses in urban run-down area were overhauled with a building area of 340,000m^2 (by the end of 2013).

Figure 2-1: Current Low-income Housing in Zhoushan

According to *Urban Housing Security "13th Five Year" Plan of Zhoushan*, it is expected that by the end of 13th Five Year Plan period, urban low-income housing project will benefit 75,093 households and 210,260 people, with a coverage rate of over 25 percent. Urban housing security development needs to achieve "three basic requirements", namely, urban housing security system dominated by public rental housing security is basically formed, renovation of existing centralized urban run-down areas is basically completed; public rental housing security demand from families whose per capita disposable income is lower than local urban level, new employees without housing and migrant workers satisfying a certain requirements is basically met.

Regarding about low-income housing structure, affordable housing development scale was decreased obviously during the "12th Five Year Plan"period. Therefore, low-income housing project during the "13th Five Year Plan"period should focus on development of public rental housing and renovation of urban run-down areas. For this, overall principle for developing public rental housing is to reduce new building as much as possible by collecting housing source through market mechanism and promoting monetary housing security. The overall principle for renovation of urban run-down areas is no new resettlement project will be developed by promoting monetary housing compensation actively.

2.1.2 Analysis on the demand of urban housing security

When analyzing urban housing security demand during the "13th Five Year Plan" period, Zhoushan needs to consider several factors including urbanisation progress, hukou system reform, and equalization of rural and urban access to public services, incorporation of migrant workers into urban housing security, land resource endowment and local economic and social development level.

Predication of public rental housing demand

According to National Sample Survey on Urban Households, generally, urban households are divided into five categories by income level. Specifically, all the surveyed urban households are classified into five groups based on per capita disposable income, i.e., low income households, lower-middle income households, middle income households, upper-middle income households and high income households. Zhoushan City also adopts this method. According to the latest available urban household income information of Zhoushan (2012), per capita disposable income for low income households was 16,311 RMB (2,584 USD), that for lower-middle income households was 24,263 RMB (3,844 USD), equivalent to about 54 percent and 90 percent of that for middle income households (30,075 RMB,i.e, 4,764 USD). Because per

capita disposable income for middle income households may also be deemed as broad median, which was slightly lower than per capita disposable income for urban households in Zhoushan (34,244 RMB, i.e., 5,422 USD), the two are regarded as approximately equal to each other in this Report. Therefore, Zhoushan middle income households' income level is multiplied by a certain ratio to estimate the income levels for both low income households and lower-middle income households.
Developing public rental housing in Zhoushan can help solve housing difficulty encountered by various lower-middle and lower income households, and alleviate the temporary housing problem faced by new employees, introduced talents and migrant workers. The former is a group that is not able to solve housing problem by their own in a long term view and the latter is a group whose housing affordability grows gradually.

The income line for public rental housing determined by Zhoushan Government is 80 percent of per capita disposable income for urban households in the same year. In 2015, per capita annual income line standard for public rental housing was 35,876 RMB (5,760 USD), approximate to the per capita annual disposable income for lower-middle income households. On this basis, and by considering the actual condition for households whose per capita housing area is lower than 16m^2, it is possible to determine the housing demand from lower-middle income households with housing problem.

Additionally, income line for public rental housing could also be deemed as the boundary line to purchase commercial residential housing through market method. A model for estimating public rental housing income line based on commercial residential housing market data and transaction situation is established in this Report in order to analyze the income boundary line above which people adopt market method to solve housing problem. The households below this line are deemed as the targeted group needing government to provide housing security (Appendix A). After estimation, households that were not able to purchase 60 m^2 commercial houses were corresponding to lower-middle and low income households while that were not able to purchase 90 m^2 commercial houses were corresponding to upper-middle, middle and lower-middle income ones. Those households are the target of public rental housing, especially the sandwich-class.

Since conflict between supply and demand of public rental housing will not disappear in a short term and housing construction requires some periodical feature, it is required to screen the prioritized group for housing security and enhance security efficiency. After investigation and analysis, during the "13th Five Year Plan"period, a total of 5,873 apartments were needed for public rental housing, of which, 1,077 were for lower-middle income households, 2,295 for new employees, 390 for migrant workers with stable jobs and 2,111 for introduced talents (Appendix B).

Predication of demand for urban dilapidated housing renovation

Urban run-down area renovation is one pro-people project released by Zhoushan Government to renovate urban dilapidated houses and improve the housing conditions of poor families. After investigation and analysis, during the "13th Five Year Plan"period, a total of 838 urban dilapidated buildings are needed to be renovated, involving 18,772 households and a building area of 1,193,000m^2 (Appendix C).

2.1.3 Analysis on urban housing security investment

Based on the above investigation results, Zhoushan Government has determined the planning aim for urban housing security during the "13th Five Year Plan"period with the following scale, methods and indexes.

Zhoushan City will renovate 10,334 households in urban run-down areas, a building area of 1,109,000 m^2, of which, 6,232 households will receive physical housing with a building area of 700,000 m^2 and 4,102 households will receive monetary housing compensation, with a building area of 409,000 m^2, leading to a monetary compensation ratio of 39.7 percent.

Newly developed low-income housing will

include 15,642 houses, of which, 15,099 units are resettlement houses, 543 units are public rental housing. Delivered low-income housing will include 29,323 units, of which, 25,206 units are resettlement houses and 4,117 units are public rental housing.

A total of 570 additional households will receive public rental housing subsidies. Based on Zhoushan's housing security purpose and after the estimation by Zhoushan Government, during the "13th Five Year Plan" period, capital demand from Zhoushan's low-income housing is 17.913 billion RMB (2.723 billion USD), of which, monetary subsidy(compensation) demand is 4.293 billion RMB (653 million USD), construction capital is 13.618 billion RMB (2.070 billion USD). Of the construction capital demand, 335 million RMB (51 million USD) is for public rental housing, including newly developed and continued projects as well as housing source for purchase and long-term leasing during planned period, etc; 13.283 billion RMB (2.019 billion USD) is for urban run-down area renovation, including newly developed and continued projects, as well as land expropriation during planned period, etc.

2.1.4 Financing needs for low income, lower and lower-middle income housing

Capital is a crucial factor for Zhoushan to push urban indemnificatory conformable housing project. According to China's latest requirement ruling ratio of self-owned capital to total capital invested in projects related to fixed assets, for indemnificatory housing project, the minimum self-owned capital is 20 percent[4]. Considering characteristics of investing and financing demand, and practical construction conditions with respect to different low-income housing projects in Zhoushan, in this Report, financing demand from newly developed low-income housing projects are mainly analyzed. Generally, during the "13th Five Year Plan"period, construction capital for Zhoushan's newly developed low-income housing projects will be 5.596 billion RMB (851 million USD) (Appendix D). Assuming that the minimum self-owned capital ratio required by the State is deducted and other capital can be obtained by external financing, then the ideal upper limit of financing demand is 4.477 billion RMB (680 million USD). Considering the supporting degree for low-income housing construction by financial market and necessary investment from government, then feasible and conservative financial demand (lower limit) is 1.679 billion RMB (255 million USD). In conclusion, during the "13th Five Year Plan"period, financing need for Zhoushan's urban low-income housing will be between 1.679 and 4.477 billion RMB (255 million USD and 680 million USD).

A total of **570** additional households will receive public rental housing subsidies.

2.2 Financing Needs for Infrastructure and Urban Services

2.2.1 Financing needs for transport

Zhoushan has unique location and port resource advantages. However, as an archipelago city, transport is of crucial importance for city development. Zhoushan has outward transport and urban transport, the former refers to land-island transport and the latter urban transport and inter-island transport. As early as the late 20th century, Zhoushan was aware of the importance of outward transport. In 2005, it built the longest cross-sea Donghai Bridge in the world, and later began to conduct Zhoushan mainland-islands linking project. Currently, Zhoushan has formed a comprehensive transport system dominated by water transport and supported by highways and airlines, and basically realizing the fast and convenient freight and passenger transport paths with other cities. However, due to archipelago geographical restraint, expansion of expressways and railways are serious affected. The Ningbo-Zhoushan expressway (G9211) completed in 2009 is the only land

Table 2-2 Zhoushan's Existing Outward Transport

Transport infrastructure	2005	2014
Productive berths (number)	385	291
berths for 10,000- tonner or higher (number)	12	48
Bridges (number)	165	295
Highway (km)	952	1,897.3
Expressway (km)	0	41.9

Table 2-3 Zhoushan's Existing Transport Facilities

Transport infrastructure	2005	2014
urban road (km)	487	662.14
buses in operation (number)	350	737
transport terminals (number)	146	219

path connecting Zhoushan and external land transport. What is more, outward transport is often affected by weather conditions, travel needs and outbound communications of Zhoushan residents are hugely limited, and the synergy efficiency of Zhoushan Archipelago and mainland society for economic and social development is also affected.

Zhoushan's urban transport has formed a network dominated by water transport and supported by corridors, grouped lines and urban-rural lines. By 2014, regarding about inter-islands transport, Zhoushan built 219 terminals; regarding about urban transport, the available road was 66.214km and 737 public vehicles were in service. Of these vehicles, 191 were clean energy vehicles (including 30 bus rapid transit vehicles) (Table 2-3). In October, 2013, Zhoushan opened the No.1 bus rapid transit with a total length of 25km. Zhoushan's bus network covers main streets in Dinghai, Xincheng and Putuo downtown areas with complete self-service ticketing and bus coverage rate for administrative villages has reached 100% (not including Zhujiajian). Although inter-islands transport in Zhoushan can satisfy freight transportation and passengers' travel demand to some degree, because these intra-island systems are not connected to intra-island roads and urban transport network are low in grade, such transport system is not fully adapted to the needs of production and life development.

During the same time, the amount of motorized vehicle in Zhoushan increased sharply, imposing great pressure on urban road network. By the end of 2014, the amount of motorized vehicle in Zhoushan reached 171,000, of which, the amount of automobile broke 110,000. Zhoushan had 97 automobile per thousand people, during the lower-middle stage of the "S"- shape curve for motorization development, a stable growing phase. Compared with other prefecture-level cities in Zhejiang Province, the number of cars per thousand people in Zhoushan was at the lower-middle level, indicating some growing space in the future.

Table 2-4 The Amount of Motorized Vehicles and Automobile in Zhoushan from 2010 to 2014

Year	2010	2011	2012	2013	2014
The Amount of Motorized vehicle (number)	131,595	142,710	147,716	160,153	171,230
The Amount of Automobile (number)	60,474	73,741	85,518	99,415	110,218
The amount of automobile per capita (number/thousand people)	54	65	75	87	97

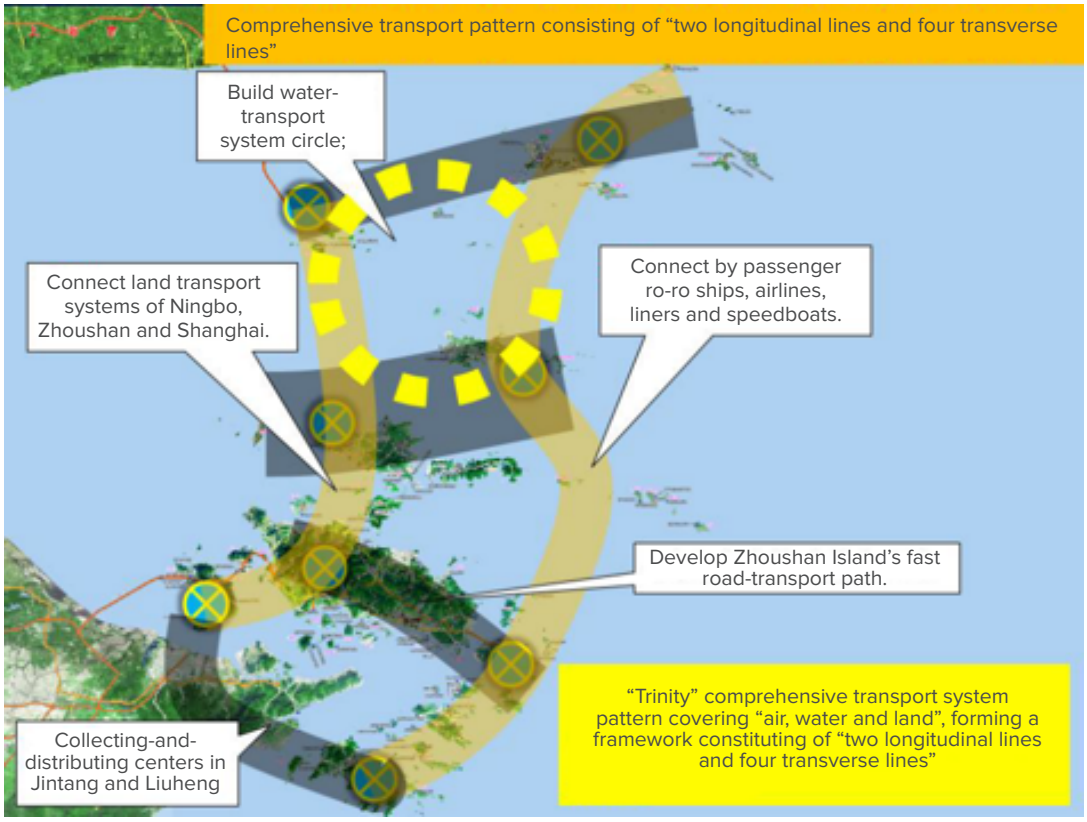
Table 2-5 Transport Demand Features of Zhoushan Archipelago New Area by 2020

	Freight transport	Passenger transport
Dominating transport method	Water transport	Road transport
Transport demand	water freight transport will reach 359 million tons	Road passenger transport will reach 302.8 million person-times.
	Zhoushan Port's cargo throughput is expected to reach 520 million tons	Water passenger transport will reach 30.20 million person- times.
	road freight transport will be 129 million tons	Airport's annual passenger throughput will reach 2 million person-times.

The "13th Five Year Plan"period is an important phase for Zhoushan New Area to develop by leaps and bounds, and also an critical period to accelerate constructing an sustainable stereo and comprehensive traffic system. Relevant bodies under Zhoushan Government have predicated that by 2020, the total freight transport and total passenger transport for Zhoushan Archipelago New Area will reach 494 million tons and 335 million person-times (Table 2-5). As a result, comprehensive traffic infrastructure of Zhoushan needs to be further improved, including, outward system needs convenient passenger transport with large capacity, such as inter-city railways, expressways and mainland-islands linking projects among others, needs to expand Zhoushan Putuo mountain Airport and to actively immerse into integrated development of Yangtze River Delta Region; internal system needs bus rapid transit, rail transit, passenger terminal and fast ship among others in order to build a stereo, multi-layer and multi-mode inter-island transport system, and to ensure the emergency general airline communications between different function zones, daily freight and passenger transport communications between islands occupied by people and the Zhoushan Island, as well as the land transport communications between major logistics industrial islands.

With respect to spatial pattern, Zhoushan works hard to build a "trinity" modern comprehensive traffic system covering airway, land-way and waterway, with Zhoushan Port's waterways as leading role, road network as framework, general water traffic as base, civil aviation as supporting point and general aviation as highlight, to connect both internal and outward transport system, thereby realizing the urban integration effect with Shanghai and Ningbo (Figure 2-1). Of this comprehensive system, the "tri-" refers to water, land and air transport system for passenger and freight, the "-nity" refers to the transport network consisting of the main framework of"two longitudinal lines and four transverse lines" and the nodes of "eight regional hubs".

Figure 2-2 Modern Comprehensive Transport System Pattern of Zhoushan Archipelago New Area



Regarding about the planned construction, Zhoushan will accelerate urban transport infrastructure construction from road, railway, land-island transport, waterways and anchorages, airline construction, stations for road transport and transport service system to really improve its comprehensive traffic service level (Table 2-6).

Table 2-6 Traffic Construction planned in "13th Five Year Plan"period for Zhoushan

Traffic system	Planned key points
Roads and railways	Further push construction of mainland-islands linking project. Further promote construction of collecting and distributing paths for ports and renovation of common national and provincial highways, build a range of model projects for designing, constructing and operating beautiful roads, and deepen upgrading and renovation of rural roads
Land-island transport	Further optimize layout of water passenger transport to build a multi-layer and convenient island-land transport network including regional water passenger terminals, supporting terminals for water buses, supporting terminals for tourism islands and livelihood freight and passenger terminals
Waterways and anchorages	Strengthen the planning and construction of important waterways, anchorages and navigation bases.
Airlines	Push the expansion and opening up of Putuo mountain Airport, increase airlines and flights toward major domestic cities and establish passenger and freight airlines toward Hong Kong, Macao, Taiwan and international destinations as appropriate to build a middle-sized international airport with some regional radiation ability and service ability.
Stations for road transport	Build an inter-city, rural-urban, inter-island and intra-island integrated highway passenger transport network with comprehensive passenger transport hubs as center, and highway passenger stations of city, county and town levels as supports. Strengthen construction of facilities like public parking lots and charging stations.
Transport service system	Strengthen connection to peripheral provincial and municipal distributing centers and transport hubs, and further optimize inter-city rapid passenger transport network by increasing coverage rate, decreasing rapid bus's departure interval and improving rapid passenger buses' service quality.

Based on Zhoushan City's planning documents and by analyzing data provided by relevant governmental bodies, we have noted that total planned investment in road traffic facilities is 63.782 billion RMB (9.695 billion USD). After the amount invested in 2015, then the total planned investment for the "13th Five Year Plan"period is about 35.566 billion RMB (5.406 billion USD) (Appendix E).

According to minimum capital ratio requirement applicable to projects of investment in fixed assets for different sectors, the minimum ratio of self-owned capital to total capital invested in road transport projects is 20 percent. Assuming that the minimum self-owned capital ratio required by the State is deducted and other capital can be obtained by external financing, then the ideal total financing need for road transport projects during the "13th Five Year Plan"period is 28.452 billion RMB (4.352 billion USD). However, considering operating modes and cashflow conditions of road transport projects, profit-projects, like expressways, can generate some cashflow, but are often unable to totally cover their costs relying on operation alone; while non-profit projects do not generate cashflow, such as urban roads and common roads which are public-interest oriented. Therefore, the market financing amount for road transport projects is limited and fiscal supports are needed to be expanded to increase the self-owned capital's weight and satisfy external financing requirement. After investigation, Zhoushan has similar financing practices. The feasible and conservative financing need for road transport projects is 14.226 billion RMB (2.162 billion USD). In conclusion, during the "13th Five Year Plan"period, Zhoushan's road transport projects' total financing demand is between 14.226 and 28.452 billion RMB (2.162 and 5.325 billion USD).

2.2.2 Financing needs for energy and power

Zhoushan's unique geographical location has made that its resources are distinctively different from that for inland regions. Zhoushan's land area basically has no energy or raw materials, all its needed primary energy (coal and oil) are provided by other regions. Zhoushan is severely restricted by market factors. With the development of Zhoushan's marine economy and acceleration of its urbanisation progress, Zhoushan works hard to use self-owned resources by gradually stepping on supply of clean energies such as natural gas, wind energy, tidal energy and solar energy, in order to realize green transformation of power industry, optimize energy structure, enhance energy efficiency, thereby pushing the sustainable development of society and economy.

Energy financing demand

Zhoushan's energy financing demand includes traditional energy and new energy. This section will focus on analyzing traditional energy financing demand.[5] Major energies consumed in Zhoushan include raw coal, gasoline, diesel and natural gas. Raw coal takes up the largest portion of energy consumed by industries with or higher than a certain scale, and showing a year-on-year rise trend. Gasoline consumption is relatively stable with some slight declines. Diesel consumption has shown an overall upward trend. Urban gas popularization rate has been improved. Except that Zhoushan Island uses nature gas, other islands mainly use liquefied petroleum gas as fuel gas. As shown in Table 2-7 and Table 2-8, in 2015, total energy consumption contributed by all industrial enterprises in Zhoushan was 1,378,000 tons of coal equivalent, energy consumption decreased by 8.9 percent per industrial added-value. Of this, 5.669,000 tons of raw coal and 2,621,000 tons of various oil products were consumed. In 2014, total supply of manufactured gas and natural gas was 28.94 million m^3 for 527,000 people, total supply of liquefied petroleum gas, and 343,660,000 m^3 for 176,100 people. During the "12th Five Year Plan" period, increase rate of total energy consumed by industrial enterprises with or higher than a certain scale was slowed, mainly because the increase rate of both total consumed major energies and total energy consumption by key energy consuming enterprises were slowed.

Table 2-7 **Chang of Energy Indexes for Industrial Enterprises with or higher than A Certain Scale in Zhoushan from 2010 to 2015**

Year	2010	2011	2012	2013	2014	2015	2010
Total energy consumption (10,000 tons of SCE) (equivalent value)	118.83	125.63	118.82	119.34	133.63	137.80	118.83
Energy consumption decrease rate by industrial added-value (%)	3.8	11.3	17.8	8.7	0.3	8.9	3.8

Source: compiled based on *Zhoushan Statistical Yearbook* from 2011 to 2015 and *Statistical Communiqué of Zhoushan on the 2015 National Economic and Social Development*

Table 2-8 Zhoushan's Energy Consumption from 2010 to 2014

Item	Unit	2010	2011	2012	2013	2014
Raw coal	tons	1,668,916	1,970,798	1,802,000	1,977,037	4,080,349
Gasoline	tons	4,386	3,843	3,967	3,637	3,426
Diesel	tons	54,315	50,089	51,582	58,279	72,756
Total gas supply (manufactured gas and natural gas)	10,000 cu.m	1,676	1,922	2,224	2,719	2,894
#civil use	10,000 cu.m	909	998	1,124	1,279	1,422
Total supply of liquefied petroleum gas	tons	34,636	31,837	28,409	33,443	34,366
#civil use	tons	34,036	31,257	27,879	32,913	33,834
Population using gas (manufactured gas and natural gas)	10,000 persons	36.49	39.73	43.76	49.75	52.7
Population using liquefied petroleum gas	10,000 persons	19.35	17	15.67	18.32	17.61

Source: compiled based on Zhoushan Statistical Yearbook from 2011 to 2015

Note: coal and oil consumption refers to the corresponding energy consumed by industries with or higher than a certain scale (practical quantity)

At present, Zhoushan has constructed an energy guarantee system which, however needs to be further improved. The energy consumption per 10,000 RMB (1,520 USD) industrial output value has been lowered to some extent, but energy efficiency remains relatively lower. Social and economic development is heavily dependent on raw coal, clean energy's ratio is less and pipeline and network construction of natural gas is deficient.

During the "13th Five Year Plan" period, Zhoushan will improve energy guarantee network, enhance energy guarantee capacity, thereby supporting economic and social transformation by lower increase rate of energy consumption and scientific and reasonable energy consumption structure. Regarding about coal, Zhoushan will strictly control total coal consumption, push the clean and efficient use of coal, thereby fully realizing reduction in coal consumption and replacement of coal-fired boilers. Regarding about natural gas, Zhoushan will accelerate stepping on project of ENN LNG import terminal and filling station, building natural gas facilities such as urban fuel gas network and filling stations. By 2020, it is expected that urban civil gas popularization will reach 95 percent and pipeline gas popularization rate more than 50 percent.

Based on Zhoushan City's planning documents and by analyzing data provided by relevant governmental bodies,for the planned construction of energy and power, we have noted that total investment in non-renewable energy projects is about 11.082 billion RMB (1.684 billion USD). After the investment completed in 2015 is deducted, the total investment for the "13th Five Year Plan" is about 11.077 billion RMB (1.684 billion USD) (Appendix F).

Urban power and fuel gas projects are quasi-public goods and natural monopolies. Production and supply of power and fuel gas is

of relatively high profitability, therefore requires less support from national budget capita. For these projects, self-owed capital takes up a higher ratio of the total capital and debt financing is preferred. According to minimum capital ratio requirement applicable to projects of investment in fixed assets for different sectors, the minimum ratio of self-owned capital to total capital invested in power and energy projects is 20 percent. After investigating capital sources for energy and power projects of Zhoushan City and in combination with the similar projects' financing market status in China, Zhejiang Province and Zhoushan, the ratio of self-owned capital to total capital for non-renewable energy projects is between 20 and 80 percent, the corresponding total financing amount is between about 2.215 and 8.862 billion RMB (337 and 1.347 billion USD).

Power financing demand

During the "12th Five Year Plan" period, total electricity consumption in Zhoushan grew year-by-year, with industrial electricity consumption taking up a large portion and civil electricity consumption increasing continuously, however, the increase rate of latter was much lower than that of former. In 2015, Zhoushan's total electricity consumption was 4.603 billion KWH, of which, 2.345 billion KWH was industrial consumption and 796 million KWH was civil consumption, with the per capita electricity consumption of 688.58 KHW per year, and the largest electricity load was 910 MW. Considering reasons such as equipment repairing and maintenance, Zhoushan's self-supplied electricity was relatively short. In the circumstance that both Zhejiang provincial power network path and Zhoushan's internal major power plants are relatively monotonous, Zhoushan's grid is at system risk. Additionally, not all the islands are covered by transmission network, some remote islands still reply on diesel generators.

During the "13th Five Year Plan" period, Zhoushan will arrange the construction of power plants and the grid, optimize power plant distribution and the grid structure, and maintain the stable and coordinated development of power plants and the grid. Regarding about power plants, Zhoushan will strengthen island power plant support, accelerate stepping on construction of Zhoushan Power Plant's phase III 2×660,000 KW unit and Zhejiang Zheneng Electric Power Co., Ltd Liuheng Power Plant's phase II project among others. Also, Zhoushan will actively develop distributed energy by speeding up to construct small scale pilot distributed projects of combined cooling, heat and power projects for natural gas. In terms of the grid, Zhoushan will accelerate construction of 500 KV 2nd path project connecting Zhoushan and mainland, optimize 220KV grid framework covering Zhoushan Island the other major islands, fully make use of multi-terminal flexible DC transmission projects' modeling effect, further improve the smart and strong grid with strong network structure, coordinated transmission and distribution, coordinated rural and urban networks, and flexible dispatching.

Based on Zhoushan City's planning documents and by analyzing data provided by relevant governmental bodies, we have noted that total investment in power facilities planned by Zhoushan City is about 8.92 billion RMB (1.356 billion USD). After the investment completed in 2015 is deducted, the planned total investment for the "13th Five Year Plan" period is about 8.905 billion RMB (1.353 billion USD) (Appendix F).

After investigating capital sources for energy and power projects of Zhoushan City and in combination with the similar projects' financing market status in China, Zhejiang Province and Zhoushan, the ratio of self-owned capital to total capital for power projects is between 20 and 80 percent, the corresponding total financing amount is between about 1.781 and 7.124 billion RMB (271 and 1.082 billion USD).

2.2.3 Financing needs for water and waste management

Financing needs for water resource utilization and water conservancy facilities

Zhoushan Archipelago is separated from the mainland, without any foreign water and, whose water resource is basically from precipitation alone. However, most of precipitation is drained into the sea with poor water closure. Therefore, Zhoushan is quite short of water resource. In order to meet water need due to civil life and urban development, Zhoushan has actively implemented water resource guarantee projects, having basically completed the "trinity" urban and rural water resource distribution pattern focusing on local reservoir, water diversion from mainland and sea water desalination. By the end of 2015, Zhoushan's total water consumption reached 145 million m^3, with the water consumption per 10,000 RMB (1,477 USD) GDP of 13.6 m^3, 37.3 percent lower than that in 2010, water consumption per 10,000 RMB (1,477 USD) industrial added-value of 15.6 m^3, 31 percent lower than that in 2010. But facing increasingly growing water demand, insufficient water supply remains one of major problems influencing Zhoushan's sustainable social and economic development. According to predication, by 2020, Zhoushan's water demand will reach 315 million m^3 based on 90 percent guarantee rate, with a water shortfall of 170 million m^3. After many years' development and construction, Zhoushan Archipelago's land suitable and easy for development is depleted, resulting in more difficult engineering construction and higher cost.

For the "13th Five Year Plan" period, Zhoushan has planned to implement multi-source water supply projects to enhance quality and intensive water resource guarantee and to form a water resource guarantee pattern with the features of "multiple sources, both quality and quantity prioritized, intensive, reliable and big islands radiating small islands". Zhoushan will work hard to promote Zhoushan City's mainland water diversion project phase III, Shengsi County's mainland water diversion (Shanghai to Sijiao Island) project and Putuo's Liuheng Island water diversion from Ningbo, etc. Zhoushan will also implement projects such as pumping water into reservoirs and reserved network, strengthen comprehensive management of reservoir and riverways and fully play the role of built-up projects in water supply. By 2020, the newly added water supply will be 116 million m^3, rural tap water popularization rate will reach 99 percent and rural population enjoying safe drinking water will increase by 160,000 people.

Based on Zhoushan City's planning documents and by analyzing data provided by relevant governmental bodies, we have noted that Zhoushan's total planned investment in water supply and water drainage is about 7.342 billion RMB (1.116 billion USD), of which, the planned total investment for the "13th Five Year Plan" period is about 6.511 billion RMB (990 billion USD) (Appendix G). Of the 7.342 billion RMB (1.116 billion USD), about 4.137 billion RMB (629 million USD) is used for multi-source water supply project and planned investment for the "13th Five Year Plan" is about 3.763 billion RMB (572 million USD); about 3.205 billion RMB (488 million USD) will be used for waste water processing projects and the planned investment for the "13th Five Year Plan" period is about 2.748 billion RMB (418 million USD) (Table 2-9).

rural tap water popularization rate will reach **99 percent** and rural population enjoying safe drinking water will increase by 160,000 people

Table 2-9 Investment in Multi-source Water Supply Projects and Waste Water Processing Projects

Item	Unit	2010	2011	2012	2013	2014
Raw coal	tons	1,668,916	1,970,798	1,802,000	1,977,037	4,080,349
Gasoline	tons	4,386	3,843	3,967	3,637	3,426
Diesel	tons	54,315	50,089	51,582	58,279	72,756
Total gas supply (manufactured gas and natural gas)	10,000 cu.m	1,676	1,922	2,224	2,719	2,894
#civil use	10,000 cu.m	909	998	1,124	1,279	1,422
Total supply of liquefied petroleum gas	tons	34,636	31,837	28,409	33,443	34,366
#civil use	tons	34,036	31,257	27,879	32,913	33,834
Population using gas (manufactured gas and natural gas)	10,000 persons	36.49	39.73	43.76	49.75	52.7
Population using liquefied petroleum gas	10,000 persons	19.35	17	15.67	18.32	17.61

Source: Zhoushan's "13th Five Year Plan" for Water Conservancy and Zhoushan City's Key Projects List for the "13th Five Year Plan"

According to minimum capital ratio requirement applicable to projects of investment in fixed assets for different sectors, the minimum ratio of self-owned capital to total capital invested in profit water conservancy projects is 20 percent and this system is not applicable to non-profit projects. Assuming that the minimum self-owned capital ratio required by the State is deducted and other capital can be obtained by external financing, then the ideal total financing need for multi-source water supply projects and waste water treatment projects during the "13th Five Year Plan"period is 5.209 billion RMB (792 million USD). At the same time, in combination with similar projects' market status and actual supports from financial institutions in China, Zhejiang Province and Zhoushan, the feasible and conservative market financing ratio applicable to these projects is 30 percent, with a corresponding financing scale of 1.953 billion RMB (297 million USD). In conclusion, during the "13th Five Year Plan" period, total financing demand from both multi-source water supply project and waste water processing projects is between 1.953 and 5.209 billion RMB (297 and 792 million USD).

Financing need for waste management

Zhoushan City's waste management mainly includes management of industrial solid waste and household garbage. The collection, transportation and disposal are managed by relevant administrative bodies. In 2014, Zhoushan City produced 940,700 tonnes of industrial soild waste. Household garbage is mainly from civil garbage, commercial garbage, trading market garbage, street garbage, public place garbage and these from public institutions, schools and plants, etc. The household garbage produced in 2015 was 763 tons per day. Zhoushan has established preliminary household garbage transfer network with 17 garbage transfer stations and 1 garbage transfer terminal in downtown area. However, household garbage of all districts and counties are transported to garbage landfill plants and garbage incineration plants located in Jishan Island The high cost of garbage transportation and treatment, and severe pollution caused by various pollutants from landfill leachate have negatively affected Zhoushan to build "sea garden city" and southern seafront landscape of Zhoushan Archipelago.

In order to strengthen comprehensive waste management, during the "13th Five Year Plan" period, Zhoushan will realize classification for waste collection, closed waste transportation, harmless waste treatment, reduce waste production and try to transfer waste into resource as much as possible. In terms of waste collection, Zhoushan will implement containerized, closed and classified collection, with classified collection method being commensurate with classified treatment method, and achieve compressed rate for waste transfer of 80 percent and mechanization rate for waste clean and transportation of 100 percent. In terms of waste transfer, Zhoushan City is an archipelago, so its waster transfer approach is special and transfer cost is high. Most of waste transfer stations are small scale. Based on the existing 17 waste transfer stations, Zhoushan plans to build 24 more transfer stations. Regarding about waste treatment, Jishan island waste treatment base is temporarily reserved. In order to satisfy waste treatment need by 2030, Zhoushan has planned to build new waste treatment bases in the islands north to Zhoushan Island and focus on construction of waste incineration power plants to relieve the environmental pollution and negative influences on landscape brought by landfills, and to achieve 100 percent harmless waste treatment, constructing a comprehensive treatment system consisting of "classification/recycling+incineration+composting+sanitary land-filling" which are connected and organically combined.

In order to treat urban household garbage properly and effectively control pollution from garbage treatment, Zhoushan City's total planned investment in waste treatment project for the "13th Five Year Plan" period is about 830 million RMB (126 million USD) (Appendix G).

According to minimum capital ratio requirement applicable to projects of investment in fixed assets for different sectors, the minimum ratio of self-owned capital to total capital invested in environmental sanitation is 20 percent. Assuming that the minimum self-owned capital ratio required by the State is deducted and other capital can be obtained by external financing, then the ideal total financing need for waste management during the "13th Five Year Plan" period is 664 million RMB (101 million USD). At the same time, considering similar projects' market status in China, Zhejiang Province and Zhoushan, the feasible and conservative ratio of self-owned capital to total capital for such projects is 30 percent; the corresponding total financing amount is between about 249 RMB (37.8 billion USD). In conclusion, during the "13th Five Year Plan" period, financing demand from waste management prospects is between 249 and 664 million RMB (38 and 101 million USD).

2.3 Sources and Status of Finance for Housing, Infrastructure and Urban Services

2.3.1 Sources and status of finance for lower and lower-middle income housing

In order to complete urban low-income housing construction aim planned for the "12th Five Year Plan" period, Zhoushan Government, based on local conditions, has actively dominated multi-channel financing and pushing measures. Overall, most of construction capital was from governmental investment, however, the capital sources varied between different types of low-income housing.

Construction of public rental housing remained dominated by governmental investment, but social capital's participation was increased. By the end of 2015, of the physical housing provided from Zhoushan's public rental housing project, 5,507 units were invested by government and 3,655 units by social capitals such as enterprises, taking up a ratio of 39.9 percent. General mode for public rental housing construction consists of land allocation by government and development and construction by state-owned enterprises. The major financing channels are listed below:

- Special subsidy funds from central and provincial governments
- Capital from local fiscal budget
- Housing security capital withdrawn from 10 percent of net proceeds of land sales
- Balance of housing provident fund's value-added benefits after loan risk reserve and management fee are subtracted.
- Sales of public houses directly administered by national real estate management agencies and balance of compensation fund for housing demolition and relocation
- Social directional donation and capital raised through other channels

Gaoyunjiayuan project is used to illustrate the capital source and status for Zhoushan's public rental housing construction. This project is located at southeast side of Xincheng tunnel, Lincheng new district, Zhoushan City, consists of 16 high-rises whose total floors are from 11 to 17 and relevant supporting facilities, and has 1,706 households. It was incorporated into Zhoushan Government's 2012 investment plan. Currently, all bidding sections of this project are under nearly completed. This project's total planned land area is 64,731 m^2, total building area about 145,212 m^2, and total investment 610 million RMB (968.135 million USD). Regarding about capital source, higher government's fiscal subsidy and local government's fiscal support take up 60 percent of total investment, also indicating Zhoushan's public rental housing construction is heavily dependent on government's fiscal support (Table 2-10).

Table 2-10 Capital Source and its Structure for Gaoyuanjiayuan project

Capital source	Amount (10,000 RMB)	Amount (10,000 USD)	Share (%)
Fiscal subsidy from higher government	17,642	2,681	29
Local government support	18,872	2,868	31
Local government bond	15,000	2,280	24
Others	9,600	1,459	16
Total	61,114	9,289	100

Source: Provided by the Zhoushan government.

Figure 2-3: Construction Photo of Gaoyuanjiayuan Project

Because most of urban run-down area renovation projects are intended for sales, their financing channels are more and market acceptability is higher than that for public rental housing. Zhoushan's capital for urban run-down are renovation projects are mainly from fiscal subsidies, bank loans, enterprise support and funds raised by people, with the following main aspects:

- National and provincial subsidies, including on-budget subsidy from central government, special subsidy funds from both central and provincial governments.
- City and county fiscal capitals, including special funds arranged from urban maintenance and construction tax, urban public utility surcharge, urban infrastructure support fee and land sale revenue, etc.
- Credit capital. Zhoushan government tries to fully connect to financial institutions such as China Development Bank and Agricultural Development Bank of China.
- Social capital. Zhoushan government actively guides social capital into renovation of urban run-down areas and real estate development enterprises with enough strength and good credit to participate in renovation projects.
- Funds raised by residents in run-down areas.

2.3.2 Sources and status of finance for transport

Since most transport infrastructure projects are not profit-oriented, these projects are unable to produce stable cashflow and therefore dependent on government investments. However, government financial supports are unable to cover all the increasingly growing and huge investment demand for transport infrastructure, Zhoushan must seek private capital to invest into transport infrastructure projects. In March, 2016, Zhoushan City People's Government printed and distributed *Notice on Pilot Implementing Opinions of Zhoushan City on Guiding Social Capital into Construction and Operation of Public Infrastructure*, in order to innovate channels and methods with which social capital can achieve diversified participation, and push social capital to actively involve in construction and operation of public facilities.

Currently, Zhoushan City's capital used for transport infrastructure facilities is mainly raised from the following channels:

- National and provincial subsidies, projects in public interest are mainly dependent on fiscal appropriations.
- City, county and district fiscal capital, including special funds arranged from urban maintenance and construction tax, urban public utility surcharge, urban infrastructure support fee and land sale revenue, etc.
- Credit capital, mainly the project loans from commercial banks.
- Self-raised capital mainly from Financing Platform of Zhoushan Archipelago New Area Government which attracts local large state-owned enterprises to involve in transport infrastructure facilities.

Typically, two financing methods are applicable to Zhoushan City's transport infrastructure facilities. The first one is platform operating mode conducted by large companies. Zhoushan's largest subject for investing in and financing for transport infrastructure is Zhoushan Communications Investment Group Co., Ltd (hereafter referred to as Zhoushan Communications Investment). This Company is wholly-owned by State-owned Assets Supervision and Administration Commission of Zhoushan City. Since its establishment, this Company has invested 8.6 billion RMB (1.307 billion USD), of which, 4 billion RMB (608 million USD) was invested into bridge construction, 4 billion RMB (608 million USD), road renovation and construction, and another 600 million RMB (91 million USD) ,construction of stations and hubs. In recent years, Zhoushan Communications Investment has built transport infrastructure construction platform for Zhoushan Archipelago New Area, fully played its financing role in serving development and construction of the New Area, and actively assumed several key governmental projects including "Northward Great Channel", "Liuheng Bridge" and" Fuchimen Bridge" (Table 2-11).

The second mode is "local government investment+state-owned enterprise investment+bank loan". Typical project is Main Channel of Ningbo- Zhoushan Port (Yushan Petrochemical Shugang highway). This project's total investment is about 16.762 billion RMB (2.691 billion USD), of which, 4.023 billion RMB (646 million USD) is the self-owned capital from Zhejiang Communications Investment Group Co., Ltd, 1.334 billion RMB (214 million USD) is the self-owned capital from Zhejiang Port Investment and Operation Group Co. Lt, 1.348 billion RMB (216 million USD) is from Zhoushan City's fiscal appropriation. The sum of these three capital sources is 6.705 billion RMB (1.77 billion USD), used as project capital, taking up about 40 percent of the total investment. The remaining 10.057 billion RMB (1.615 billion USD) is solved by domestic bank loan.

Table 2-11 Capital Arrangement for Transport Infrastructure Projects Dominated by Zhoushan Communications Investment

Project Type	Project Name	Capital Arrangement
Non-profit projects	The highway between Zhoushan Jintang Island Interchange to Dapukou Shutong port	Actual total investment was 1.167 billion RMB (177 million USD). The capital is mainly from enterprise debentures (690 million RMB, 105 million USD), government subsidy (616 million RMB, 94 million USD) and some self-owned capital (70 million RMB, 11 million USD).
	Expansion of Zhoushan Zhujiajian Bridge along the No.329 National Highway	
Proposed projects	Fuchimen Bridge	Estimated total investment was 1.5 billion RMB (228 million USD) and self-owned capital was 375 million RMB (57 million USD, 25 percent of the total investment)
	Ningbo-Zhoushan Railway	The total length of this railway is 87.7 km. The estimated project investment was about 24 billion RMB (3.648 billion USD) and self-owned capital was 12 billion RMB (1.8 billion USD, 50 percent of the total investment).

Source: Provided by the Zhoushan government.

2.3.3 Sources and status of finance for energy and power

Urban energy and power system include supply of power and fuel gas. Such infrastructure construction requires large early investment, long payback period and low return on investment, therefore has been mainly supported by government funds. Companies responsible for operating these projects basically have government background. Since supply urban power and fuel gas is franchised operation, and applicable to mode of user charge, it can easily generate stable cashflow and has some feasibility of obtaining bank loans. Since exact data about capital source ratio for Zhoushan's power and energy projects is not available, in this Report, by analyzing average capital source ratio for China's infrastructure projects and power and fuel projects from 2004 to 2014, and referring to capital source ratio for Zhoushan and Zhejiang Province's total investment in fixed assets in 2014, and combining Zhoushan's field investigation result, it is estimated that capital used for Zhoushan's energy and power projects is mainly self-raised, taking up about 60 percent, with bank loan being about 30 percent and national budget capital being about 10 percent (Table 2-12).

Regarding about investors, energy and power projects are dominated by state-owned enterprises and supported by private enterprises. Traditional fire plants and power network laying projects in Zhoushan are generally dominated by state-owned enterprises, with its capital mainly from self-raised capital, however, much of which is from government direct allocation and fees obtained due to franchised operation granted by government (Table 2-13).

Table 2-12 Investment Status of Typical Power Projects in Zhoushan

	National budget	Self-raised capital	Domestic loan	Foreign capital	Other
National Infrastructure Facilities	13%	53%	25%	1%	8%
National Power And Fuel Gas Industry	7%	55%	32%	1%	5%
All Industries Of Zhejiang Province	17%	60.5%	15%	0.1%	7.5%
All Industries Of Zhoushan Province	4.7%	71%	19.5%	0.3%	4.5%

Source: Compiled and calculated based on China Statistical Yearbook 2004 to 2014, Zhejiang Statistical Yearbook 2015 and Zhoushan Statistical Yearbook 2015

Table 2-13 Investment Status of Typical Power Projects in Zhoushan

Project Name	Capital source	Main investor	Total investment
Zhoushan 110KV Taimen project of power transmission and transformation	Self-raising	Zhoushan Bureau of Power Supply	42.4 million RMB (6.44 million USD)
Zhoushan 110KV Huimin bridge project of power transmission and transformation	Self-raising	Zhoushan Bureau of Power Supply	52.65 million RMB (8 million USD)

Source: Zhoushan Government Information Website http://xxgk.zhoushan.gov.cn/xxgk/index.shtml

2.3.4 Sources and status of finance for water and waste management

Sources and status of finance for water resource utilization and water conservancy construction

Water is the foundation for Zhoushan development. Zhoushan Government plays a dominating role in water utilization and water conservancy construction, and attracts social capital to participate in construction and operation of water conservancy projects according to different project types. Projects of water production and supply with good profitability need a less portion of government capital, but public interest oriented projects such as water resource development or protection relatively rely on government investment. The capital source and raising methods for water resource utilization and water conservancy projects of Zhoushan are described as below:

- National budget capital, including national special construction fund, provincial agricultural development investment fund, and local water conservancy construction fund raised in accordance with Administration and Implementations Rules on Raising and Using Capital for Local Water Conservancy Construction of Zhejiang Province, water resource fee and water, and soil conservation compensation fee, etc.
- Domestic loans, mainly referring to water conservancy credit capital by fulling using financial institutions' preferential polices including bridge loan and pledged supplementary lending.
- Self-raised capital.

Table 2-14 Capital Source and Share for Zhoushan City's Mainland Water Diversion Project Phase II

Capital Source	Central Government Investment	Local Government Investment	Bank Loan	Self-raised Capital
Amount (10,000 RMB)	20,000	46,524	75,000	997
Amount (10,000 USD)	3,040	7,071	11,400	152
Share	14%	33%	53%	0.7%

Source: Zhoushan Bureau of Water Resource

Zhoushan City's mainland water diversion project phase II is used to analyze water resource utilization project's capital source and capital structure. This is one of Zhejiang Province's key projects during the "12th Five Year Plan", with the designed water diversion scale of 1m^3/s (86,000 m^3/day), average annual water diversion of 250 days, and average annual diversion amount of 21.6 million m^3. Total investment in this project was about 1.425 billion RMB (217 million USD), mainly from bank loan, national and local government investments, taking up 53 percent, 14 percent and 33 percent, respectively (Table 2-14).

Zhoushan's garbage incineration is used in this Report to describe the source and structure of capital used for profitable waste treatment project. This garbage incineration power plant project has made use of one old garbage landfill. The construction scale of this project is this plant will treat garbage of 2000 tons/day. Also, the heat produced during incineration is used for power generation. The total investment was 564 million RMB (85.72 million USD), of which, 405 million RMB (61.55 million USD) was raised by enterprise and the 159 million RMB (24.17 million USD) was obtained by commercial bank loans (Table 2-15).

Sources and status of finance for waste management

Zhoushan's waste collection and arrangement of dustbins are mainly dependent on government capital and its waste treatment is mostly through sanitary landfill and incineration. Sanitary landfill is the major method for household garbage treatment, with lower treatment fees and lower benefits, being urban municipal project in public interest while garbage incineration enjoys relatively higher profits. Different steps in waste management flow have different investment and profit features. Therefore, source and structure of capital used for different projects vary from one to another.

Table 2-15 Source and Share of Capital used for Zhoushan City's one Garbage Incineration Project

Capital Source	Self-raised	Bank loan
Amount (10,000 RMB)	40,500	15,944
Amount (10,000 USD)	6,156	2,423
Share	72%	28%

Source: Study on Selected Technical Schemes for Urban Household Garbage Disposal-a case of Zhoushan City

END NOTES

[4] On September 9, 2015, the Notice on Adjusting and Improving Capital System for Projects of Investment in Fixed Assets issued by the State Council (Guo Fa[2015] No. 51) provided that the minimum capital ratio requirement applicable to projects of investment in fixed assets for different sectors. The investment in projects of housing, infrastructure facilities and public services mentioned in this Report all follow the requirement provided in the Notice.

[5] New energy's financing need will be analyzed in Chapter 3.

Chapter 3

Financing Needs and Status for Resilient and Green Urban Solutions

3.1 Financing Needs for Resilient and Green Urban Solution

Zhoushan is an ecological city, with beautiful living environment. But most of current ecological conditions are natural. As the first state-level new area themed with marine economy in China, Zhoushan will accelerate urban construction. However, during this process, Zhoushan will face two big challenges, i.e., low carbon development and climate change adaptability. Housing is not only provision of residence, but also an important source for energy consumption and greenhouse gas emission. Infrastructure facilities play a crucial role in one city's economic, social and environmental management, and needs to be improved in terms of its response to climatic disasters. Therefore, Zhoushan needs to adopt adaptive management and to make good technical and capital preparations to explore resilient and sustainable development paths by focusing on building a sea garden city.

3.1.1 Financing needs for resilient and green housing development

The green and resilient housing in this Report is defined as a building that offers healthy, applicable and efficient use space to people, in harmony and co-existence with the nature and in compliance with energy saving, water saving, land saving, material saving ,pollution reducing and environmental protection, during its whole service life.[6] Green and resilient housing should be housing first, and also has the features of green, resilient and smart housing. In recent years, Zhoushan City has made some successes in green housing energy-saving housing by improving design standards, pushing application of renewable building and renovating existing buildings for energy saving. During the "12th Five Year Plan", Zhoushan strictly executed design standard for building with an energy saving rate of 50%, and renovated existing housing building of 139,900 m^2 for energy efficiency improvement. From May 1, 2016, Zhoushan has fully executed Zhejiang Province Regulations on Green Buildings and encouraged construction of residential buildings to conform to technical requirements of two-star or higher level green building. On August 31, 2016, General Office of Zhejiang Province People's Government issued "Implementing Opinions on Stepping on Green Building and Building Industrialization, and in which, specified "by 2020, all the newly built buildings in urban areas of Zhejiang will be green buildings, with green building higher than two-star level taking up more than 10 percent.". Therefore, Zhoushan City has obtained adequate policy condition and social and economic development condition for green building development. In the future, green building construction will step into a speeding-up phase, with both building area and investment scale on a new step.

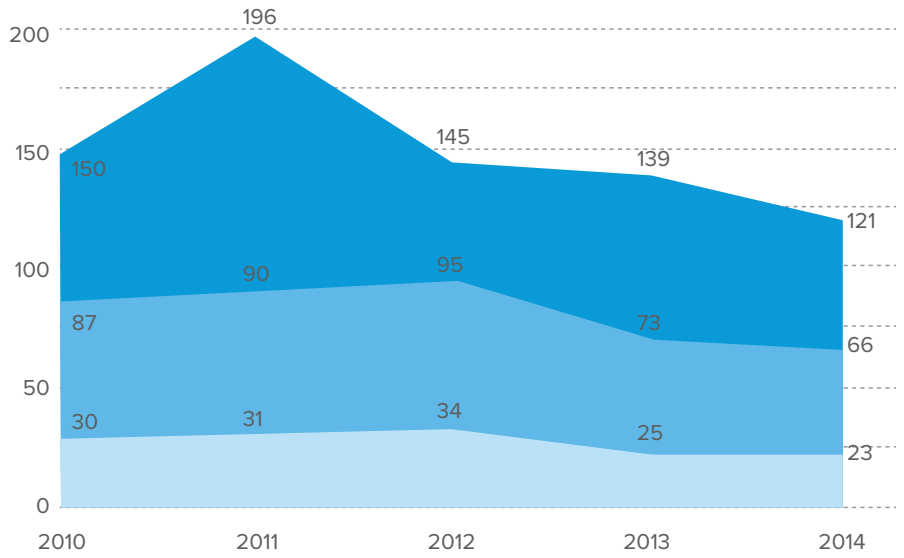
In this Report, the green ecological housing demand model based on preference theory (Chen Hong et al, 2006; Ma Jing and Deng Yu, 2014) is used to analyze consumer preference for green and resilient housing. And the predicated green and resilient housing demand in Zhoushan is obtained. It is expected that the demand for 2020 and 2030 will be 296,700 m^2 and 719,400 m^2, respectively (Table 3-1) (Appendix H). It should be noted that since people's preference is time-varying, the long term predication in this Report might be to some degree deviated from actual situation.

Table 3-1 Predicated Demand for Green and Resilient Housing in Zhoushan From 2020 to 2030

Year	2015	2020E	2030E
predicted population (10,000)	115.2	150	180
predicated demand for green and resilient housing(10,000 m2)	12.80	29.67	71.94

For green and resilient housing, as the future direction and increased market for residential housing industry, its development and investment scale is closely related to green building cost. According to statistics of green building's increased cost[7] for 148 projects reviewed by China Society for Urban Studies in 2014, increased costs of one-star, two-star and three-star green building housing project are 23 RMB/m^2 (3.74 USD/m^2), 66 RMB/m^2 (10.74 USD/m^2) and 121 RMB/m^2 (19.70 USD/m^2), respectively. Compared with increased cost of corresponding star green building in 2011, a historical peak value, the data in 2014 was lowered by 31 percent to 38 percent (Figure 3-1). According to practice curve, it is expected that, with the emergence, maturity and popularization of green technologies, products and construction processes, and with the more reasonable green plans selected by real estate developers aided by professional teams and consultation parties, increased cost of green building will be gradually lowered. In view of the development status of Zhoushan's green and resilient housing, three-star green building's increased cost is used as the green and resilient building's cost in this Report. In addition, since renovation of existing housing for green and resilient direction is mainly invested and guided by government, its financing demand is not estimated in this Report.

Figure 3-1 Increased Cost of China's Star Green Building from 2010 to 2014



Source: China Association of Building Energy Efficiency

Green and resilient housing is better because of its features of green, resilience and smartness, however, still is housing commodity. Therefore, analytic method applicable to commercial residential housing is used to estimate scale of investing in and financing for such housing. Based on investigation findings, Zhoushan existing commercial residential housing's unit investment price is 7,031.84 RMB/m^2 (1,069 USD/m^2), with a annual growth rate of about 2.1 percent. Therefore, it is possible to calculate that investments in green and resilient housing in 2020 and 2030 will be 1.24 billion RMB (189 million USD) and 3.19 billion RMB (485 million USD), respectively.

Table 3-2 Predicated Demand for Green and Resilient Housing in Zhoushan From 2020 to 2030

Year	2015	2020E	2030E
Demand for green and resilient housing(10,000 m2)	12.8	29.7	71.9
Growth rate of demand for green and resilient hosing (10,000 m2)	—	16.9	42.2
Unit investment price of commercial residential housing (rmb/m2)	7031.8	7179.5	7484.2
Increased cost of green and resilient housing (rmb/m2)	121	115	106
Total investment in green and resilient housing (100 million rmb)	9.3	12.4	31.9

As newly built green and resilient housing belongs to middle or higher end commercial residential housing, the minimum capital ratio for such development project is 25 percent. Green and resilient housing of low carbon and energy efficiency represents the developmental direction of housing industry, and will be understood and supported by the community gradually, thereby indicating a sound market prospect. Therefore, financial institutions are prone to supporting such projects, the ideal external financing scale for such housing in 2002 and 2003 is 868 million RMB (132 million USD) and 2.233 billion RMB (340 million USD), respectively. Also, since development of green and resilient housing projects will also be influenced by market environment and macro-policies, market risk will exist to some degree. So, in combination with current financing market status of Zhoushan, the feasible and conservative financing demand for green and resilient housing in 2020 will be between 248 and 868 million RMB (38 and 132 million USD) , in 2030, between 638 million and 2.233 billion RMB (97 million and 340 million USD).

3.1.2 Financing needs for resilient and green infrastructure development, urban services

Development of green and resilient traffic

Green and resilient traffic is one coordinated traffic and transport system that can satisfy requirements of urban economic, social and environmental sustained development, with the aim of relieving traffic congestion, lowering environmental pollution and promoting reasonable resource utilization. With the principles of “equality, coordination, human-based, equilibrium and sustainability”, Zhoushan City has been building five systems, i.e., public traffic, ecologic traffic, smart traffic, safe traffic and harmonious traffic, and prioritizing the development of public traffic and slow traffic systems full steam ahead, thereby pushing the low carbon development of green traffic infrastructure and transport industry. By comparing travel methods used by Zhoushan’s citizens in 2010 and 2016, we have note that, although the ratio of private cars has been increased a lot, reflecting the current social and economic development level, the ratio of green travel methods has also been increased, especially the ratio of bus travel (Table 3-3). Overall, Zhoushan’s green and resilient traffic is still in an early development stage.

Table 3-3 Comparison of Zhoushan Citizens’ Travel Method Unit: %

Year	Walk	Bicycle	Electric vehicle	Public bus	Taxi	Passenger car owned by organizations	Private car	Motorcycle	Other
2010	17.1	15.7	36.4	6.9	0.7	5.7	9.4	5.7	2.4
2016	15.36	19.58	20.73	15.16	0.96	—	27.06	—	1.15

Source: http://dhnews.zjol.com.cn/dhnews/system/2016/11/17/020881805.shtml

As the concept of green and low carbon life and green traffic is popularized, people's demand for green and resilient traffic will be increasingly growing. During the :"13th Five Year Plan", Zhoushan will purse resource saving, energy efficiency increase, emission control and environmental protection and focus on enhancing energy efficiency and lowering carbon dioxide emission in order to build green traffic and transport system, and grow to be a green traffic model city. The specific planned contents for the "13th Five Year Plan" period are as follows:

Public bus will be fully prioritized. Zhoushan will gradually build a three-layer urban-rural integrated public bus network consisting of fast lines, common lines and branch lines and strengthen green travel. Zhoushan will increase bus station coverage rate in downtown area, by 2020, the 300m bus station coverage rate will reach 80 percent, with a travel mode split rate of 25 percent.

Green slow traffic system will be established. Zhoushan will built slow traffic system along appropriate highways passing Zhujiajian island and Shengsi islands by creating beautiful highway projects, in order to built ecological and environmental protection roads.

Construction of green and low carbon traffic infrastructure will be promoted Zhoushan will strictly implement environmental protection and, water and soil conservation measures and push construction of greening and beautifying projects in order to increase greening level of current roads and by 2020, greening rate of trunk highways will reach 99 percent.

Green and low carbon transport industry will be rapidly developed. Zhoushan will deepen low carbon and green development concept in all industries, and accelerate stepping on application of clean energy equipment in road freight and passenger transport and urban public transportation fields. By 2020, with respect to energy efficient and environmental protection vehicles in Zhoushan, such buses will take up 60 percent, taxis 75 percent, profit passenger vehicles 10 percent, profit freight vehicles 2.2 percent. Compared with 2010, energy consumption per ton-kilometer of profit vehicle will be lowered by 13 percent and carbon dioxide emission by 14 percent.

In order to achieve aims about green and resilient traffic development, during 2015 to 2018, Zhoushan's traffic and transport industry will accelerate implementing 54 key projects of energy saving and emission reduction in seven categories, i.e., application of clean energy and new energy, convenient urban public transport, urban slow traffic system, green road transport system, green port water-transport system, green hubs and stations, building of green traffic management capacity. The total investment in these projects is estimated to be 5.6 billion RMB (851 million USD), of which, 4.07 billion RMB (618 billion USD) will be directed to energy efficiency and emission reduction. During the "13th Five Year Plan", another 1.53 billion RMB (233 million USD) will also be invested (Appendix E).

Development of green and resilient traffic is a key aspect of Zhoushan's future traffic infrastructure construction, and also an effective approach to realize sustainable traffic development. Traffic infrastructure projects meeting green and resilient direction will be supported by green finance from financial institutions and fiscal capital. For such projects' financing demand, on one hand, the minimum self-owned capital ratio required by China for road transport infrastructure projects should be met; one the other hand, the market financing status of similar projects in China, Zhejiang and Zhoushan should also be referred. After primary estimation, during the "13th Five Year Plan", financing demand for Zhoushan's green and resilient traffic infrastructure projects will be between 612 million and 1.224 billion RMB (93 and 186 million USD).

New energy and power

Acceleration of Zhoushan's urbanization, port development and marine economy development has imposed higher requirement for energy consumption and energy structure. Zhoushan has abundant local renewable energies, so it is possible to actively develop and use new energies as the supplement of traditional energies. Currently, Zhoushan is

focusing on developing wind energy, tidal energy and solar energy with the following detailed information.

Wind energy. Zhoushan has built the land wind power with an installed capacity of 142.8 MW, including Qushan wind farm, Cengang wind farm, Changbai wind farm, Jintang wind farm and Shengsi Donglvhua wind farm projects. State Grid's Liuheng oceanic wind power project phase I has completed the pile foundation engineering. While China General Nuclear Power Group's Daishan oceanic wind power project has finished wind measurement.

Tidal energy. Zhoushan has rich oceanic resources, of which, usable tidal energy takes up more than 50 percent of the total amount owned by China. Therefore, Zhoushan is suitable for building large scale tidal power farm. Daishan -Guishan water channel tidal power station was put into service since September, 2013. In August, 2016, the first 1MW unit of the world's first 3.4 MW LHD modulated large scale tidal generation unit was successful put into service in Xiushan island southern sea area of Daishan County.

Solar energy. Zhoushan is located in front edge of East China Sea, with long sunshine duration and large solar radiation. Zhoushan's photovoltaic power generation has shown rapid development momentum, mainly driven by private enterprises. Distributed photovoltaic power generation projects located in Zhoushan Economic Development Zone and Daishan Guangya Auto-parts Manufacturing Co., Ltd have been in use. In November, 2016, Daishan Suntellite-Asia solar photovoltaic power generation project has been started is the largest distributed photovoltaic power generation project under construction. This project will mainly make use of 300,000 m^2 unused roofing of Tsuneishi Group (Zhoushan) Shipbuilding Inc., leading to a total installed capacity of 20MW and expected annual generation capacity of 20 million KWH.

The requirement of lowering energy consumption, enhancing energy efficiency and increasing green and resilient energy portion has made it an essential trend to develop and use new energy for Zhoushan's power and energy development. For the "13th Five Year Plan", Zhoushan plans to actively accelerate utilization of oceanic energy and renewable energy, promote adjustment and optimization of energy structure, push construction of energy saving and environmental protection projects, introduce and cultivate a group of enterprises for manufacturing new energy equipment and integrating system, step on developing coastal wind power in order, actively develop tidal power, wave power and solar power. It is predicated that by 2020, Zhoushan's marine new energy industrial output value will reach 1 billion RMB (152 million USD) and by 2030, renewable energy will take up over 20 percent of total energy, oceanic wind farms' accumulated installed capacity in Zhoushan will reach 1.25 million KW and tidal power's total installed capacity 200.000 KW, a pilot wave power generation project and a roof photovoltaic power generation project whose installed capacity is 50MW will be completed..

Based on Zhoushan City's planning documents and by analyzing data provided by relevant governmental bodies, we have noted that total planned investment in Zhoushan's wind power projects is 10.45 billion RMB (1.588 billion USD). After the investment completed in 2015 is deducted, the total planned investment for the "13th Five Year Plan" period is 9.88 billion RMB (1.502 billion USD). Planned investment in pilot tidal power projects is totaled 625 million RMB (95 million USD) and planned investment in photovoltaic power generation projects 350 million RMB (53.2 million USD) (Appendix F).

Based on previous investigations, capital sources for photovoltaic projects have been determined. The owner of tidal energy pilot project has proposed to finance 300 to 500 million RMB (45.6 to 76 million USD), which is mainly used for optimizing MW prototype and integrating and developing a great deal of system integration. According to minimum capital ratio requirement applicable to projects of investment in fixed assets for different sectors, the minimum ratio of self-owned capital to total capital invested in wind power projects is 20 percent. Assuming that the minimum self-owned capital ratio required by the State is deducted and other capital can be obtained by external financing, then the ideal

total financing need for wind power projects during the "13th Five Year Plan" period is 7.904 billion RMB (1.201 billion USD). After market status of wind power and actual supports from financial institutions, the feasible and conservative market financing demand for such projects is 1.976 billion RMB (300 million USD), with a corresponding ratio of 20 percent. In conclusion, during the "13th Five Year Plan" period, the total financing demand for wind power projects is between 1.976 and 7.904 billion RMB (300 million and 1.201 billion USD).

Resilient development of water resource and water conservancy

Zhoushan Archipelago's ecologic environment is quite vulnerable, with frequent natural disasters. Environmental disasters like rainstorms, droughts and storm tides severely affect social and economic development. In order to increase urban resilience, Zhoushan actively explores and uses green water resource, continuously improve flood control and disaster reduction ability, sustainably promote reclamation with silt and optimize water ecological environment, having made some successes. The status of Zhoushan's resilient development of water resource and water conservancy is given as follows.

Green water resource. In addition to regular water supply, Zhoushan also adopts some non-conventional water resources like water desalination, water recycling and rain water utilization as supplementary water sources. By the end of 2015, the capacity of sea water desalination projects in service reached 120,000 tons/day, exceeding 2/3 of total sea water desalination capacity of Zhejiang Province; existing arable land in Zhoushan was 17,346.7 hectares, effective irrigation area 15,073.4 hectares, water-saving irrigation area 3,966.7 hectares, taking up 22.9 percent of total irrigation area, highly efficient water-saving irrigation area 1,666.7 hectares, only taking up 9.6 percent.

Flood control and disaster reduction. As of 2015, the built-up areas and important industrial clusters of Zhoushan's counties or districts can defense the floods rarely seen in 50 -year period, important towns and densely populated rural areas, 30-year period, and other area, 10 to 20-year period. But some reservoirs have safety threats, with prominent "typhoon and flood" disasters, being the weakness of Zhoushan's anti-flood and disaster-reduction system.

Reclamation with silt. Currently, Zhoushan's land resource is rather limited. In order to increase its environmental and resource-carrying capacity, during the "12th Five Year Plan" period, Zhoushan has completed a reclamation area of 3,200.16 hectares. But due to national macro-policy adjustment, together with difficulty of construction and large investment, such project is slowed in progress.

Water ecological environment. During the "12th Five Year Plan", Zhoushan's investment in water ecological environment projects totaled 1.198 billion RMB (192 million USD), overhauling 5,000 hectares of water loss and soil erosion, and recovering 1,333.34 hectares of water and soil ecology, overhauling 300 km of riverways. As a result, 76 percent of water samples obtained from 25 surface water monitoring sections controlled by Zhoushan City and its counties reached the water quality standard, and 90.5 percent of water samples from centralized drinking water sources met relevant the standard. However, with the increase of population and economic and social development, some areas' water environmental carrying capacity remains insufficient.

In order to further improve its water resource and water conservancy guarantee ability, during the "13th Five Year Plan" period, Zhoushan will adhere to and strictly implement the guideline of water-saving first, work hard to enhance water resource guarantee ability, fully improve safe and reliable anti-flood and disaster reduction capacity, strengthen the carrying capacity of healthy and beautiful water environment. It is expected that by 2020, in terms of green water resource, Zhoushan's sea water desalination scale will reach 250,000 tons/day, contributing to over 70 percent of newly added water supply for islands short of water, also, highly efficient water-saving irrigation will be developed to

improve irrigation area of 133.4 hectares and build additional highly efficient water saving irrigation area of 683 hectares; In terms of anti-flood and disaster reduction, built-up areas and important industrial clusters in counties and districts will defense flood rarely seen in 50 to 100 year period, and drain flood rarely seen in 20 -year period, with 33 dangerous reservoirs being renovated; in terms of reclamation with silt, the total reclamation land will reach 12,266.67 hectares, with a total embankment length of 44.1 km, and a total circled area of 5,333.33 hectares ; In terms of water ecological environment, at least 85 percent of water samples from key water function areas at least 95 percent of samples from centralized drinking water sources will reach relevant standards, with additional 21 km^2 eroded soil and lost water being recovered, controlling the water loss and soil erosion rate of lower than 7 percent, and functional water area ratio being higher than 2.5 percent.

Based on above planned contents, Zhoushan's investment in development resilient water resource and water conservancy is totaled 22.035 billion RMB (3.349 billion USD), of which, total planned investment for the "13th Five Year Plan" is 9.393 billion RMB (1.426 billion USD) (Appendix G).

Development of green and resilient water conservancy is one key aspect for Zhoushan's water conservancy infrastructure construction, and also an effective approach to improve water resource guarantee ability and realize sustainable water conservancy development. Generally, water conservancy projects are public-interest oriented, mainly replying on government investment. According to minimum capital ratio requirement applicable to projects of investment in fixed assets for different sectors, the minimum ratio of self-owned capital to total capital invested in water conservancy projects is 20 percent. For important construction projects, this applicable ratio could be slightly lower. At the same time, after market financing status of similar projects in China, Zhejiang Province and Zhoushan is considered, the feasible market financing ratio for water conservancy projects could be determined. After preliminary estimation, during the "13th Five Year Plan" period, financing demand for Zhoushan city's water resource and water conservancy projects will be between 1.877 and 7.506 billion RMB (285 million and 1.141 billion USD).

3.2 Sources and Status of Finance for Resilient and Green Urban Solutions

Zhoushan has just started its resilient and green practices in housing, infrastructure and public services, such practices are not fully separated from traditional construction fields, and their capital sources are similar to some extent. Green and resilient housing's construction capital is mainly raised by market approach since it has good market prospect and can satisfy green and livable requirement from high-income people. Construction of resilient and green infrastructure has obvious external economies, however, imposes large investment and long payback period, and therefore requires direct investment from government. Zhoushan has various types of infrastructure facilities which bear respective financing and investing features, and different attractiveness to social capital. Accordingly, capital sources for green and resident traffic, new energy, green and resilient water conservancy facilities show different features.

Green and resilient housing

Zhoushan's green and resilient housing is not an individual industry, but incorporated into the whole real estate industry. In recent years, on one hand, Zhoushan has promoted the energy saving renovation of existing residential buildings by actively adopting a series of green and energy efficient technologies, such as exterior wall insulation, movable external sunshade, insulation roof, solar energy and ground source heat pump, and promoting application of green building materials; on the other hand, Zhoushan has enforced Green Design Standards of Civil Building in Zhejiang Province and Zhejiang Province Regulations on Green Buildings, improve green design standards and push increased development of green residential building. The former's renovation fund is mainly provided by government. While the latter's capital

sources and structure are similar to that of commercial residential housing's development and construction, whose capital is mainly from commercial bank loans and self-raised capital by construction organizations.

Green and resilient traffic

Solving traffic problems requires a transformation from traditional traffic to sustainable traffic. In June, 2015, Zhoushan fully initiated a four-year term "green traffic city" construction scheme, advocating of green and low carbon travel modes, trying to build smooth, efficient, safe and green traffic and transport system. In current phase, Zhoushan's green and resilient traffic development is mainly dominated by government investment, such as promotion and leasing of bicycles, green slow traffic system, smart system for vehicle operation and management, and smart operation EDI system of Zhoushan Port, etc. In the meanwhile, Zhoushan government also actively construct social involvement mechanism and attract social capital, guide enterprises to assume green responsibilities in order to push green and low carbon development of transport industry together and expand capital sources for green and resilient traffic.

Table 3-4 **Investment Status of Representative Green and Resilient Traffic Projects in Zhoushan**

Project Name	Major Investor	Capital Source	Investment Amount
Bicycle leasing	Zhoushan People's Government	Government investment	13 million RMB (2 million USD)
Dinghai part of binhai avenue (phase i) phase ii of second bidding section	Zhoushan Dinghai District Urban-rural Construction Group Co., Ltd	Government investment	43 million RMB (6.54 million USD)
Project of gasoline recovery for crude oil shipping	Sinochem Xingzhong Oil Staging (Zhoushan)Co., Ltd	Raised by enterprises	93 million RMB (14 million USD)
Ship recycling project	Zhoushan Changhong International Ship Recycling Co., Ltd	Raised by enterprises	2.837 billion RMB (431 million USD)

Source: http://xxgk.zhoushan.gov.cn/xxgk/auto310/auto312/index2.shtml

New energy and power

By investigating typical new energy projects' investment of Zhoushan in recent years (Table 3-5), we have noted that such projects' investors are local state-owned enterprises and private enterprises currently, with self-raised capital and bank loan as the major capital sources. Local state-owned enterprises' fund is largely from national fiscal appropriation, and partly from bank loan which is applied based on the specific capital shortfall. Take State Grid's Putuo No.6 oceanic wind farm's 2nd section project as an example, this project's investor is a local state-owned enterprises, with a planned total investment of 4.466 billion RMB (675 million USD). Since this amount is too large, in addition to self-raised capital, remaining part is financed by commercial bank loan.

Private enterprises have relatively more financing methods, in addition to self-raised private capital, bank loan, financing through listing, enterprise debentures and foreign capital are also possible. Take the 20MW distributed photovoltaic power generation system project as an example, Asia Clean Capital is a developer invested in China by Goldman Sachs and specializing in investment and operation of distributed photovoltaic power generation projects, and invested all the capital required for photovoltaic power generation project conducted by Tsuneishi Group (Zhoushan) Shipbuilding Inc.

Table 3-5 Investment Status of Typical New Energy Projects in Zhoushan

Project Name	Investor	Capital Source	Investment Amount
Qushan Wind Farm phase II 110KV transmission project	State Grid Zhejiang Electric Power Zhoushan Supply Company	Self-raised	14.53 million RMB (2.2 million USD)
Zhaipan mountain's pilot project of marine current energy generation and island new energy supply	Zhejiang Zhonghe New Energy Development Co., Ltd		64.95 million RMB (9.87 million USD)
Xingang power supply station and electric vehicle charging station project	Zhoushan Bureau of Power Supply		32.8 million RMB (5.07 million USD)
Danshan County Photovoltaic power station	Zhoushan Kete Photovoltaic Power Co., Ltd		2.5 million RMB (0.37 million USD)
State Grid Putuo No.6 oceanic wind farm 2nd Section project	GD Power Development Zhoushan Oceanic Wind Power Development Co., Ltd	self-raised and bank loan	4.446 billion RMB (675 million USD)
20MW distributed photovoltaic power generation system	Tsuneishi Group (Zhoushan) Shipbuilding Inc	Asia clean capital	0.16 billion RMB (24.31 million USD)

Source: http://xxgk.zhoushan.gov.cn/xxgk/index.shtml

Green and resilient water conservancy facilities

According to statistics, from 2004 to 2014, capital used for investment in fixed assets such as water conservancy, environment and public facilities in China mainly consisted of self-raised capital, 60 percent, national budget capital, 16 percent, domestic loan, 15 percent and other capital, 9 percent. From such overall data, self-raised capital was a major contributor to fund for water conservancy investment while national budget capital and domestic loan also took up some weights.

Based on investigations on typical projects' capital sources in recent years, different types of green and resilient water conservancy facilities in Zhoushan had different capital sources (Table 3-6). Water system management projects are beneficial for building water ecological environment and flood-proof and flood drainage, being municipal projects in public interest and mainly funded by self-raised capital as well as central and local governments' fiscal supports. Reservoir reinforcement projects can ensure the safe operation and normal function of reservoirs, being key projects for anti-flood and disaster reduction and mainly funded by local and central governments' fiscal supports. Reclamation with silt projects can help provide new land space for Zhoushan's urban development, with some investment returns in the future, therefore in addition to local government's investment, cooperation with financial institutions are also possible to get corresponding water conservancy credit capital.

Table 3-6 Capital Sources for Typical Green and Resilient Water Conservancy Facilities

Project	Central government investment	Local government investment	Bank loan	Self-raised capital	Total investment
Baiquan trunk river management in Dinghai District (10,000RMB)	1,164	510	0	1,326	3,000
Baiquan trunk river management in Dinghai District (10,000USD)	177	78	0	202	456
Investment percent (%)	39%	17%	0%	44%	
Chenao reservoir reinforcement project (10,000RMB)	850	2,681	0	0	3,531
Chenao reservoir reinforcement project (10,000USD)	129	407	0	0	537
Investment percent (%)	24%	76%	0%	0%	
Luomen new fishing port's supporting reclamation project (10,000RMB)	0	7,807	11,000	0	18,807
Luomen new fishing port's supporting reclamation project (10,000USD)	0	1,187	1,672	0	2,859
Investment percent (%)	0%	42%	58%	0%	

Source: Zhoushan Bureau of Water Resources

END NOTES

[6] *Green and resilient housing's definition is mainly from China's green building standard Green Building Assessment Standards(GB/T50378-2014).*

[7] *Increased cost of green building is divided into hard cost and soft cost. The former includes: purchase of tangible assets such as equipment and materials. The latter includes fees associated with building design, consultation, legal affairs and certification. Increased cost is related to factors such as exterior decoration, optimization of fence structure, utilization of renewable energy, cool and heat storage technologies, utilization of non-traditional water sources, indoor environmental control and smart system.*

Chapter 4

Financing Instruments for Housing, Infrastructure and Urban Services

4.1 Key Challenges and Constraints in Financing the Housing Sector

Zhoushan housing supply is dominated by commercial residential housing and aided by low-income housing. Development of commercial residential housing is mainly oriented for selling, with relatively short payback period and low risk, thereby being easily funded by market capital. Low-income housing is further divided into public rental housing and urban run-down area renovation housing; the former is operated through leasing, with long payback period and high risk, while the latter is intended for selling, with short payback period and low risk. Currently, low-income housing's development is mainly invested by government; however, due to limited fiscal support from Zhoushan government, it is required to raise money through various channels.

By comparing major challenges and restrictions of commercial residential housing and low-income housing in terms of financing from both supply and demand sides, we have noted that the two kinds of housing are both affected by local economic and social development level, governmental policies, financial market development level and credit condition, etc. (Table 4-1). Pursuant to the 13th Five Year Plan for Urban Housing Security of Zhoushan City, for future low-income housing, market approach of raising housing sources and promotion of monetary housing compensation should be adopted as much as possible. Thus, Zhoushan City needs to build housing financing mechanism of market mode coordinately and fully play the key role of government capital in housing security field.

Table 4-1 Major Challenges and Restrictions of Zhoushan's Housing Financing

Housing type	Development financing feature	Major challenges and restrictions of financing from supply-side	Major challenges and restrictions of financing from demand-side
Commercial residential housing	Large financing demand, selling-oriented, short payback period and low financing risk	1. Loans from commercial banks within Zhoushan to real estate companies are largely affected by government's macro-adjustment and real estate industry's policies, and the loan scale and loan period are limited. 2. Zhoushan's financial market scale is limited and its real estate development companies' overall strength is not enough, leading to insufficient financing channels for such companies.	1. Zhoushan house purchaser obtaining commercial bank mortgage loans is associated with personal income and commercial banks credit policies. 2. Zhoushan house purchaser obtaining Housing Provident Fund loan is easily affected by government's macro-adjustment. And such kind of loan is related to actually deposited fund, and leading to unequal supports among different purchasers.
Low-income housing	For public-rental housing: Large capital demand, leasing-oriented, long payback period, high financing risk and large financing difficulty	1. Public rental housing development is mainly invested by government, but pubic fiscal support is restricted. 2. Zhoushan financial market scale is limited, lacking of financial products meeting features of returns on investment in public rental housing and not being able to attract enough social capital.	1. Residents covered by such housing policy are hard to obtain commercial bank loans, although can withdraw their Housing Provident Fund for paying rent, the amount permitted to withdrawn is limited. 2. Zhoushan government offers subsidy for such residents covered by public rental housing policy, but the actual subsidy amount is limited.
	For urban run-down area renovation: selling -oriented, shorter payback period, relatively larger financing difficulty due to large capital demand and low return on investment.	1. Urban run-down area renovation houses are largely affected by housing security policies, although being supported by policy banks, still needing fiscal discount from Zhoushan government. 2. Social capital engaged in run-down area renovation are much more, including enterprise supports and self-raised by common people, etc.	1. Residents covered by such housing security policy are deficient in payment, and only obtain limited commercial bank loans, thereby needing policy supports and corresponding subsidy from government. 2. Housing Provident Fund loans obtained by such residents are connected to their actually deposited amount. 3. Government promotes to connect the path between common commercial residential housing and renovation housing, so such residents will be granted purchase bonus or fiscal subsidy.

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4.2 Financial Instruments for Housing

4.2.1 Assessment of financing instruments for commercial residential housing

In this report, financing instruments for commercial residential housing assessed in terms of their financing scales, terms, costs and risks, from both supply and demand sides, and a comprehensive evaluation is given (Table 4-2). Regarding about supply side, major financial instruments adopted by real estate companies in Zhoushan are analyzed, including equity financing, debt financing and mixed financing (equity and debt combined). In current phase, the optimal choice for real estate financing is bank credit. Over 50 percent of capital used for commercial residential housing development in Zhoushan is from commercial banks.

From the view of demand-side, financing instruments used by Zhoushan citizens to buy commercial residential housing are analyzed. Currently, the major instrument is debt financing, including housing mortgage loans from commercial banks and Housing Provident Fund loans, with personal mortgage loans from 14.749 billion RMB (2.178 billion USD) in 2010 to 21.412 billion RMB (3.486 billion USD) in 2014, and an average annual ratio of total housing mortgage loan to total financial system' RMB loan balance from 2010 to 2014 of about 15.7 percent. From the perspective of increasing purchasers' payment ability and lowering housing purchase cost, the best choice for purchasers is Housing Provident Fund loan, followed by housing mortgage loan from commercial banks.

Table 4-1 Major Challenges and Restrictions of Zhoushan's Housing Financing

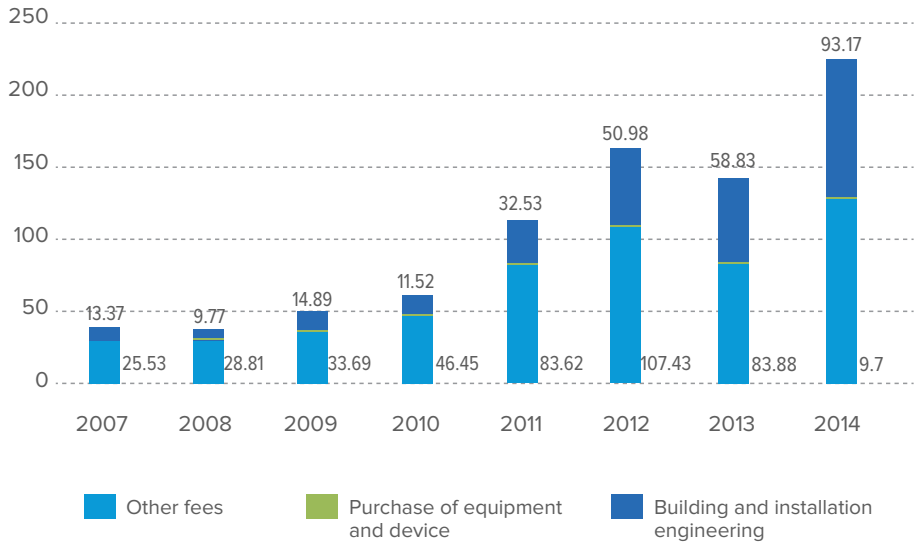
Borrower	Instrument	Type	Term	Scale	Cost	Risk	Comprehensive evaluation
Real estate development enterprises	Equity financing	Housing development project's equity financing	longest	Not fixed	When housing market is good, equity is diluted, financing cost will be higher if distribution is made according to equities. When housing market is bad, compared with debts, equity financing cost is relatively lower because it has no fixed spending.	high	Rarely used
	Debt financing	commercial bank loan	less than 3 years	Amount is determined by guarantee and market value of pledge given by developer and	Financing cost is low	low	Best
		enterprise debentures	longer	Determined by enterprise strength and scale and benefits of investment object	Financing cost is low, but enterprise' credit rating should be high.	low	Second best
	Mixed financing (equity and debt)	private equity fund	longer	Scale is related to benefit level of the invested project	Financing cost is second to private lending	high	Rarely used
		real estate trust	2 to 3 years	Influenced by Trust Law of the People's Republic of China and relevant administration regulations, invested project's benefit level	Financing cost is generally higher than bank loan	high	Rarely used
Housing purchasers	Debt financing	bank mortgage loan	Not fixed, long range for choice	Determined by loan limit and purchaser's income level	Financing cost is low	low	Second best
		Housing Provident Fund loan	Not fixed, long range for choice	Determined by loan limit and purchaser's income level	Financing cost is lower than bank loan	low	Best

4.2.2 Financing sources and flows for commercial residential housing

Capital used for commercial residential housing development is mainly attributed to commercial bank loans, during development process, instruments like real estate trust and real estate fund might be used in different phases to solve short-term capital demand. As for commercial residential housing sales, purchasers mainly use Housing Provident Fund loans and personal housing mortgage loans from commercial banks to obtain capital supports.

Regarding about capital use structure of commercial residential housing development, the major uses include building and installation engineering, equipment and device purchase and others, of which, the "other" mainly refers to land acquisition fee. Since data about Zhoushan's commercial residential housing development investment structure is not available, and considering commercial residential housing development is one major component of real estate development, we have chosen data about Zhoushan's total real estate development investment structure in this Report to make approximate analysis. During 2008 to 2014, of the investment structure of Zhoushan's real estate development, building and installation engineering took up the largest part, with an annual of about 68.2 percent, followed by other fees, with an annual ratio of about 31 percent, and followed by purchase of equipment and device, with an annual ratio of about 0.8 percent (Figure 4.1).

Figure 4-1 Real Estate Development's Investment Structure in Zhoushan (Unit: 100 million RMB)



4.2.3 Assessment of financing instruments for lower and lower-middle income population

According to the method of categorizing China urban households into five classed by income level, low income households and lower-middle income households in Zhoushan take up 20 percent respectively. These two classes of households are potential target groups of Zhoushan's housing security, with applicable low-income housing including public rental housing and urban run-down area renovation housing. By referring to the method of evaluating housing financing instruments, used in section 4.2.1 of this Report, and by combining financing analysis of low-income housing from supply and demand sides in section 4.1 of this Report, in current phase, the best financing choice for Zhoushan's low-income housing construction is commercial bank loan, followed by bond issuing, including government bond and company bond. The first financing choice for demanders to purchase renovated urban run-down housing is Housing Provident Fund loan, followed by personal housing mortgage loan from commercial banks.

4.2.4 Financing sources and flows for lower and lower-middle income population

Capital sources for Zhoushan low-income housing construction are described in section 2.3.1 of this Report, mainly including national budget capital, indirect government investment and social capital. As specific data about capital sources for low-income housing construction in Zhoushan is not available, by analyzing Zhoushan housing security supply structure, we have concluded that in current phase, such capital is mainly directed to public rental housing construction, affordable housing construction and run-down area renovation, and future capital will be mainly used to push monetary housing compensation.

4.3 Financing Instruments for Infrastructure and Urban Services

Urban infrastructure and public services play an important role in urban construction and development, creating better production conditions for different industries, building good investment environment and urban image, directly influencing urban competitiveness and people's living standards, and having obvious macro social benefits. Therefore, when assessing investing and financing efficiency of infrastructure and public services, it is improper to overstress economic benefits of investors, but needed to consider social demand. After construction and operation features of Zhoushan's infrastructure facilities and public service projects are analyzed, the projects intended to be studied in this Report are classified based on operation features (Table 4-3).

Table 4-3 Classification of Zhoushan's Infrastructure Facilities and Public Service Projects

Project Type	Charge and cashflow status	Operation mode	Zhoushan's corresponding projects
For profit	With charging mechanism, these projects can generate stable or some cashflow	Self-operation can produce some revenue, which cannot always cover cost	Transport: expressways, airports, terminals, etc.; Water conservancy: water supply and drainage facilities, waste water treatment plants, etc. Waste disposal: garbage incineration plants
Non-profit	Without charging mechanism, no cashflow is generated.	Only offering public goods	Transport: common highways; Water conservancy: water conservancy facilities; Waste disposal: garbage collection and transfer

By investigating existing capital channels for Zhoushan' s infrastructure and public service projects and screening out mainstream financing instruments for infrastructure projects in China and satisfying practical needs of Zhoushan, we have established a complete financing instrument system, including debt financing, equity financing, mixed financing and public-private-partnership (PPP) financing, etc. These financing instruments are analyzed from scale, term, cost and risk and assessed comprehensively in this Report (Table 4-4). Since different infrastructure and public service projects are different from one another in terms of investment construction and operation management, corresponding financing instrument preference and choice will be resulted.

Table 4-4 **Assessment of Financing Instruments for Zhoushan's Infrastructure and Public Service Projects**

Instrument	Type	Term	Scale	Cost	Risk	Comprehensive evaluation
Debt financing	Bank loan	Not fixed	Bank loan amount is related to infrastructure type, profit project or project with such guarantee as meeting bank's requirement can get bank loan more easily.	Low financing cost	Low	Second-best
	Syndicated loan	Not fixed	Generally, financing scale is larger than bank loan, and related to infrastructure type.	Low financing cost, but adviser fee and administration fee are required.	Low	Second-best
	Government bond	Not fixed	Determined by national or local key projects' requirement.	Low financing cost	Lowest	Best
	Enterprise bond	Relatively longer	Based on enterprise' comprehensive strength and scale and benefits of the invested objects.	Financing cost is relatively low, but enterprise's credit should be high.	Low	Second-best
Equity financing	Equity financing by project company	Long term	Not fixed.	Financing cost is low, but profit-sharing is required.	High	Rarely-used
Mixed financing (debt and equity)	Infrastructure construction find	Relatively longer	Scale is related to operational benefits of invested project.	Relatively high financing cost	High	Rarely-used
	Infrastructure construction trust	2 to 3 years	Determined by Trust Law of the People's Republic of China and relevant regulations, and operational benefits of invested project.	Financing cost is higher than bank loan.	High	Rarely-used
PPP	Project financing	Long Term	On the part of government, financing is often arranged according to project' expected benefits, assets and supporting measures of government rather than credit standing of project initiator.	Financing cost is low, but profit-sharing is required.	High	Second-best

4.3.1 Assessment of financing instruments for transport

The planned transport projects for the "13th Five Year Plan" period by Zhoushan are mainly classified into two parts. The first part refers to outward mainland-islands linking projects and green port projects and the second part internal highways, roads in towns and public buses and stations. Based on initial analysis shown in Table 4-3 and Table 4-4, and since currently Zhoushan transport facilities' construction are hugely short of capital, it is recommended in this Report the following financing instruments for planned transport projects, i.e., PPP mode, government bond and enterprise bond for planned outward railway and green port projects, government bond, enterprise bond and syndicated loan for island-linking projects, and bank loan for public bus and station projects. In this way, it is better to lower financing cost and to attract social capital to participate in public infrastructure construction.

4.3.2 Assessment of financing instruments for energy and power

Planned power and energy projects for the "13th Five Year Plan" are divided into two parts, i.e., fuel gas and power infrastructure, and new energy. Based on the initial analysis in Table 4-3 and Table 4-4, and since power and energy projects are relatively strong at profitability, it is recommended in this Report the following financing instruments for major power and energy projects. Specifically, syndicated loan, bank loan and enterprise bond are for fuel gas and power projects while bank loan, enterprise bond and financing by listing for new energy projects. In addition, it is better to expand financing methods as much as possible, including issuing green bonds or energy industry investment fund to obtain long term market capital source.

4.3.3 Assessment of financing instruments for water and waste

Planned waster resource development and utilization and waste disposal projects for the "13th Five Year Plan" in Zhoushan are divided into three parts. The first part refers to water resource projects, including multi-source water supply and waste water treatment; the second part waste disposal projects, and the third part green and resilient water conservancy projects. Based on initial analysis in Table 4-3 and Table 4-4, and considering the different operation features of these projects, it is recommended in this Report the following financial instruments. Government bond and bank loan are for important multi-source water supply projects, PPP mode, enterprise bond and bank loan for important waste water treatment and waste disposal projects, and government bond and bank loan for water conservancy projects, thereby to lower financing cost and attract social capital to engage in relevant infrastructure construction.

4.4 Scale and Volume of Finance

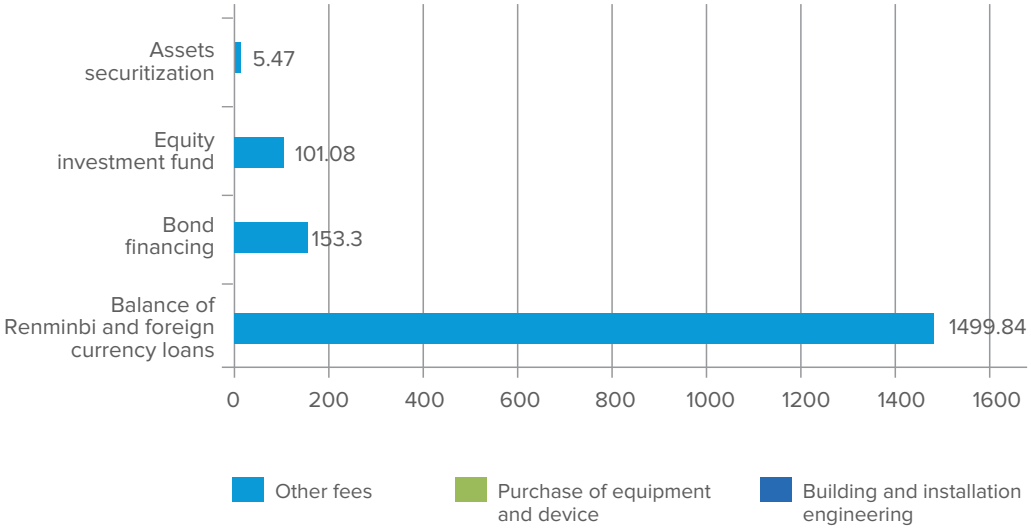
4.4.1 Assessing the scale and volume of financing involved in each financial instrument in the city

Currently, Zhoushan's financing scale is relatively small. As of the end of 2015, total financing balance of Zhoushan was 280.741 billion RMB (45.074 billion USD), balance of Renminbi and foreign currency loans 149.984 billion RMB (24.081 billion USD), taking up 53.42 percent of total financing balance. Direct financing methods include bond financing, assets securitization and equity investment fund, of which, issued various bonds reached 15.33 billion RMB (2.461 billion USD), assets securitization, 547 million RMB (87.823 million USD), and equity investment fund, 10.108 billion RMB (1.632 billion USD), taking up 5.5 percent, 0.2 percent and 3.6 percent of total financing balance, respectively (Figure 4-2).

Regarding about capital scale supported by financial institutions for construction of housing and infrastructure, the largest support is directed to transport facilities, followed by housing and the least supported projects are generation and supply of power and water conservancy. By the end of 2015, financing balance for bridge and road construction from

financial institutions reached 4.46 billion RMB (716 million USD), with a year-on-year growth rate of 1.72 percent, for real estate development (including on and off-sheet), 5.56 billion RMB (893 billion USD), with a year-on-year decrease rate of 25.28 percent[8], for generation and supply of power 1.17 billion RMB (188 billion USD), with a year-on-year decrease rate of 9.53 percent, for water conservancy 920 million RMB(148 million USD), with a year-on-year growth rate of 17.14 percent.

Figure 4-2 Zhoushan Financing Scale by Financing Instruments in 2015 (unit: 100 million RMB)



4.5 International Finance

4.5.1 Assessing the financial flows and trends of international finance and international aid in and to the city

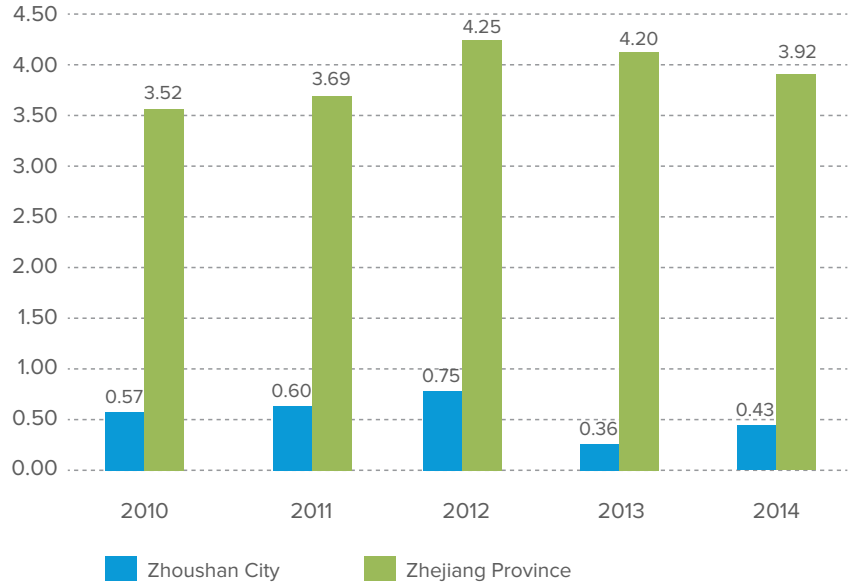
Zhoushan's financial internationalization is at an early stage, with a small total scale and lower opening degree. In 2015, total balance of cross-border payments in Zhoushan was slightly higher than 9 billion USD, about 20 percent lower than the previous year, of which, 5.3 billion USD was income, 3.8 billion USD, expenditure, 2.6 billion USD, exchange settlement and 2.7 billion USD, foreign exchange purchased. The foreign debt in the same period was 300 million USD, including 100 million long and middle -term debt, and 200 million USD short term debts. Additionally, over 1 million USD loan was transferred from foreign debt, which was an international financial organization loan mainly used for fishery cooperation project.

Zhoushan's balance of foreign exchange loan includes short term loan balance, middle and long-term loan balance and others, of which, short-term loan is mainly for trade financing and its balance scale is the largest, increasing from 29.45 billion USD in 1995 to 570 million USD in 2014, taking up 92 percent of foreign exchange loan balance. From 2010 to 2014, Zhoushan's foreign exchange loan balance took up an average annual 0.55 percent of balance of total Renminbi and foreign currency loans, while in the same period, Zhejiang Province's foreign exchange loan balance 3.91 percent, indicating Zhoushan's foreign exchange loan balance was obviously lower than average level of Zhejiang Province.

Since global economic downturn, Zhoushan's foreign capital utilization rate is somewhat lowered. In 2015, a total of 19 foreign invested enterprises were newly approved, with a total investment of 505 billion USD and a contracted foreign capital of 382 billion USD, 64.5 percent lower than the previous year.

Actually used foreign capital was 78 million USD, 61 percent lower than the previous year. In the same period, Zhoushan's outbound direct investment (ODI) was increased, with 9 foreign invested enterprises being newly established, 1 project of increased capital, Chinese investment of 40 million USD, and international contractors' cooperation revenue of 555 million USD, increasing by 11.4 percent.

Figure 4-3 Foreign Loan's Ratio in Total Renminbi and Foreign Currency Loans of Zhoushan and Zhejiang Province (unit: %)



Source: compiled based on 2015 Zhoushan Statistical Yearbook and 2015 Zhejiang Statistical Yearbook

4.6 Assessing City Financing Challenges in Each Category

4.6.1 Macro level challenges (e.g. national regulatory, policy constraints, financial market volatility, transparency and accountability issues)

Though Zhoushan has formed a diversified financial system with the co-existence of many kinds of financial institutions and coordinated development of national and local financial institutions (organizations), financial institutions are mostly banks, indirect financing and debt financing are the dominated financing type and instrument, respectively.

As franchised financial organization to operate currencies, banks generally are regulated by governments. China Banking Regulatory Commission is responsible for supervising and guiding China banking institutions and their activities pursuant to laws and regulations. Chinese government quite focuses on social livelihood improvement and sustainability of social and economic development. In recent years, Chinese government has enlarged investment in low-income housing and infrastructure facilities as an important development measure against economic "new normal" background. As the base and main body of China's financial system, commercial banks is naturally obliged to participate in this progress and fully play the supporting role of bank credit to serve national strategy. However, China's commercial banks should still operate independently and assume risks, profits and losses themselves with the principles of safety, liquidity and profitability. Therefore, Zhoushan's banking institutions should both support

national macro-adjustment and industrial development policies and strictly obey prudent rules and enhance credit efficiency when doing specific credit businesses.

4.6.2 Sectoral challenges (e.g. market, demand, volume, technology, financial management)

Real economy is the base for survival and development of financial industry. According to Zhoushan's "13th Five Year Plan", accumulated total investment in fixed assets of Zhoushan will exceed 850 billion RMB (129 billion USD), with an average annual growth rate of 15 percent and GDP will reach 180 billion RMB (27.4 billion USD), with an average annual growth rate of over 10 percent. In 2016, Zhoushan has stepped into a speeding-up stage, with its river-and-sea coordinated transport project being approved by the State Council and listed into top 100 projects for China's "13th Five Year Plan", and Zhoushan Pilot Free Trade Zone being approved. These constructions impose higher requirements for Zhoushan's investment in infrastructure and public service fields. Hence, Zhoushan's financial sector needs to actively cope with these key aspects and changes, think how to find and realize low cost middle and long -term capital sources, improve infrastructure financing innovative system, thereby providing sound financial supports for Zhoushan to achieve development leaps and bounds.

4.6.3 Project level challenges

Zhoushan has various infrastructure and public service projects which bear different features with respect to investment and financing. Therefore, financial institutions need to design and provide financial products matching with such features based on their own business ranges. Banking institutions may innovate and improve credit products by focusing on Zhoushan's key projects, such as, releasing PPP loans and loan for government purchased services. Direct financial institutions may select profit projects to explore and conduct bond financing, and expand infrastructure financing channels by using equity investment fund and industrial funds. Meanwhile, Zhoushan will accelerate stepping on PPP mode, actively introduce insurance capital, encourage developing financial leasing, and innovate and assimilate private capital to support infrastructure facility construction.

4.6.4 Municipal government capacity constraints

Comfortable housing project and infrastructure construction is of great significant for national development and people's livelihood, so Zhoushan government should actively assume such responsibility. Although in recent years, Zhoushan fiscal revenue has increased continuously and investment in comfortable housing project and infrastructure construction has been increased, current fiscal support is far from adequacy when being compared with the capital demand. Under this circumstance, Zhoushan government should do two jobs at once, on one hand, developing economy and industry, enhancing fiscal revenue and improving fiscal guarantee capacity as much as possible, on the other hand, shifting thinking mode, playing a good guiding role of fiscal capital since government guiding does not simply mean government investment. Therefore, Zhoushan Government should actively promote and deepen institutional reform of investing and financing, thereby creating good external environment and access conditions for financial institutions and social capital to participate in comfortable housing project and infrastructure construction.

END NOTES

[8] *During investigation in Zhoushan Financial Office, accurate data about financing scale for housing field is not obtained. But since commercial residential housing development takes up a major part of real estate development, and its average annual weight from 2005 to 2015 reached 70 percent, the financing balance for housing development is therefore estimated as about 3.89 billion RMB.*

Chapter 5

Impacts of Financing Instruments at the Financial System Level

5.1 Impacts on the Financial System

5.1.1 Assessing the impacts of financial instruments at the financial system level, particularly on the sustainability and resilience of the national financial system

Finance serves real economy whose features determine the features of financial system. Since reform and opening up, China has made splendid accomplishments in economic construction and institutional reform. In the meanwhile, China has established a steady and healthy financial system, with financial instruments, financial market and financial institutions being rapidly developed and providing increasingly strong capital and financial service supports for real economy. China Monetary Policy Report, Quarter Four, 2015, released by People's Bank of China on February 6, 2016 indicated that by the end of 2015, China's all-system financial aggregate 138.14 trillion RMB (22.18 trillion USD), 12.4 percent higher than the previous year. Regarding about the financial aggregate structure, Renminbi loan was 92.75 trillion RMB (14.9 trillion USD), taking up about 67.1 percent, and 13.9 percent higher than the previous year (Table 5-1). Renminbi loan index refers to the on-balance business status of financial institutions, and has indicated that China financial institutions' current financing structure is dominated by bank loans.

According to general rules of financial system, short-term capital demand is mainly satisfied by bank loans while long term by direct financing such as issuing equities and bonds, which can avoid the maturity mismatch caused by solving long term demand by short-term capital. Currently, China's long term capital demand is over-dependent of bank loans, resulting in that financial risks are highly concentrated in banking system which can easily encounter liquidity problem. This situation has potential financial risk and influences long term stability of financial system.

From China's economic and administrative practices, local governments are the leaders and promoters of regional economic development. Construction of urban infrastructure and public services require continuous investment from national fiscal supports and relevant capital. However, local government is limited in fiscal capital and resource. Therefore, how to cope with huge financing demand is an important subject confronted by local government. Although local government may have many choices for financing, such as debt financing, equity financing, project financing and resource financing, currently, the major method remains to be debt financing and largely relies on bank loans. Local government has two ways to obtain credit capital from banking system, explicit way, including direct application of domestic bank loan and syndicated loan, and implicit way, i.e., applying bank loans through local government' financial platforms

Table 5-1 China's All-System Financial Aggregate by the End of 2015

	All-system financial aggregate	Of which						
		RMB loans	Foreign currency loans	Credit loan	Entrusted loans	Undiscounted bankers' acceptances	Corporate bonds	Domestic equity financing of non-financial enterprises
2015 Year-end (100 million RMB)	1,381,383	927,526	30,193	109,328	53,925	58,542	146,258	45,251
2015 Year-end (100 million USD)	221,731	148,881	4,846	17,549	8,656	9,397	23,476	7,263
Year-on-year growth	12.4	13.9	-13.0	17.2	0.8	14.8	25.1	20.2
Share	—	67.1	2.2	7.9	3.9	4.2	10.6	3.2

Note: stock of all-system financing aggregates refers to total volume of financing provided by the financial system to the real economy at the end of a period, where the real economy means domestic non-financial enterprises and households. Stock data is calculated based on book value or nominal value. The data of year-on-year growth are comparable figures.

Source: People's Bank of China, National Development and Reform Commission, China Securities Regulatory Commission, China Insurance Regulatory Commission, China Central Depository & Clearing Co., Ltd and National Association of Financial Market Institutional Investors.

Local government's financing platforms refer to corporate economic entities established by local governments through assets such as fiscal appropriation, land allocation and equities, and assuming the financing and investing functions for government projects in public interest. Although such financing platforms play an active role in construction of urban infrastructure and public utilities, the financing method is heavily dependent on bank loans, and more supported by local governments' credit. Most projects invested by such platforms have less economic benefits with low debt-repayment ability, so the final repayment is determined by local governments' solvency. Since loans collected through local governments' financing platforms are not coordinated by being incorporated into local governments' budgets, local governments' financing aggregate is hard to describe in a quantitative manner, resulting in relaxing management of implicit debts, and easy occurrence of debt risk. Once local governments face debt risks, it is possible that such debts are transferred to central government, further resulting in central fiscal burden and finally national fiscal risk.

In recent years, Chinese government has started to regulate local governmental debt management by legal approaches. On September 21, 2014, the State Council released Opinions on Strengthening Local Governmental Debt Management (Guo Fa [2014] No. 43) to promote a borrow-use-payment united local governmental debt management mechanism by specifying borrower, review and approval authorities, borrowing method, borrowing scale, borrowing procedures, capital uses and budget management, and to build risk alarming mechanism, risk emergency response mechanism and accountability mechanism for local governmental debt. In 2015, local government bonds issuance scale was rapidly expanded. Governments of 30 provinces and 4 cities directly under national economic and social development plan issued government bonds, with a total scale of 3.8 trillion RMB (610 billion USD), and average term of 6.4 years. Therefore, issuing local government bonds is beneficial for lowering local government's debt cost, adjusting debt structure and alleviating debt pressure, therefore playing an active role in building transparent and regulated local government's financing and investing mechanism.

5.2 Impacts on Sectors

5.2.1 Identifying issues faced by different actors and stakeholders in financing housing

The aim and challenge of housing financing is to balance interests of different participants and stakeholders, ensuring that required capital can be raised and debt can be repaid to achieve development purpose or benefits. In Zhoushan's financing for commercial residential housing development, initiator of housing development and capital demander are generally real estate enterprises while capital providers are often profit financial institutions and investors from capital market, where professional service institutions include guarantee companies, appraisal companies, credit rating companies, insurance companies, security companies, financial consultation companies and law firms. Stakeholders not directly involved in housing financing are governmental bodies, public, building companies, material suppliers and equipment suppliers.

As the party in charge of housing project development, real estate enterprises need to raise money and assume profits and losses themselves. Commercial residential housing development period in Zhoushan generally does not exceed 5 years, while period of sales is determined by actual condition of commercial residential housing market. The basic financing idea for real estate enterprises is: financing scale is prioritized to meet the demand of project development and construction; financing cost should be minimized and self-owned capital's use should be maximized. The first debt financing choice for real estate enterprises is commercial bank loan, whose comprehensive financing cost is low. The currently adopted benchmark annual interest rate for one to five year-period loan determined by People's Bank of China is 4.75 percent. Although commercial bank loan is the most stable and most important debt financing mode used by real estate enterprises, commercial bank loan has an annual limit and is greatly affected by macro-policies, these enterprises will resort to bond issuing for financing. In January, 2015, China Securities Regulatory Commission issued Administration Methods on Issuance and Transaction of Corporate Bonds and specified non-listing corporate was also eligible for issuing corporate bonds, which provided a good opportunity for real estate enterprises to be listed for financing. According to historical data, corporate bond issuing interest rate has declined continuously, from highest 8 percent in early 2014 to nearly 4 percent in recent days. Because a large number of real estate enterprises apply to issue bonds, it is quite difficult to be approved. These enterprises will also consider medium term notes in inter-bank bond market as debt financing instrument. The average term of medium term notes issued in last two years was 3 to 5 years, with its average nominal interest rate being lowered to 4.0 percent. Additionally, when housing project faces capital problem during development, real estate enterprises will also choose financial instruments with higher cost, such as real estate trust and real estate fund. The real estate trust issued in the last two years had an average term of 1.5 to 2 years with its average nominal interest rate being lowered to 6.98 percent.

Commercial banks independently issue load for housing development and construction through taking deposits from public based on the principles of profitability, safety and liquidity. When reviewing and approving real estate enterprise' loan applications, commercial banks will carefully assess if the project can produce enough cashflow in the future used to repay principal and interest, and often pay attention to two aspects, namely, the ratio of self-owned capital and compliance of national requirements. Specifically, firstly the minimum self-owned capital ratios for common and high-end commercial residential housing are 20 percent and 25 percent respectively, and such projects should be put into construction before commercial bank loans are in place; secondly, upon application, these projects should be equipped with four certificates, including state-owned land use certificate, construction land planning license, construction project planning license and construction license for building project; thirdly, real estate enterprise should be in good credit, operation and financial standing, being able to replay principal and

interest; fourthly, real estate enterprise can provide guarantee method accepted by banks, including choosing proper pledge and guarantee company; on such basis, commercial banks will also coordinately consider national macro-economic status, credit policies, supply change of housing market, etc, to make a classified comprehensive assessment for loan applied by real estate enterprise and lower loan risk as much as possible.

When applying to issue corporate bonds, real estate enterprise is required to have bond credit rated by credit rating institution as the major basis for bond pricing. Bond credit rating refers to a judgment of real estate enterprise's comprehensive repayment ability based on investigating credit standing of issuer and in combination of bond provisions and external supports obtained by issuer for repayment. Bond market investors usually make investing decisions based on rating report released by credit rating institution.

During the "13th Five Year Plan" period, different types of low-income housing projects in Zhoushan bear different financing demands. Public rental housing project is dominated by government, built by local state-owned enterprise and basically funded by fiscal capital while run-down area renovation project, as the key aspect for low-income housing construction, needs external financing. In financing field for run-down area renovation, project initiator and capital demander are mainly government and local state-owned enterprises, while capital providers are often development and policy financial institutions, with professional service institutions as guarantee companies, appraisal companies, credit rating institutions, insurance companies and law firms. Stakeholders not directly involved in financing include public, building companies, material suppliers and equipment suppliers.

When leading the low-income housing construction, Zhoushan Government, in addition to guaranteeing land supply, has to raise construction capital. On one hand, government applies for central and provincial special fiscal subsidy and arranges such capital through local fiscal budget to increase governmental supports; on the other hand, government actively uses national polices, and connect to development and policy financial institutions for applying long term and low interest-rate credit supports in order to solve capital shortfall.

China Development Bank is positioned as a development financial institution, with the aim of serving national development strategies, with market operation as basic mode, with "break even and seek a meager profit" as operation principle, with long and medium term financing and investing as carrier, actively supports urban run-down area renovation, and focuses on solving urban run-down area renovation and urban village renovation. By the end of 2015, China Development Bank had issued 1.55 trillion RMB (248.86 billion USD) for run-down area renovation, having strongly supported renovation of 5.8 million houses in run-down areas. Urban run-down area renovation loan from China Development Bank refers to the long and middle-term project loan for urban run-down area renovation listed into national renovation plan and annual plan, as well as the reloan of soft loans Such loans are targeted for state-owned enterprises, with a 10 to 15 -year period and preferential interest rate, and loan commitment fee and financial adviser fees being exempted. China Development Bank actively engages in renovation of Zhoushan's urban run-down areas by establishing communication and coordination mechanism with Zhoushan's counties and districts and offering great credit supports, with its applied interest rate being 10 to 15 percent lower than the benchmark developed by People's Bank of China.

Agricultural Development Bank of China is a policy financial institution serving urban-rural integrated development and state's regional development strategies, greatly supporting rural run-down area renovation. Run-down area renovation loan from Agricultural Development Bank of China is mainly used for resettlement housing, monetary compensation and construction of supporting infrastructure facilities related to such renovation. Such loan is targeted for state-owned enterprises founded by local government and local government financing platforms not incorporated into regulatory list, with a period of less than 20

years, and preferential interest rate at the premise of "break even and seek a meager profit". Agricultural Development Bank of China is also actively engaged in renovation of Zhoushan's run-down areas by establishing communication and coordination mechanism with municipal level of Zhoushan to provide credit supports for run-down area renovation satisfying certain requirements.

5.2.2 Identifying issues faced by different actors and stake holders in financing infrastructure and urban services

Urban infrastructure and public service projects bear the common features of quasi-public goods, market system are prone to failure during resource allocation, leading to investment inadequacy. Theoretically, government should make proper investment in urban infrastructure and public service projects to compensate the deficiency of market system. Urban infrastructure facilities are mostly within capital-intensive industries, requiring large capital investment. Therefore, relying on government alone is hard to resolve capital supply problem, it is better to attract social capital. Such project financing needs to focus on needs of various actors and stakeholders to build good partnership, form the best combination for different interests and responsibilities, and realize project construction and operation aims thereby better serving the city. In Zhoushan, such project's initiator and capital demander are often government, central and local state-owned enterprises while capital providers are commercial banks, development banks and capital market investors, with professional service institutions as guarantee companies, appraisal companies, credit rating institutions, insurance companies and law firms. Stakeholders not directly involved in financing include public, building companies, material suppliers and equipment suppliers.

Zhoushan Government is responsible for reviewing and approving planning, construction, operation and environmental protection of infrastructure and public service projects, assumes or entrust local state-owned enterprises as main body for investment and construction, and takes charge of project capital raising to ensure the smooth completion of project, thereby fulfilling government duties or implement economic policies. When attracting social capital to participate in infrastructure construction, government needs to play the guiding role of fiscal capital while strengthening government accountability and improving confidence of social capital.

As Zhoushan Government's financing platforms, Zhoushan Ocean Comprehensive Development and Investment Co., Ltd ("Zhoushan Ocean Investment"), Zhoushan Communications Investment and Zhoushan Urban Investment Co., Ltd bear the basic characteristics of "supported by government and facing the market" and assume the responsibility of urban infrastructure construction. Profit projects are operated through market manner, while government gives appropriate fiscal subsidy or discount as necessary. Pure public interest projects are repurchased by government gradually to promote the sustainable development of financing platform. In addition to traditional bank loan approach, these platforms will increase more direct financing approaches step by step. Zhoushan Ocean Investment successfully issued medium term notes and super short-term commercial papers of 3.2 billion RMB (513.8 million USD) from 2014 to 2015. Zhoushan Communications Investment was approved to issue corporate bonds of 2 billion RMB (304 million USD) in March, 2016 and issued the initial 500 million corporate bonds in August, 2016 with a term of 5 years and a coupon rate of 3.3 percent, and will issue the remaining 1.5 billion RMB (228 million USD) bonds as market required and appropriate.

Commercial banks cannot completely ignore social benefits while pursuing economic benefits and therefore should coordinate the two aspects. Against the background of "economic new normal", the national development strategy of improving supply level of infrastructure facilities and public services requires commercial banks play role in infrastructure facilities and serve the development of real economy. During reviewing and approving infrastructure project loans, commercial banks generally pay attention to the following aspects. First,

regarding about types of infrastructure project, the industries and projects with low risk and secured profits and proper for financing are preferred. Second, self-owned capital should meet the minimum standard required by national regulations. Third, if self-owned capital or repayment source involves local fiscal fund, local government is required to incorporate such fund into local budget management and be able to repay it. Fourth, borrower or its parent companies should be experienced in management of similar projects, with proper professional competence and financing strength and try to provide eligible guarantor offering credit guarantee. Fifth, commercial banks will also strengthen in risk prevention and defending by focusing on shortfall of project capital, construction risk and policy risk, etc.

China Development Bank, based on its positioning, supports China urban infrastructure construction and optimizes urban spatial distribution. By the end of 2015, the accumulated balance of municipal infrastructure construction loans released by China Development Bank was 8,599 billion RMB (1,381 billion USD). Unlike commercial banks, China Development Bank often does not focus on the maximization of returns on investment, but pays attention to aspects such as promoting regional economic, industrial or social development when reviewing and approving project loans. China Development Bank provides long and medium-term RMB loans applicable to infrastructure construction requiring large investment, with long construction period, concentrated risks and strong social and public benefits. Project benefits are the major source for repayment. These loans are characteristics of large amount, long term and preferential interest rate.

Application for bond issuance by local governments and their financing platforms requires bond credit rating by rating institutions, which is taken as the major basis for bond pricing. Bond credit rating refers to a judgment of issuer's comprehensive repayment ability based on investigating credit standing of issuer and in combination of bond provisions and external supports obtained by issuer for repayment. Bond market investors usually make investing decisions based on rating report released by credit rating institution.

5.3 Challenges faced by different actors

5.3.1 Identify issues faced by different actors and stakeholders in financing housing and infrastructure to meet the resilient and green requirements

Green finance refers to economic activities for supporting environmental improvement, coping with climate changes and efficiently using resources, namely, financial services of project investing and financing, project operation and risk agreement in the fields such as environmental protection, energy saving, clean energy, green transport and green building. Development and construction of green and resilient housing and infrastructure facilities require the great supports from green finance. Therefore, various actors and stakeholders in housing and infrastructure fields need to think how to achieve the green and resilient sustained development of housing and infrastructure.

Central government guides to build sustainable development framework and promote various parties to collaborate. Government must demonstrate strong political will and formulate powerful national policies and reasonable guidelines to incorporate project initiators, financial institutions, investors, building companies, operators, and material suppliers among others into a specific and established framework for cooperation. In this way, specific system and operating conditions are created to support green and resilient housing and infrastructure construction more effectively.

Financial authority and regulatory bodies promote green financial system building and improve incentive and restraint mechanism. Green financial system cannot develop without top-layer design. On August 31, 2016, The Guiding Opinions on Constructing Green Financial System (Yin Fa [2016] No. 228) printed and distributed by People's Bank of China together with other seven ministries and

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commissions specified to promote and establish China's green financial system, mobilize and motivate more social capital to invest into green industry, and support development of green financial system through measures such as reloan, professional guarantee mechanism, fiscal discount for projects by green credit and setting national green development fund.

Green and resilient drive from banking system supports long term green credit projects. Currently, China's green financial product mainly refers to green credit. By incorporating environmental factors into operation and management framework, banking system will help increase stability and prudence of financial system and better assume social responsibilities. Green housing and infrastructure projects are mostly long-term ones and require much more investment than traditional non-green projects. As a result, banks need to strengthen risk management, overcome maturity mismatch in green credit, e..g, issuing securitized projects supported by future profits of green credit projects.

Green and resilient drive from bond market promotes green infrastructure construction. China's green bond market is in an initial stage. Some green infrastructure projects with long or medium-term stable cashflow are the potential investing targets for bond market. However, green bond market currently is deficient in terms of standards, certification, rating and supervision and management system. So, it is necessary for China to promote through up-to-bottom policies focusing on green bond market.

Project initiators emphasize green and resilient awareness, and therefore promote green level of housing and infrastructure facilities. Green finance serves sustained development of housing and infrastructure. Therefore, when making investing decisions about these projects, investors need to consider organic blending with environment and society, and take energy saving and emission reduction requirement into consideration during purchase, design and construction processes, in order to increase the green and resilience of these projects.

Chapter 6

Alternative Financial Instruments

6.1 New Challenges, Approaches, Instruments

6.1.1 Analyzing new housing and infrastructure development challenges, issues, priorities and financing opportunities and solutions in the city

After many years construction in housing and infrastructure, Zhoushan City has the foundation to build a garden-like livable city. In the end of 2015, the built-up urban area of Zhoushan reached 71.7 km^2, having formed a prototype for grouped city state and with its urban supporting facilities and comprehensive business functions being continuously improved. Urban per capita housing building area was 34.2 m^2, with prominently improved housing security level and living environment. Zhoushan's urban plan objective is to build a free-trade port and a sea garden city, which imposes higher requirements for future development of urban housing and infrastructure.

Residents having access to comfortable housing is an important objective for Zhoushan's housing construction. With the continuously deepening of marine economy and steadily promoting of urbanization, Zhoushan will attract more migrant population and expect to have a higher permanent population and urbanization rate by 2020, thereby providing new space for Zhoushan's housing development. Zhoushan's future housing development need to pay attention to the following points.

Residential housing land supply is limited. Assuming that urban per capita housing building area remains unchanged, by 2020, a total housing building area of 9.55 million m^2 is needed to meet the need of newly increased urban population alone. If improving housing need is considered, urban residential housing land demand will be further increased. But Zhoushan Archipelago geographical features have determined that land is the scarce resource for urban development, and total land proper for housing construction is limited. Therefore, Zhoushan needs to plan urban land scientifically, improve residential housing land efficiency and satisfy residential demand from different income groups.

Green and resilient housing enjoys market opportunity. With the increasingly improvement of Zhoushan people's living standard, residents impose higher requirements for housing quality. Zhoushan Archipelago ecological condition and air quality rank the first class in China, and very suitable for developing and building low carbon, smart, green and resilient housing. Consequently, residential housing developers need to change ideas and actively promote design and construction of green and resilient housing in order to meet the high quality requirement from market.

Housing security demand exists for a long term. With the reform of hukou system and equalization of urban-rural public services, Zhoushan housing security will cover more people. It is expected that conditions for applying low-income housing during the "13^{th} Five Year Plan" will be further relaxed, thereby increasing the working difficulty of housing security in Zhoushan. Therefore, Zhoushan needs to define boundary between housing security and housing market, adopt more market approaches to raise low-income housing sources, strengthen low-income housing management and ensure a proper degree of housing security.

Infrastructure construction is closely related to sustainability of Zhoushan's economic and social development. Zhoushan has planned to build "four-island, one city and one center" to construct a modern infrastructure system with properly advanced level, completed supporting functions, and safety and efficiency, which provides new opportunity for Zhoushan's infrastructure construction. In the future, Zhoushan's infrastructure construction need to focus on the following points.

Comprehensive transport system is urgently to be improved. As an archipelago city and being located at the end of Yangtze River Delta Region, Zhoushan needs to reinforce its transport connections with cities within Yangtze River Delta region, especially to Shanghai and Ningbo, in order to better immerse into Yangtze River Delta economic circle, which has always

been the first priority for Zhoushan's outward transport development. In the meanwhile, Zhoushan urgently needs to optimize urban transport system, improve inter-island transport between Zhoushan Island and other islands, and increase public transportation efficiency. Therefore, Zhoushan needs to accelerate constructing stereo comprehensive transport system and reinforce the urban integration effect with Shanghai and Ningbo.

Energy structure should be optimized to increase energy guarantee. On one hand, due to lacking of energies, raw materials and resources, Zhoushan's all required non-renewable energies are supplied by the mainland, being obviously restricted by market and transport conditions. On the other hand, Zhoushan is bestowed with good marine resources, and therefore may accelerate developing new energies, such as wind energy, tidal energy and solar energy, to optimize energy supply structure and increase energy efficiency and guarantee capacity. Therefore, Zhoushan needs to enlarge investment in marine new energies and renewable energies, and increase financial and fiscal supports.

Water resource development and utilization should be diversified. Zhoushan is severely lacking of water resource, and its water quality is not good enough, thereby leading to huge anti-flood and disaster reduction pressure. In order to increase water resource guarantee ability, Zhoushan needs to implement diversified strategies. First, Zhoushan should conduct multi-source water supply project based on local water resource and by strengthening mainland water diversion, increasing sea water desalination and pushing non-regular water utilization. Second, Zhoushan needs to reinforce water ecological environment protection, comprehensively overhaul reservoirs and riverways and improve its defense against "typhoons and floods". Third, Zhoushan needs to increase civil water source protection, renovate and improve water processing technologies, build water quality monitoring and measuring facilities in order to achieve the all-around improvement of drinking water quality and efficiency.

Capital sources for infrastructure facilities should be diversified. Zhoushan's infrastructure projects are dominated by governmental investment currently, leading to insufficient total investment, monotonous investing channel, non-separation of government administration and enterprise management in infrastructure field, low investing efficiency for some projects and overburden of fiscal subsidy, thereby failing to meet requirement of social and economic development.

6.1.2 Analyzing approaches which could reduce the costs of affordable housing and narrow the affordable housing gap in the city, including market-oriented solutions (e.g. lowering the cost of land, construction, operations and maintenance, and financing)

Affordable housing mentioned in this Report refers to housing that can be afforded by lower-middle income or lower income households. In Zhoushan, this kind of housing mainly means the low-income housing built under the guidance of government. China's residential housing building cost generally contains land cost, building and installation cost, decoration cost, financial fees, administration fees and relevant taxes and duties. The following measures may be adopted to lower low-income housing cost in Zhoushan:

Improve land supply mechanism and allocate land administratively. Zhoushan city attaches high importance to housing security and adopt administrative land allocation to ensure the priority supply of low-income housing land, while increasing floor area ratio, in order to fully enhance land resource utilization efficiency.

Strictly control building standards and keep a proper degree of housing security. Zhoushan will promote to scientific space use, to

provide basic decorations of conciseness and environmental protection, and effectively meet basic living functions in accordance with the requirements of small-sized residence, completed functions, good supporting facilities, high quality, safety and reliability.

Implement supporting preferential policies and reduce or exempt relevant taxes and fees. Construction of public rental housing and affordable housing, and renovation of urban run-down area are exempted from various administrative fees and governmental funds like urban infrastructure support fee. Public rental housing built as supporting facilities for common commercial residential housing project will enjoy tax reduction or exemption policies according to relevant regulations.

Try to obtain low-interest rate capital from financial market and lower financial fees. Zhoushan will actively attempt to obtain loan supports from financial institutions like China Development Bank and Agricultural Development Bank of China, with an aim of getting more preferential credit policies for low-income housing with respect to loan conditions, interest rate and loan term.

Zhoushan housing security is a dynamic and long term process. Although government has promised to be completely responsible for housing security, because fiscal capital and resource controlled by government are limited and key working points of future housing security is Zhoushan is monetary housing compensation or resettlement, the best choice to decrease shortfall of affordable housing is the market approach. The optional measures are described as follows.

Housing Provident Fund should play its largest role. Zhoushan needs to enlarge Housing Provident Fund's coverage and reasonably enhance upper limit of Housing Provident Fund loan, support using Housing Provident Fund as housing rent, thereby increasing urban citizen's housing consumption ability.

Zhoushan Government will support social capital to increase low-income housing source. Government strengthens organizing and coordinating, encourages supporting social organizations including enterprises, public institutions, village collective economic organizations and nonprofit social institutions to invest in and operate public rental housing by streamlining project review and approval procedures, granting fiscal subsidy and taxes and fees reduction and exemption. At the same time, public rental housing could also be leased in market manner, and government compensates rent difference through fiscal subsidy to ensure a proper profit room for social capita.

Housing leasing market should be regulated and developed. Government could release administration regulations regulating leasing market and guarantee the rights and interest of both tenants and landlords, strengthen contractual management of house leasing to specify rights and obligations of both parties, and increase rent management to restrict rent change conditions and eradicate arbitrary price increase by landlords.

6.1.3 Assessing opportunities for launching and developing new instruments which support low carbon and climate resilient development

As an ecological city with distinctive island landscape, Zhoushan has always been paying attention to marine ecological civilization. Zhoushan has successfully met the standards of national model city for environmental protection and national water saving city, having finished task associated with indexes for energy consumption per unit GDP and major pollutants emission reduction having, and with its air quality in the leading level in China. In new situation, Zhoushan enjoys good policy environment, objective demand and proper economic strength to conduct new tools for supporting low carbon and defensing climate change. So, considering seeking supports from green finance and relevant technologies, it is feasible to launch an develop such new instruments

Ecological civilization construction becomes a national policy. Since 2012, Chinese government has paid more attention to sustainable development, by accelerating

a resource-saving and environment-friendly society and fostering the strong sense of "lucid waters and lush mountains are invaluable assets" to work hard into a new age for socialistic ecological civilization. Central government requires local governments to treat ecological civilization construction as an important task by working hard to solve prominent problems related to ecological environment by giving an improved ecological environment to people, thereby making greater contribution to building a beautiful China.

Urban construction needs higher standards. Although Zhoushan urban development has made some accomplishments, construction concepts and methods remain extensive-based. So it is essential to further improve efficiency in terms of saving resource and protecting environment. In the future, Zhoushan has large growing space with respect to housing and infrastructure fields, and needs to take higher standards initiatively. For example, Zhoushan should further reducing air, water and soil pollution for sustained development of energy, water and transport, lowering greenhouse gas emission to alleviate and adapt to climate change, thereby obtaining environmental benefits.

Economic strength enhances guarantee ability. Zhoushan's overall economic aggregate, although is at the lower level within Zhejiang Province, in recent years, has been keeping a steady growing momentum, with growth rate higher than average rate of Zhejiang Province and China in the same period, showing some late-developing advantage. In the context that China deepens marine comprehensive development, Zhoushan opening has become a national strategy. Zhoushan has increasingly growing marine economy and international competitiveness, providing sound foundation for construction of marine ecological civilization in the future.

Zhoushan has a long history, but its modernization construction started not long ago. Zhoushan has many shortcomings in urban development concept, green financial supports and application of ecological and environmental protection technologies. As a result, Zhoushan needs to use external powers to further enrich urban financial instruments and enhance applications of technologies that can support sustained development if desiring to grow into a global ecological model city.

6.2 Improving Financial and Technical Support at the City Level

6.2.1 Present recommendations on how to improve efficiency and effectiveness of financial and technical support in the city

Currently, Zhoushan financial supporting approach is mainly bank loan, resulting in monotonous financing channel and banking system's risk concentration. However, in recent years, Zhoushan has made prominent effects in direct financing, with debt financing and bond financing amounts being increased obviously. Based on the current status of Zhoushan's financial development, existing problems and future plan, the following measures could be used to increase financial supports.

Supporting commercial banks to release green loans. Zhoushan needs to guide commercial banks to conduct green credit loan and promote energy saving and emission reduction under the instructions of banks' head offices. Zhoushan Government may support by fiscal discount, properly increase fiscal discount rate and reasonably determine discount period or assume a certain ratio of default loss for green credit loan projects during operation to give guarantee for green credit projects.

Promoting state-owned financing platform to make direct financing. Zhoushan will build Zhoushan Ocean Investment, Zhoushan Communications Investment and Zhoushan Urban Investment into leading enterprises to raise money for infrastructure construction, and support long and medium term green projects through issuing long and medium-term green bonds. Additionally, Zhoushan will try to lower financing cost of green bonds by credit-increasing methods including fiscal discount and guarantee.

Enlarging development and policy financial supports. On the current basis, Zhoushan will

actively apply for loan supports from financial institutions such as China Development Bank and Agricultural Development Bank of China, in order to obtain more preferential loan policies in terms of loan conditions, interest rate and term, and enlarge credit supports for green infrastructure projects

Building PPP green industrial fund. Infrastructure facilities are mostly low-profitability, so green industrial fund imposes strong demand for government investment. Establishment of PPP green industrial fund cooperated by fiscal capital and private capital is an important approach to push green industrial fund development, which can play the leverage role of fiscal capital and guide and encourage long-term capital such as social security capital and insurance capital to engage in urban infrastructure construction.

In addition to increasing financial support level, Zhoushan also needs to enhance application levels of technologies supporting urban sustained development Based on the practical applications of green, low carbon, energy saving and emission reduction technologies, as well as the current economic development of Zhoushan, the following approaches could be considered.

Introducing matured technologies to support green project development, which on one hand, is good for lowering introducing cost, and on the other hand, can avoid risks caused by new technology's uncertainties. For instance, Zhoushan will introduce coupled development and application technologies about new energies, such as oceanic wind energy, tidal energy and solar energy, and technologies and processes improving sea water desalination and comprehensive utilization rate to develop sea-island circular economy; It will also introduce new technologies, new materials and new processes used for green building and infrastructure projects to improve their development sustainability.

Pushing major and important scientific and technologies innovations in marine ecology field. By focusing on marine ecological civilization construction and replying on existing oceanic science, education and innovation system, Zhoushan will strengthen exchanges and cooperation with both domestic and foreign famous universities and research institutes to pay attention to application of green building and infrastructure projects, to implement important innovative researches of special projects on ecological science and technologies, and to promote the industrialization and commercialization of their research results.

Improving diversified and multi-channel system for investing into science and technology. On one hand, Zhoushan government will fully play its guiding role in investment to strengthen government investment and motivate all-system ability of distributing scientific and technological resources by government direct investment and preferential taxes. On the other hand, Zhoushan government could also guide financial institutions' investment in innovation and application of marine ecological science and technology by fiscal discount or guarantee, or establish marine investment-financing alliance system initiated by government and composed of equity investors, banks, guarantee companies and other relevant institutions.

6.3 Opportunities for International Financial Institutions and Agencies

6.3.1 Support to financial sector development

In recent years, Zhoushan financial sector has made some achievements, and the financial system's ability of serving real economy has been improved obviously. Nevertheless, Zhoushan still faces investment structure conflict where infrastructure investment dominated by government capital takes up a large portion. During the "13th Five Year Plan" period, Zhoushan's planned total investment in fixed assets is 850 billion RMB (129 billion USD), of which, over 425 billion RMB (64.5 billion USD) is intended for infrastructure construction. After considering the minimum ratio of self-owned capital to total investment in fixed assets required by China and combining

the historical financing condition of Zhoushan's financial market, it is forecast that during the "13th Five Year Plan: period, total market financing demand for investment in fixed assets is between 340 and 510 billion RMB (between 51.68 and 77.52 billion USD), of which, 170 and 255 billion RMB (25.84 and 38.76 billion USD) for infrastructure facilities. Therefore, we can note that Zhoushan financial sector is urgently needed to be developed and enjoys larger market demand space.

According to the Financial Development "13th Five Year Plan" of Zhoushan, overall idea for financial development of Zhoushan is to build "Zhejiang Innovation Model Zone for Combination of Marine Industry and Finance", by focusing on exploring various channels and mechanism through which marine finance supports marine economy, and implementing five major measures to promote the interactive development of Zhoushan's marine industry and financial industry. Improving innovative system for marine infrastructure construction financing is one of the five major measures, and will further perfect existing financial system and broaden financing channels.

6.3.2 Financing opportunities in the city

Zhoushan's financial development opportunities are mainly attributed to internal development and external policy environment. Since Zhoushan City's opening is elevated as national strategy, particularly, approval of Zhoushan to establish Pilot Free Trade Zone in August, 2016, Zhoushan financial sector's development enjoys policy advantages, and will make breakthroughs with the continuous development of its marine economy and upgrading and transformation of industrial system.

In recent years, China has released a lot of policies supporting ecological civilization construction and green financial system development, thereby providing good external policy conditions for Zhoushan to develop green housing and infrastructure projects. In September, 2015, the State Council issued the Integrated Reform Plan for Promoting Ecological Progress and for the first time specified the strategy to establish China's green financial system. In August, 2016, the No.228 document issued by the People's Bank of China together with seven ministries and commissions stated a series of incentive measures to support and encourage green investment and financing, while supporting local governments to develop green finance, encouraging regions with proper conditions to motive more social capital to investment into green industry by professional green guarantee mechanism and setting green development funds, etc.

6.3.3 Capacity building opportunities for financing the city

In the new context, Zhoushan's opportunities for financing capacity building are mainly originated from three aspects, i.e., urban investing and financing system reform, fully enhancing opening-up level and continuously optimization of financial market.

Deepening investing and financial system reform in the field of infrastructure construction. On July, 18, 2016, Opinions of the Central Committee of the Communist Party of China and the State Council on Deepening Reform of Investment and Financing System (Zhong Fa [2016] No. 18) was promulgated and implemented, and was the first document issued in the name of Central Committee of the Communist Party of China and the State Council for reform of investment and financing system. In infrastructure construction field, investment and financing management system still has some problems, such as, management of government investment is urgently needed to be innovated, the guiding and motivating role of government should be further improved; difficulty in project financing and high financing cost, financing channel should be further broadened; Streamlining government and delegating authorities are not coordinated and not in place, it is required to further establish enterprise' investor role. Accordingly, such document provides policy guarantee for Zhoushan to make reforms of investment and financing system in infrastructure field.

Fully enhancing opening-up level and Zhoushan's competitiveness. By establishing Pilot Free Trade Zone, Zhoushan will focus on bulk commodity free trading, convenient marine industry investment and opening and development of modern marine service to explore and conduct free trade system both conforming international practices and show regional features, being trying to become an importance platform for China to improve its ability to distribute bulk commodity globally and to guarantee national economic security, the strategic node for 21st Century Maritime Silk Road and Yangtze economic belt, the sea portal for a new round of opening-up. During this process, Zhoushan's financial system will be greatly internationalized.

Further optimizing financial market system and improving financing capacity. Although currently, Zhoushan's financial market is dominated by credit market, financial institutions by banks, and financial instrument, by bank loans, in recent years, direct financing has shown obvious effects, bond financing and equity financing have started to be activated, financial innovation represented by assets securitization are begun, which will have the whole financial market ecological system more improved and more competitive. Financial market serves real economy, therefore, with the overall stable and healthy development of Zhoushan's economic strength, financial market's financing capacity will be further enhanced.

6.3.4 Partnership opportunities as well as knowledge development and sharing in financing FRUGS

In the current situation, during construction of housing and infrastructure, it is required to consider resource and environment cost of urbanization, to reduce environmental loss due to urbanization, and promote deepening combination between economic and social development and environmental protection during urbanization. United Nations Human Settlements Programme has called for establishment of a Financing for Resilient, Green and Smart Urban Global Solutions (FRUGS) platform together with international financial institutions, aiming to provide relevant assessment services and financial support solutions for cities to promote green, smart and resilient development of such cities, and coping with multi-challenge encountered by cities and the earth together.

FRUGS platform has been initiated in 2016. The first 8 candidates for model cities are mainly from developing countries, one of which is Zhoushan City. Through this globalized FRUGS platform, Zhoushan City may resort to international experts with respect to difficulties about housing and infrastructure fields, thereby obtain newer urban development concepts, and measure its own advantages and disadvantages and exploring new development paths in accordance with assessing index system and standards of global green, smart and sponge cities, while applying for urgently needed green financial and technical supports to finally achieve sustainable urban development. Therefore, participation in FRUGS will be a very valuable opportunity for Zhoushan development

6.3.5 Opportunities for launching and developing new instruments (e.g. assessment tools for green and climate resilient cities, green building and housing index

After considering domestic and international index assessment practices, we have noted that comprehensively assessing object through indexes with time-series characteristic bear the advantages of objective assessed contents, specificity, non-ambiguity, strong operability and clear measuring criteria, and therefore help governmental bodies, public and investors make decisions or analyze market opportunities. In China, representative cases of using indexes to assess regional or urban sustainable development include: Report on China's Green Development Index-Regional Comparison jointly complied by Beijing Normal University School of Economic and Resource Management, Institute of Development Studies in Southwestern University of Finance and Economics and China Economic Monitoring and Analysis Center under National Bureau

of Statistics, and Assessment on Sustainable Development of 35 Large and Middle-sized Chinese Cities collaborated by Office of United Nations Development Programme in China, Oriental Outlook under Xinhua News Agency and Tongji University School of Economics and Management.

Currently, Zhoushan City has no systematic indexes of assessing urban green development and adapting to climate changes. It only has urban ecological environment index (EI) released by Zhoushan Bureau of Environmental Protection annually to indicate the ecological and environmental quality condition of Zhoushan. In 2015, this ecological index of Zhoushan was 79.9, classified as good grade. In housing field, Zhoushan adopts Assessing Criteria of Green Building of China (GB/T50378-2014) to assess green building grade, with the only index of monthly or annual residential housing sale price, which only simply reflects year-on-year or month-on-month change of average sale price of new and old urban housing. Such index can only offer limited help to governmental bodies, public and investors when making decisions, analyzing market development status and trend.

According to "13th Five Year Plan for Economic and Social Information of Zhoushan City (2016-2020), Zhoushan City will build a national-level marine data center integrating acquisition, storage, management digging and use, and conduct comprehensive information application focusing on three fields, i.e., governmental management, livelihood services and industrial development. This has provided basic guarantee for Zhoushan City to develop indexes measuring urban green and resilient development as well as green building and housing development, with some technological feasibility.

Chapter 7

Project Identification

7.1 National Priorities for Housing, Infrastructure and Urban Services

Housing is one of basic social conditions determining living quality and happiness of people and regions, while infrastructure is the framework to keep normal running of social economy and material prerequisite for citizens to obtain good and safe life. Global urbanization experience demonstrates that housing and infrastructure construction plays a vital role in urban sustainable development. As the largest developing country, China attaches high importance to sustainability by actively exploring resource saving and environment friendly green development pat. In March, 2016, the fourth session of the 12th National People's Congress passed *The Outline of Thirteenth Five-Year Plan for National Economic and Social Development of the People's Republic of China* and specified the following key points for development:

Establishing harmonious and livable cities. China will transform urban development methods, improve urban management ability, enlarge prevention and treatment of "urban diseases", and continuously enhance urban environment quality, residents' living quality and urban competitiveness in order to build harmonious and livable cities with vitality and distinctive features.

Improving housing supply system. China will build a housing supply system with government offering basic guarantee and market satisfying multi-layer demand, optimize housing supply and demand structure in order to steadily improve citizens' housing level, better guarantee "residents having access to housing" and enhance housing security level.

Strengthening urban infrastructure construction. China will construct a modern urban infrastructure system with reasonable distribution, supporting facilities, complete functions, safety and high efficiency. China will accelerate renovation and construction of urban water supply facility, and strengthen building of urban ecological facilities such as anti-flood and water adjustment, parks and wetlands thereby supporting development of sponge cities, improving urban public service facilities. Additionally, China will improve anti-disaster capability of urban buildings and infrastructure facilities.

Constructing a modern energy system. China will deepen pushing energy reform by promoting reform of energy production and energy use, optimizing energy supply structure, improving energy efficiency, in order to establish a modern energy system of clean and low carbon, safe and efficient, and safeguard national energy security.

Intensifying water safety guarantee. China will speed up improving water conservancy infrastructure network, pushing scientific development, reasonable distribution, efficient and effective use of water resource, thereby fully elevating water safety guarantee capacity.

Pushing resource saving and intensive use. China will work hard to establish intensive and recycling resource awareness, promote fundamental change of resource use, and strengthen all-process saving management and hugely increase comprehensive benefits of resource utilization.

Enlarge comprehensive environment renovation and improvement. China will change concept and method of environment renovation and improvement, implement the strictest environmental protection system, reinforce emitters' responsibilities, thereby forming an environmental protection system constituting of governments, public and enterprises to achieve the overall environmental improvement.

Some ministries and commissions under the State Council of the People's Republic of China have also granted relevant policy supports and developed objectives for green and resilient development of housing and infrastructure construction. In housing field, Ministry of Housing and Urban-Rural Development actively promotes green building development and increase the ratio of green building to

new buildings. It is planned that by 2020, green building will take up over 30 percent of new buildings and energy and resource consumption level during construction and use of buildings will reach or close to current level of developed countries. Additionally, Ministry of Housing and Urban-Rural Development has promoted fiscal incentive mechanism for high-star level green building by collaborating with Ministry of Finance, aiming to guide construction of higher level green buildings. In urban infrastructure field, General Office of the State Council printed and distributed *Guiding Opinions on Promoting Construction of Sponge Cities* in October, 2015 to arrange for promoting construction of sponge cities by reinforcing anti-flood capacity, improving new urbanization quality, promoting the harmonious development between human and the nature, and minimizing influences of urban development and construction on ecological environment with one index of using 70 percent of rainfall in local sites. It is planed that by 2020, more than 20 percent of urban built-up area will meet the above requirements while by 2030, more than 80 percent will do. Therefore, Zhoushan City is equipped with good external policy environment and market development opportunity, which can help Zhoushan get great supports from central and Zhejiang Governments when exploring resilient and sustainable development path,

7.2 City Priorities for Housing, Infrastructure and Urban Services

Green ecology is the necessary condition for sustainable development and an important reflection of people's pursuit for happy life. Against the future, Zhoushan City will incorporate good ecological environment into the lifeline and core competitiveness of New Area development, by enlarging ecological advantages, developing "beautiful economy", opening the effective path transforming "lucid waters and lush mountains" to "invaluable assets", and offering more quality ecological products to people, in order to promote harmonious and green development of human and the sea. *The Outline of Thirteenth Five-Year Plan for National Economic and Social Development of Zhoushan* specified the key priorities for housing, infrastructure and public services.

Building quality living environment and achieving "residents have access to comfortable housing". Zhoushan will, on one hand, actively popularize green and low carbon building, advocate green habitat concept and on the other hand, implement low-income housing projects by enlarging urban housing security coverage in order to further improve urban resident's housing conditions.

Adhering to sea-land coordination and coupling, and improving modern infrastructure system. Zhoushan will strengthen comprehensive coordination, improve infrastructure network including transport, energy, water conservancy, information, anti-disaster. In addition, Zhoushan will push construction of "sponge city" full steam ahead in order to renovate and upgrade urban water supply, waste water, electricity, fuel gas, environmental sanitation and anti-flood and flood drainage facilities.

Improving urban public supporting services and creating convenient and comfortable multi-functional living environment. Zhoushan will emphasize balance of workplace and residence, high consistency between public service facilities and important public traffic nodes with an aim that public facilities such as medical care, education, culture and sports are coordinately distributed within living circles only taking about 10 to 20 minutes by walk in downtown area.

7.3 Financing Opportunities for Project Pipelines

Based on financing demand analysis of housing, infrastructure and public services made in Chapter 2 and Chapter 3, the total planned investment in key projects studied in this Report for housing, infrastructure and public services of Zhoushan is 114.36 billion RMB (17.38 billion USD), the possible market financing range is between 33.86 and 79.19 billion RMB (between 5.2 and 12.1 billion USD). Of the total planned investment, 3.415

billion RMB (519 million USD) is for new low-income housing projects with possible market financing range between 16.518 and 40.321 billion RMB (between 2.51 and 6.13 billion USD), 50.4 billion RMB (7.66 billion USD) for traditional infrastructure and public service projects, with a possible market financing range between 16.518 and 40.321 billion RMB (between 2.51 and 6.13 billion USD), 60.547 billion RMB (9.20 billion USD) for projects promoting urban green and resilient development, with a possible market financing range between 16.314 and 36.138 billion RMB (between 2.48 and 5.49 billion USD). The selecting criteria and specific contents of key projects are detailed in section 7.4 to section 7.6 of this Report.

The possible financing amount for projects mentioned in this Report is a range since it is considered that various stakeholder's interests should be coordinated, the final financing amount will be determined through many rounds of negotiations and between project initiator (capital demander) and financial institutions (capital providers or raisers). Thus, it will provide diversified choices for financial institutions interested in investing into key projects of Zhoushan.

Overall, the financing needs of key projects in housing, infrastructure and public service fields are mainly characteristics of large capital demand, long term and low financing cost. Considering the actual status of Zhoushan's existing financing market, the optional financing methods and instruments include: bank loans or syndicated loan, corporate bonds, project financing and PPP mode.

7.4 Project Identification and Pipelines for Low Income, lower and Lower-Middle Income Housing

Based on relevant planning documents about Zhoushan's housing security development and previous investigations, in this Report, newly built low-income housing projects that can help achieve urban sustainable development are selected as candidate financing projects from the aspects of "society, economy and environment". Of the three aspects, social sustainability mainly means that one candidate project can really improve urban residents' housing condition, have significant social influence, improve happiness of the targeted people and increase balance and tolerance of urban development; environmental sustainability, can adopt green building standards, reasonably use materials and processes that can save energy and protect environment, and decrease influences on ecological environment; economic sustainability, have necessary self-owned capital and proper capital source, feasible meager profit mode or chairing mechanism, and guarantee and timely repay the principal and interest of loans.

After analysis, during the "13th Five Year Plan" period, Zhoushan has four newly built low-income housing projects satisfying such requirements with a total planned investment of 3.415 billion RMB (519 million USD) (Table 7-1).

Table 7-1 Important Low-income housing Projects of Zhoushan during the "13th Five Year Plan"

Project Name	Construction Scale	Construction Period	Investment Scale		Planned Investment for the '13th Five Year Plan"	
			10,000 RMB	10,000 USD	10,000 RMB	10,000 USD
Dujialing Resettlement Neighborhood Phase 7	Total building area is about 360,000 m2	2016-2019	163,000	24,775	154,000	23,407
Heping Road Resettlement Land Lot	Total building area is about 190,000 m2	2016-2020	90,000	13,679	50,000	7,599
Dinghai District Renovation of Dilapidated Houses	Total building area is about 62,000 m2	2016-2017	87,500	13,299	87,500	13,299
Guangantou Resettlement Neighborhood	Total building area is about 37,400 m2	2017-2020	100,000	15,199	50,000	7,599
Total			440,500	66,953	341,500	51,906

7.5 Project Identification and Pipelines for Infrastructure and Urban Services

Based on relevant planning documents of Zhoushan and previous investigations, in this Report, newly built infrastructure and public service projects that can help achieve urban sustainable development are selected as candidate financing projects from the aspects of "society, economy and environment". Of the three aspects, social sustainability means one candidate project can improve urban infrastructure and supporting public facilities, effectively push integrated urban-rural development, enhance equalization of urban-rural public services and have great social influence; environmental sustainability, can follow the development concept of compact city, ecological city and public city, helping improve air and water quality, protecting natural resources and actively coping with climate changes; economic sustainability, have necessary self-owned capital and reasonable capital sources, meager profit mode or charging mechanism, guarantee and repay principal and interest timely, particularly, non-profit projects or projects in public interest need necessary fiscal supports.

After analysis, during the "13th Five Year Plan" period, Zhoushan has 12 traditional infrastructure and urban livelihood projects satisfying such requirements with a total planned investment of 5.04 billion RMB (7.55 billion USD), of which, 3 are transport projects, with a total planned investment of about 29.8 billion RMB (4.53 billion USD), 5 energy and power projects, with a total planned investment of about 15.83 billion RMB (2.41 billion USD), and 4 water resource management and waste treatment projects, with a total planned investment of about 4.772 billion RMB (730 million USD) (Table 7-2).

Table 7-2 Important Infrastructure and Public Service Projects of Zhoushan during the "13th Five Year Plan"

(1) Transport						
Project Name	Construction Scale	Construction Period	Investment Scale		Planned Investment for the '13th Five Year Plan"	
			10,000 RMB	10,000 USD	10,000 RMB	10,000 USD
Ningbo-Zhoushan Railway	From East Ningbo Station to Jintang island Passenger and Freight Station, with a total length of about 87.7 km.	2018-2023	2,400,000	364,785	680,000	103,356
Liuheng Road Bridge for Ningbo-Zhoushan Port	From southwest side of Liuheng island to Ningbo-Chuanshan Shugang Road, with a total length of about 31.31 km.	2018-2023	1,750,000	265,989	1,000,000	151,994
Main Paths of Ningbo-Zhoushan Port	Shugang road in Zhoushan green petrochemical base, with a total length of about 39.61km.	2017-2021	1,609,100	244,573	1,300,000	197,592
Total			**5,759,100**	**875,349**	**2,980,000**	**452,942**
(2) Energy and Power						
Zhoushan pipeline connecting LNG import terminals and filling stations	Total length is about 91 km, with an expected annual transport volume of about 8.1 billion m3.	2016-2018	182,000	27,662	182,000	27,662
Zhoushan Economic Development Zone LNG transfer, storage and transport project	Proposed LNG import terminal project whose phase I scale is about 3 million tons.	2016-2018	500,000	75,997	500,000	75,997
Zhoushan import terminal and filling station (phase II) by ENN energy	One tank of about 230,000 to 260,000 m3 and supporting facilities.	2017	120,000	18,239	120,000	18,239
Zhoushan 500KV network transmission and transformation project	2×114.5 km , 2×1 million KVA main transformer, 500KV submarine cable terminal	2016-2018	481,000	73,109	481,000	73,109
Zhoushan Power Plant expansion project(phase III)	660,00 KW supercritical coal-fired unit	2018-2020	300,000	45,598	300,000	45,598
Total			**1,583,000**	**2,406,06**	**1,583,000**	**2,406,06**
(3) Water Resource Management and Waste Treatment						
Zhoushan mainland water diversion Phase III	Water diversion flow of 1.2m3/s, water supply of 32 million m3/year	2016-2020	236,204	35,901	199,200	30,277
Shengsi County mainland water diversion	Water diversion flow of 0.04m3/s, water supply of 10 million m3/year	2017-2020	120,000	18,239	120,000	18,239
Daishan waste water processing plant	Treating waste water of 100,000m3/day	2017-2019	113,000	17,175	113,000	17,175
Supporting waste water treatment plant and pipelines for Zhejiang Petrochemical 40 million tons/year integrated project	Treating waste water of 66,000m3/day	2016-2025	90,000	13,679	45,000	6,839
Total			**559,204**	**84,995**	**477,200**	**72,531**
Total of infrastructure and public service			**7,901,304**	**1,200,952**	**5,040,200**	**766,080**

7.6 Project Identification and Pipelines for Resilient and Green Urban Development Projects

Based on relevant planning documents of Zhoushan and previous investigations, in this Report, newly built infrastructure and public service projects that can help achieve urban green and resilient development are selected as candidate financing projects from the aspects of "society, economy and environment". Of the three aspects, social resilience and tolerance means one candidate project can improve all Zhoushan citizens' livelihood, have significant social influence, promote the whole society to share development achievement, and increase people's sense of gain; environmental resilience and ecology, push resource saving, strengthen sea and island ecological protection, enhance carrying capacity of environment resources, increase adaptability to climate changes and natural disasters to achieve harmonious and green development of human and sea; economic resilience and sustainability, promote economic structure transformation and upgrading, provide real supports for Zhoushan's marine economy development and promote Zhoushan to develop leaps and bounds.

After analysis, during the "13th Five Year Plan" period, Zhoushan has 9 projects satisfying urban resilient and green development requirements with a total planned investment of 60.547 billion RMB (92.0 billion USD), of which, 1 is large comprehensive project (Zhoushan Qiandao Central Business District), with a total planned investment of about 47 billion RMB (7.14 billion USD); 2 are green and resilient transport projects, with a total planned investment of about 1.147 billion RMB (174 million USD), 2 new energy projects, with a total planned investment of about 6.325 billion RMB (961 million USD) and 5 green and resilient water conservancy projects with a total investment of about 2.45 billion RMB (372 million USD) (Table 7-3).

END NOTES

[9] *Infrastructure Engineering Procurement Construction mainly include west reclamation project, municipal road project, cross sea bridge project, underground integrated pipeline and corridor project, development and utilization of public underground lot, riverway project for anti-flood and drainage, garden landscape project and terminal project.*

Table 7-3 Important Projects of Zhoushan for Resilient and Green Urban Solution Planned for the "13th Five Year Plan"

(1) Large Comprehensive Project						
Project Name	Construction Scale	Construction Period	Investment Scale		Planned Investment for the '13th Five Year Plan"	
			10,000 RMB	10,000 USD	10,000 RMB	10,000 USD
Zhoushan Qiandao Central Business District	Build head office of river and sea coordinated transport service center, green petrochemical base head office and regional head office for China Communications Construction, thereby becoming head office economic complex for Zhoushan Archipelago New Area. This project has a total planned area of about 448.4 hectares, including investment and development, infrastructure Engineering Procurement Construction[1] and urban comprehensive operation and management.	2017-2030	4,700,000	714,372	4,700,000	714,372
Total			**4,700,000**	**714,372**	**4,700,000**	**714,372**
(2) Green and Resilient Transport Projects						
Jintang Mudai container low-carbon port project	Including energy feedback technology used for variable-frequency equipment of port machine and application of shore power technology ,etc.	2017-2018	57,735	8,775	57,735	8,775
Construction of green port construction for oil products in Waidiao	Including energy saving of technologies and equipment and reasonable use of electricity etc.	2017	57,000	8,663	57,000	8,663
Total			**114,735**	**17,439**	**114,735**	**17,439**
(3) New Energy Projects						
China General Nuclear Power Group Daishan 4# oceanic wind farm	Total installed capacity is 300 MW	2016-2019	570,000	86,636	570,000	86,636
MW Pilot tidal energy project	Optimizing 5MW,10MW and 15 MW prototypes and development and research of a great deal of system integration		62,500	9,499	62,500	9,499
Total			**632,500**	**96,136**	**632,500**	**96,136**
(4) Green and Resilient Water Conservancy Projects						
Zhoushan Island sea water desalination project phase I	Newly built desalination plant is capacity is 100,000 m3/day.	2020	42,500	6,459	10,000	1,519
Dayushan desalination project phase I	Supporting facilities for a desalination project with a capacity of 270,000m3/day.	2016-2020	270,000	41,038	50,000	7,599
Cezi island new seawall project	Newly built seawall of 5 km that can defense sea disaster rarely seen in a 50 year period.	2019-2025	80,000	12,159	20,000	3,039
Yushan island new seawall project	Newly built seawall of 12 km that can defense sea disaster rarely seen in a 200 year period.	2016-2021	215,000	32,678	165,000	25,079
Total			**607,500**	**92,336**	**245,000**	**37,238**
Total green and resilient projects			**6,054,735**	**920,284**	**5,692,235**	**865,186**

Chapter 8

Conclusions

Zhoushan is located at the Yangtze River estuary and south to Shanghai City, consisting of 1,309 islands, and bearing obvious advantages in shoreline, sea resources and ecological environment. Zhoushan has better natural conditions to build green ecological city, but also faces resource bottlenecks of water and land deficiency. At the same time, due to a large number of spatially scattered island and some islands have less permanent population, it is hard to generate management scale effect. Therefore, Zhoushan needs to shift ideas for development by exploring new green and resilient path from the following three aspects. First, construction of green buildings with high standards and strictly following relevant green building standards issued by United Nations Human Settlements Programme. Second, fully play the advantages of Zhoushan Archipelago in natural resources and energies, integrating such advantages with environment organically and avoiding disadvantages by doing a good job at water resource protection and defending against natural disaster. Third, exploring a sustainable development path that is commensurate with archipelago features, such as, technology, transport and cost factors should be accounted when treating solid waste and household garbage.

Zhoushan is the first state-level new area themed with marine economy, and has been approved to establish pilot free trade zone, thereby enjoying pioneering policy advantage. Based on previous investigations and analyses, Zhoushan City's development is still dependent on shipbuilding and port and shipping logistics, which, however, are under great decline pressure and cultivation of new emerging industries and introduction of important projects are slow, thereby having not formed sustainable new economic growth points. Zhoushan may, by using this opportunity of applying for FRUGS pilot city, optimize urban development structure in order to further improve urban economic and social development level. Based on feasibility, Zhoushan may focus on planning and building international shipping (financial) center and international free trade port zone, breaking the bottleneck of transport construction and talent introduction. It is recommended that Zhoushan had better build the northward transportation paths connected to Shanghai by focusing on the expressway between Shanghai and Zhoushan and trying to apply this expressway as a provincial or national key project, and adopt more flexible supporting policies for talent introduction.

Within the research range designated in this Report, by analyzing Zhoushan's financing demand from planned projects in housing, infrastructure and public service fields during the "13th Five Year Plan" period, we have proposed the total planned investment in key projects of Zhoushan is 114.36 billion RMB (17.38 billion USD), with a possible market financing range of between 33.86(5.15) and 79.19 billion RMB(12.03 billion USD). This financing range provides multiple choices for financial institutions interested in investment into Zhoushan. There are 25 recommended key projects whose financing needs are characteristic of large scale, long term and low financing cost. Considering the current financing market status of Zhoushan, the optional financing methods and instruments are bank loan or syndicated loan, corporate bonds, project financing and PPP mode.

Currently, Zhoushan has not special scheme for green, smart and resilient urban development at a city-level, especially in terms of smart city development. Although existing *General Plan for Zhoushan Development (2012-2030), Outline of the "13th Five Year Plan" for National Economic and Social Development of Zhoushan and the "13th Five Year Plan" for National Economic and Social Information Development of Zhoushan (draft for soliciting public opinions)* have specified Zhoushan's development from green ecology, smartness and resilience, the depth and guiding role are not enough. Domestically, over 30 Chinese cities have released "sponge city construction" plans and over 100 cities have issued "smart city construction" plan. Therefore, if Zhoushan desires to become one pilot city approved by United Nations Human Settlements Programme, it needs to improve or develop such urban development plans. Also, it is advisable that Zhoushan adds some planned projects into framework of green and resilient urban development, and incorporate them into the overall urban construction (and trying to incorporate into reviewing range), such as smart transport, smart medical care and smart tourism, etc.

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Appendixes

Appendix A: Determination of Market-based Income Line for Zhoushan Public Rental Housing

The current public rental housing income line standard developed by Zhoushan Government is 80 percent of per capita disposable income. Zhoushan urban permanent residents' per capita disposable income for 2015 was 44,845 RMB (6816 USD), so actually used income line for public rental housing was 35,876 RMB (5453 USD). In other worlds, household with per capita disposable income lower than this figure and satisfying housing difficulty standard are the targeted group of public rental housing. Such income line may also be regarded as the boundary affordability for purchasing commercial residential housing in market. By analyzing purchasers'' actual affordability and market data, we have estimated the housing security income line, with the following major steps.

Step 1: Determine the area standard of common commercial residential housing.

Assume that common commercial residential housing in Zhoushan has two area standards, i.e., 90 m^2 and 60 m^2.

Step 2: Determine the total market price of a single commercial residential house.

Total market price=area standard×average market price of commercial residential housing.

Based on data published on www.creprice.cn by China Real Estate Association, in August, 2016, Zhoushan's newly built commercial residential building's average price was 11,294 RMB/m^2(1717USD/m^2). Accordingly, total market price is 677,600 RMB (102991 USD)for 60m^2 and 1,016,500 RMB(154502 USD) for 90m^2.

Step 3: Determine credit combination, percent, term and interest rate applicable for housing purchase.

According to actual housing mortgage loans applied by urban families in Zhoushan, most household adopt the combination of "commercial bank loan+Housing Provident Fund loan" where Housing Provident Fund loan is used first, with an upper loan limit of 400,000 RMB (60798 USD) and the remaining part is from commercial bank loan.

Assume the ratio of down payment is 20 percent and loan term is 30 years, then repayment period is 360 installments (months).

The loan interest rate herein refers to the latest benchmark interest rate released by the People's Bank of China, namely, for commercial residential housing loan of 5 or long period, 4.9 percent, and for Housing Provident Fund loan, 3.25 percent.

Step 4: Estimate monthly payment.

Assume that equal repayment of principal and interest is used. If total loan is A, and monthly interest rate β, total repayment period m (months), and monthly repayment X. Take relevant data in the above steps into the following repayment calculation formula, the monthly payment will be obtained:

$$X = \frac{A\beta(1+\beta)^m}{(1+\beta)^m - 1}$$

When housing area standard is 60 m^2, the eventually monthly payment is 2,495 RMB(379 USD) (annual payment of 29,940 RMB(4551 USD)), while housing area is 90 m^2, the monthly payment is 3,934 RMB (598 USD)(annual payment of 47,203 RMB(7175 USD)).

Step 5: Determine housing expenditure ratio.

Based on international experience and domestic banks' reviewing conditions for personal housing mortgage loan application, in this Report, housing expenditure taking up 30 to 50 percent of household disposable income is chosen to expand income line estimation range.

Step 6: Determine income line.

Housing income line=annual repayment÷housing expenditure ratio÷average household size (person/household)

In 2015, income line of households that could purchase 60m^2 and 90m^2 houses were between 23,032 (3501 USD)and 38,385 RMB (5834 USD), and between 36,310 (5519 USD) and 60,517 RMB (9198 USD), respectively.

Step 7: Analyze income line

According to 2015 data, household not being able to afford 60m^2 house corresponded to lower-middle or lower income household while not being able to afford 90m^2 to upper-middle, middle or lower income household. Since the mainstream commercial residential housing in market is no smaller than 90m^2, it is required to properly enlarge housing security coverage for sandwich class of Zhoushan in a dynamic way, while also considering the actual fiscal strength of Zhoushan City.

Appendix B: Survey on Public Rental Housing Demand of Zhoushan for the "13th Five Year Plan" Period

The "13th Five Year Plan" period, in the context of the Belt and Road initiative and Yangtze River Economic Belt, is an important period for Zhoushan Archipelago New Area to develop marine economy, and also a critical period for it to build river and sea coordinated transport service center. Therefore, a lot of new employee, introduced talents and migrant workers are needed. In response to this, in early 2016, Zhoushan Government conducted a systematic survey on housing demand from various targeted groups of public rental housing, with the following major results.

Category 1: survey on housing demand from newly employed.

First, by analyzing statistics about new employees received by Zhoushan from 2013 to 2015, we have predicated the expected increase of new employees in each county and district. Then, considering the waiting period system adopted by Zhoushan public rental housing security, generally, new employees have to wait for about 4 years to be eligible for applying for public rental housing, so during the "13th Five Year Plan" Period, new employees could move into the public rental houses whose previous tenants' renting period expires. Last, after considering that some new employees can solve housing problem by buying houses, living in parents' houses or corporate rental houses, we have surveyed the ratio of new employees desiring to solve housing problem through public rental housing provided by government. Based on such results, Zhoushan needs to solve housing problem for about 2,295 new employees during the "13th Five Year Plan" period. Of the 2,295 employees, 1,319 are in Zhoushan central city, 480 in Dinghai district, 280 in Putuo district, 132 in Daishan County and 82 in Shengsi County.

Table B-1 **Forecast of Public Rental Housing Deman from New Employees in Zhoushan during the "13th Five Year Plan" Period**

	Municipal-level	Dinghai District	Putuo District	Daishan County	Shengsi County	Total
Number of new employed	9189	3200	1400	88	840	15509
Coverage rate (%)	12	15	20	15	10	—
Number of new employees needing public rental housing	1319	480	280	132	84	2295

Category 2: migrant workers with stable jobs

Most enterprises solve the housing problem of migrant workers with stable jobs in Zhoushan, while government solves the housing problem of a small portion of such workers, about 10 percent to 15 percent. Migrant workers with stable jobs are the migrant workers with Zhejiang Province Resident Permits, having lived in municipal-level, Dinghai district or Putuo district for over 6 months and having paid all kinds of required social insurances such as endowment insurance for over 6 months, and migrant workers with Zhejiang Province Resident Permits, having paid endowment insurance for over 6 months in Daishan County. During the "13th Five Year Plan" period, a total of 390 households of migrant workers with stable jobs in Zhoushan need public rental housing, of which, 189 in municipal-level, 40 in Dinghai district, 100 in Putuo district, 61 in Daishan county and 0 in Shengsi county.

Table B-2 Forecast of Public Rental Housing Demand from Migrant Workers with Stable Jobs in Zhoushan during the "13th Five Year Plan" Period

	Municipal level		Dinghai district		Putuo district		Daishan county		Shengsi county	
	migrant workers with stable jobs	covered house-holds	migrant workers with stable jobs	covered house-holds	migrant workers with stable jobs	covered house-holds	migrant workers with stable jobs	covered house-holds	migrant workers with stable jobs	covered house-holds
2016	525	31	200	2	600	15	1250	76	—	—
2017	581	60	235	5	800	25	1310	89	—	—
2018	639	95	277	9	1000	40	1360	98	—	—
2019	703	141	327	24	1200	60	1420	111	—	—
2020	773	193	387	40	1400	110	1470	126	—	—
Coverage ratio by the end of 2020(%)	25		28.94		22		24		—	
accumulated newly increased households in "13th Five Year Plan" period	293	189	216	40	994	293	189	216	40	994

Source: Housing Administration Bureaus of Zhoushan and various counties and districts under its administration; basic housing demand from migrant workers such as professional technical workers, environmental sanitation workers and bus drivers should be prioritized; by the end of 2020, coverage rate (municipal-level)=households covered by public rental housing in 2020*1/migrant workers with stable jobs in 2020, coverage rate (Dinghai district, Putuo district and Daishan county)=households covered by public rental housing in 2020*2.8/ migrant workers with stable jobs in 2020.

Category 3: introduced talents

First, increase of introduced talents in counties and districts under the administration of Zhoushan is predicated based on statistics of introduced talents in Zhoushan from 2013 to 2015. Second, considering the waiting period system adopted by Zhoushan public rental housing security, generally, introduced talents have to wait for about 3 years to be eligible for applying for public rental housing, so during the "13th Five Year Plan" Period, introduced talents could move into the public rental houses whose previous tenants' renting period expires. Finally, we have surveyed the ratio of introduced talents desiring to solve housing problem through public rental housing provided by government. Based on such results, during the "13th Five Year Plan" period, Zhoushan needs to solve the housing problem for about 2,111 introduced talents. Of the 2,111 talents, 890 are in municipal -level, 600 in Dinghai district, 180 in Putuo district, 360 in Daishan County and 81 in Shengsi County.

Table B-3 Forecast of Public Rental Housing Demand from Introduced Talents in Zhoushan during the "13th Five Year Plan" Period

	Municipal-level	Dinghai district	Putuo district	Daishan county	Shengsi county	Total
Number of introduced talents	1483	1500	300	900	270	4453
Covered rate (%)	60	40	60	40	30	—
Number of talents needing public rental housing	890	600	180	360	81	2111

Category 4: Lower-middle income households with housing difficulty

Lower-middle income households with housing difficulty covered by public rental housing security mainly refer to urban lower-middle and lower income households with housing problem. In 2015, those eligible for applying for public rental housing referred to households whose per capita disposable income was lower than 80 percent of Zhoushan's per capita disposable income, and per capita housing area lower than 16m^2. During the "13th Five Year Plan" period, counties and districts under the administration of Zhoushan may relax applying condition based on their own status. During the "13th Five Year Plan" period, Zhoushan needs to solve housing problem for 1,077 lower-middle or lower income households, of which, 268 in municipal-level, 180 in Dinghai district, 500 in Putuo district, 99 in Daishan county and 30 in Shengsi county.

Table B-4 Forecast of Newly Increased Public Rental Housing Demand from Lower or Lower-middle Households with Housing Difficulty in Zhoushan during the "13th Five Year Plan" Period

Year	Municipal-level	Dinghai district	Putuo district	Daishan county	Shengsi county	Total
2016	43	20	300	10	6	379
2017	48	40	50	15	6	159
2018	53	40	50	27	6	170
2019	59	40	50	29	6	184
2020	65	40	50	18	6	179
Total demand	268	180	500	99	30	1077

Source: Housing Administration Bureaus of Zhoushan municipal-level and counties and districts under the administration of Zhoushan

In conclusion, during the "13th Five Year Plan" period, total demand for Zhoushan public rental housing is 5,873 units, of which, 2,666 for municipal-level, 1,300 for Dinghai district, 1,060 for Putuo district, 652 for Daishan County and 195 for Shengsi County.

Table B-5 Total Demand for Public Rental Housing of Zhoushan during the "13th Five Year Plan" Period

	Municipal-level	Dinghai district	Putuo district	Daishan county	Shengsi county	Total
New employees	1319	480	280	132	84	**2295**
Lower-middle or low income households with housing difficulty	268	180	500	99	30	**1077**
Migrant workers with stable jobs	189	40	100	61	0	**390**
Introduced talents	890	600	180	360	81	**2111**
Total demand	**2666**	**1300**	**1060**	**652**	**195**	**5873**

Appendix C: Forecast of Zhoushan Urban Dilapidated Housing Renovation Demand during the "13th Five Year Plan" Period

Urban run-down area renovation is a pro-people project launched by Chinese government for renovating urban dilapidated houses and improving housing conditions for poor households. In recent years, Zhoushan Government has attached high importance to renovation of urban run-down area by placing it as an important component of urban low-income housing security construction. In order to better push renovation of urban run-down area during the "13th Five Year Plan" period, Zhoushan Government has organized districts and counties under its administration to make surveys and solicit public opinions in order to find out the actual conditions of various run-down areas, in particular, the number of dilapidated houses (including C grade dilapidated houses and D grade dilapidated houses).

Table C -1 Definitions of Urban Run-down Areas in Zhejiang

Item	Area size	Building structure	Building density	Used years	Building quality
No.	**1**	**2**	**3**	**4**	**5**
Requirement	Relatively concentrated, generally, more than 50 households	Mainly include simple structure, wooden structure, wooden-brick structure and brick-concrete structure	Generally larger than 40 percent	Old residential area (dilapidated houses): generally older than 30 years; urban village: generally older than 15 years	Total quality is poor, some houses meet c and d grade housing according to standards for dangerous building appraisal (jgj125-99)
Item	Safety risk	Functions	Municipal supporting facilities	Supporting public services	Others
No.	**6**	**7**	**8**	**9**	**10**
Requirement	Relatively severe risks about fire, security, geological disaster or fortification against earthquake requirement are not met.	House functions are not enough, such as, no kitchen or bathroom, or function zones are not reasonably divided.	Road, fuel gas, water supply, drainage, power and communication, etc do not meet required standards	Necessary public services such as community service, education and medical care are not in place.	Unreasonable layout, poor environment, ventilation or lighting does not meet requirements,

Note: 1. Any area meeting either item 5, or item 6, or other 4 or more items at the same time is incorporated into renovation range; 2. People's Governments of all counties and districts under the administration of Zhoushan could also develop local urban run-down area definitions to accelerate improving urban housing environment by combining its own practical conditions and following spirits demonstrated in Opinions on Accelerating Renovation of Urban Run-down Areas (Guo Fa [2013] No. 25) issued by the State Council.

Based on above description and analysis, during the "13th Five Year Plan" Period, Zhoushan need to renovate 838 run-down buildings, namely, 18,772 households and with a building area of 1,1193,000 m^2. Of these, 695 are C grade buildings, namely, 16,500 households, with a building area of 1,047,000 m^2, 132 are D grade buildings, namely, 2,158 households, with a building area of 137,000 m^2.

Table B-5 Total Demand for Public Rental Housing of Zhoushan during the "13th Five Year Plan" Period

Unit: building, household, m2									
	Dilapidated housing			C grade			D grade		
	Buildings	Households	Building area	Buildings	Households	Building area	Buildings	Households	Building area
Municipal-level	11	389	27073.6	11	389	27073.6	—	—	—
Dinghai district	540	10957	694438	465	9888	632610	75	1069	61828
Putuo district	253	6938	437841	215	6186	384506	38	752	53235
Daishan county	19	337	21530	—	—	—	19	337	21530
Shengsi county	15	151	11676	4	37	2381	—	—	—
Total	**838**	**18772**	**1192559**	**695**	**16500**	**1046671**	**132**	**2158**	**136593**

Appendix D: Introduction to Zhoushan's New Low-income housing Projects

Table D-1 New Projects for Low-income housing in Zhoushan

Area	Project name	Scale	Construction period	Investment scale		Planned investment during the "13th Five Year Plan" period	
				10,000 RMB	USD[1]	10,000 RMB	USD
Xincheng	Dujialing resettlement neighborhood phase 7	Total building area is about 360,000m²	2016-2019	163,000	247,750,486	154,000	234,071,012
	Jinjishan relocation neighborhood	Total building area is about 132,300m²	2015-2019	64,278	97,698,808	59,278	90,099,100
	Sum			227,278	345,449,295	213,278	324,170,112
Dinghai	Dinghai Liujiazui land lot for peasant apartment	Total building area is 74,000m²	2016-2019	40,000	60,797,665	40,000	60,797,665
	relocation neighborhood for construction of Yancang-Dingma double-path	Total building area is 28,000m²	2016-2019	10,000	15,199,416	10,000	15,199,416
	Resettlement lot in Heping road	Total building area is 19,000m²	2016-2020	90,000	136,794,747	50,000	75,997,082
	Aige relocation neighborhood, phase 2	Total building area is 20,000m²	2018-2020	12,000	18,239,300	12,000	18,239,300
	West Yangang road relocation neighborhood, phase 2	Total building area is 30,000m²	2018-2020	18,000	27,358,949	18,000	27,358,949
	Dinghai dilapidated house renovation project	Total building area is 620,000m²	2016-2017	87,500	132,994,893	87,500	132,994,893
	Sum			257,500	391,384,971	217,500	330,587,305
Putuo	Guangantou resettlement neighborhood	Total building area is about 37,400m²	2017-2020	100,000	151,994,163	50,000	75,997,082
	Old urban area D grade housing relocation project	Total building area is about 51,600m²	2016-2017	30,824	46,850,681	30,824	46,850,681
	No.3 middle school resettlement housing construction	Total building area is about 20,000m²	2016-2018	13,000	19,759,241	13,000	19,759,241
	Sum			143,824	218,604,086	93,824	142,607,004
Putuo mountain-Zhujiajian	Salt plant resettlement neighborhood construction	Total building area is 50,000m²	2016-2019	20,000	30,398,833	20,000	30,398,833
	Resettlement neighborhood at east side of Wuyan section of No.329 national highway	Total building area is 45,000m²	2016-2017	15,000	22,799,125	15,000	22,799,125
	Sum			35,000	53,197,957	35,000	53,197,957
Total				**663,602**	**1,008,636,308**	**559,602**	**850,562,378**

[1] The USD to RMB exchange rate used in Appendix D to Appendix G is the average exchange rate from January to September, 2016, namely, 1 USD=6.5792 RMB.

Appendix E: Planned Transport Projects of Zhoushan

Appendix E: Planned Transport Projects of Zhoushan

(1) Traditional Transport Projects							
	Project name	Scale 10,000 RMB	Construc-tion period	Investment scale		Planned investment during the "13th Five Year Plan" period	
				10,000 RMB	USD	10,000 RMB	USD
Mainland island linking project	Ningbo-zhoushan railway	Total length is about 87.7 km.	2018-2023	2,400,000	3,647,859,922	680,000	1,033,560,311
	Ningbo-zhoushan port liuheng road bridge	Total length is 31.31 km.	2018-2023	1,750,000	2,659,897,860	1,000,000	1,519,941,634
	Xincheng bridge road	Total length is 1,805m, of which, bridge is 1,389m.	2016-2020	43,000	65,357,490	43,000	65,357,490
	Sum			**4,193,000**	**6,373,115,272**	**1,723,000**	**2,618,859,436**
Trunk trans-port	Main paths for ningbo-zhoushan port	Total length is about 39.61 km.	2017-2021	1,609,100	2,445,738,084	1,300,000	1,975,924,125
	Binhai avenue (dinghai section)	Total length is about 17.4 km.	2016-2018	100,000	151,994,163	100,000	151,994,163
	Zhujiajian tourism landscape path (putuo to zhoushan jianjaizui part of kaihua highway)	Total length is about 19.08 km.	2016-2018	150,000	227,991,245	135,800	206,408,074
	Donggang hillside-maozhan tourism walkway	16 km greenway will be completed.	2018-2020	6,400	9,727,626	6,400	9,727,626
	Sum			**1,865,500**	**2,835,451,119**	**1,542,200**	**2,344,053,988**
Town and rural roads	Cengang to shuangqiao part of s 307 provincial highway	7.2 km arterial road	2017-2019	52,000	79,036,965	52,000	79,036,965
	3Rd path of lujiazhi	Total length is 2.8 km, underground tunnel of two-way and four- lane	2017-2020	110,500	167,953,551	110,500	167,953,551
	Ramp between lujiazhi bridge-coastal overhead bridge	Total length is 1,120m, two-way road.	2016-2018	8,000	12,159,533	8,000	12,159,533
	Sum			**170,500**	**259,150,049**	**170,500**	**259,150,049**
Supporting roads	Supporting roads for dujialing relocation neighborhood phase 7	Linchang road -Qiando road, 820m long.	2016-2020	6,800	10,335,603	6,800	10,335,603
	Yidao road	Xincheng avenue -qiandao road, 920m long.	2016-2020	5,500	8,359,679	5,500	8,359,679
	Road project for xingang park phase 2	Total length is about 10,220 m.	2016-2020	22,640	34,411,479	22,640	34,411,479
	Road renovation for xingang park phase 1	Total length is about 4,600m.	2016-2018	7,500	11,399,562	7,500	11,399,562
	5000 Tonner public terminal and support-ing facilities for xingang park phase 2	One berth	2017-2019	12,000	18,239,300	12,000	18,239,300
	Dongang road	Construction of rest road of Donggang phase 2 project, where, the road area for phase 2 is 366,000 m^2 and for phase 1 is 78,600m^2.	2016-2020	14,000	21,279,183	14,000	21,279,183
	West donghai road renovation	Total length is 4.1 km.	2017-2020	20,000	30,398,833	20,000	30,398,833
	Sum			**88,440**	**134,423,638**	**88,440**	**134,423,638**

Bus stations and stops	Zhujiajian bus stations and stops		2016-2017	2,500	3,799,854	2,500	3,799,854
	Purchase of buses	35 plug-in hybrid electric vehicles, 55 electric vehicles and 45 diesel-fueled vehicles	2016-2020	32,020	48,668,531	22,920	34,837,062
	Construction of electronic stops(plates)	400 stops of 10m long in downtown area, 125 stops of 8m long in sub-downtown areas and 75 LED stop plates in rural and town areas.	2016-2020	5,082	7,724,723	5,082	7,724,723
	Construction of bus stops and stations	5 hubs, 2 stations for parking and maintenance, 5 starting and ending stops and 3 Bus Rapid Transit stations	2016-2020	21,184	32,198,444	1,958	2,976,654
	Sum			**60,786**	**92,391,552**	**32,461**	**49,338,293**
Sum				**6,378,226**	**9,694,531,630**	**3,556,601**	**5,405,825,404**
(2) Green and Resilient Transport Projects							
Natural gas fueled vehicles	Charging facilities for electric buses	7 charging poles for electric buses and 13 for hybrid plug-in electric buses	2016-2020	8,540	12,980,302	8,540	12,980,302
	Natural gas fueled passenger vehicles	It is planned that 56 natural gas fueled passenger vehicles will be used.	2017-2018	2,880	4,377,432	2,880	4,377,432
	Natural gas fueled freight vehicles	It is planned to promote 14 natural gas fueled freight vehicles.	2016-2018	1,680	2,553,502	1,680	2,553,502
	Sum			**13,100**	**19,911,235**	**13,100**	**19,911,235**
Convenient urban bus system	Bus rapid transit project	NO.2 Bus Rapid Transit line will be constructed.	2016-2017	2,710	4,119,042	1,460	2,219,115
	Sum			**2,710**	**4,119,042**	**1,460**	**2,219,115**
Use of clean and new energies	Natural gas fueled freight vehicle (lng container lorry)	60 LNG container lorries will be promoted.	2016-2018	2,700	4,103,842	1,800	2,735,895
	Sum			**2,700**	**4,103,842**	**1,800**	**2,735,895**
Green port	Majishan phase 3 green port project	Including energy feedback technology used for variable-frequency device of port machines and shore power technology application.	2017-2018	21,844	33,200,997	21,844	33,200,997
	Jintang mudai loading port of low carbon	Including energy feedback technology used for variable-frequency device of port machines and shore power technology application.	2017-2018	57,735	87,754,134	57,735	87,754,134
	Waidiao green port for oil products	Including energy saving processes and equipment as well as reasonable use of electricity.	2017	57,000	86,636,673	57,000	86,636,673
	Shore power technology project	Promoting construction of power facilities for port and shipping management of Daqu, Jintang and Shengsi	2016-2018	63	95,756	63	95,756
	Sum			**136,642**	**207,687,561**	**136,642**	**207,687,561**
Sum				**155,152**	**235,821,680**	**153,002**	**232,553,806**

Appendix F: Planned Power and Energy Projects of Zhoushan

Table F1 Planned Power and Energy Projects of Zhoushan

	Project name	Scale	Construction period	Investment scale		Planned investment during the "13th Five Year Plan" period	
				10,000 RMB	USD	10,000 RMB	USD
(1) Non-renewable Energy Projects							
Fuel gas	Zhoushan Pipelines connecting LNG import terminal and filling stations	Connecting pipeline is 91km in length with a designed transmission volume of 8.1 billion m^3/year.	2016-2018	182,000	276,629,377	182,000	276,629,377
	Zhoushan Economic Zone LNG transfer and storage project	LNG import terminal is proposed to be constructed and the phase I scale is 3 million tons.	2016-2018	500,000	759,970,817	500,000	759,970,817
	ENN Zhejiang Zhoushan LNG import terminal and filling station project (phase II)	One storage tank of 23,000 to 26,000 m3 and supporting facilities will be built.	2017	120,000	182,392,996	120,000	182,392,996
	Xioayangshan LNG tank expansion project	2 LNG storage tanks of 20,000 m^3 each will be built, together with processing, public and auxiliary facilities such as LNG oil tank truck loading system.	2016-2018	300,000	455,982,490	300,000	455,982,490
	Zhoushan main pipeline for Island fuel gas (No. 329 national highway section)	10 km medium pressurized trunk pipelines for fuel gas will be laid.	2016-2020	1,200	1,823,930	700	1,063,959
	Construction of Putuo filling stations	5 filling stations including Chengbei filling station, as well as stand-type LNG ground tank, cylinder bundle and fueling dispensers.	2016-2020	5,000	7,599,708	5,000	7,599,708
Sum of non-renewable energy projects				**1,108,200**	**1,684,399,319**	**1,107,700**	**1,683,639,348**
(2) Power Facilities							
Power Facilities	Zhoushan 500KV networked transmission and transformation project	2×114.5 km, 2×1 million KVA main transformers (one is 500KV transformation station and 500KV submarine cable terminal).	2016-2018	481,000	731,091,926	481,000	731,091,926
	Zhoushan 500KV transformation and 200KV transmission project	73km transmission line of 220KV.	2017-2019	17,000	25,839,008	17,000	25,839,008
	Lincheng 200KV power transmission and transformation project	one 220KV transformation station with 2 main transformers of 240,000KVA each, and 4.6 km suspended line of 220KV	2016-2018	14,511	22,055,873	14,511	22,055,873
	Lincheng 220KV transformation station and 110KV transmission project	One 110KV overhead line of 35.75 km and 2.4 km cable	2016-2018	6,725	10,221,607	6,725	10,221,607
	Ganlan 110KV power transmission and transformation project	One new 110KV transformation station, with 2 main transformers of 50,000KVA each, and 29.7 km line of 110KV.	2016-2018	10,829	16,459,448	10,829	16,459,448
	220KV transformation and transmission project for Complex Zone.	One 220KV transformation station with two main transformers of 240,000KVA each and one 220KV line of 25km.	2018-2020	17,000	25,839,008	17,000	25,839,008

Power Facilities	110KV line between Lincheng and Mazhi	110KV line of 20 km.	2017-2019	6,500	9,879,621	6,500	9,879,621
	Qinglong 110KV transmission and transformation project	One 110KV transformation station, with 2 main transformers of 50,000KVA each and one 100KV line of 4 km.	2017-2019	5,500	8,359,679	5,500	8,359,679
	Shuangqiao 110KV transformation and transmission project	One 110KV transformation station with two main transformers of 50,00KVA each and one 110KV line of 10km.	2018-2019	5,500	8,359,679	5,500	8,359,679
	Zhoushan Power Plant phase 3 expansion project	660,000 KW supercritical coal-fueled units will be expanded.	2018-2020	300,000	455,982,490	300,000	455,982,490
	Putuo Chengbei 110KV Putuo transformation project	Nine towers, about 3.8 km overhead line, about 6.5 km cable and one transformation station.	2016-2017	8,500	12,919,504	7,000	10,639,591
	Zhoushan Economic Development Zone's comprehensive pipeline and corridor project, phase 1	About 13km.	2016-2020	12,000	18,239,300	12,000	18,239,300
	Diaoliang power distribution pipelines	About 20km	2016-2020	5,000	7,599,708	5,000	7,599,708
	Zhuajiajian power installation project	Switching station and pipelines in Guomao area and airport road underground cable project	2016	1,900	2,887,889	1,900	2,887,889
Sum of power facilities				**891,965**	**1,355,734,740**	**890,465**	**1,353,454,827**
(3)New Energy Projects							
Wind power	China Guodian Corporation Putuo 6# oceanic wind farm	Total installed capacity is 250MW.	2014-2018	475,000	721,972,276	418,000	635,335,603
	China General Nuclear Power Group Daishan 4# oceanic wind far	Total installed capacity is 300 MW.	2016-2019	570,000	866,366,732	570,000	866,366,732
	Sum			**1,045,000**	**1,588,339,008**	**988,000**	**1,501,702,335**
Tidal Energy	MW pilot tidal energy project	5MW, 10MW and 15MW prototypes will be optimized, and a large number of system integration will be developed and optimized.		62,500	94,996,352	62,500	94,996,352
	Sum			**62,500**	**94,996,352**	**62,500**	**94,996,352**
Solar Energy	TSUNEISHI GROUP roof photovoltaic project	Installed capacity is 20MW.		16,000	24,319,066	16,000	24,319,066
	Zhejiang Ouhua Shipbuilding Co., Ltd 20MW project	Installed capacity is 20MW.		12,600	19,151,265	12,600	19,151,265
	Jintang Industrial Park 10MW project	Installed capacity is 10MW.		6,400	9,727,626	6,400	9,727,626
	Sum			**35,000**	**53,197,957**	**35,000**	**53,197,957**
Sum of new energy projects				**1,142,500**	**1,736,533,317**	**1,085,500**	**1,649,896,644**

Appendix G: Zhoushan's Planned Projects for Water Resource Development and Utilization Facilities and Waste Management

Appendix G: Zhoushan's Planned Projects for Water Resource Development and Utilization Facilities and Waste Management

(1) Water Resource Management Projects								
Level 1	Level 2	Project name	Scale	Construction period	Investment scale		Planned investment during the "13th Five Year Plan" period	
					10,000 RMB	USD	10,000 RMB	USD
Multiple source water supply	Water diversion	Zhoushan mainland water diversion phase III	Diversion flow is 1.2m³/s, resulting in an annual water supply of 32 million m³.	2016-2020	236,204	359,016,294	199,200	302,772,374
		Shengsi mainland water diversion	Diversion flow is 0.04m³/s, resulting in an annual water supply of 10 million m³.	2017-2020	120,000	182,392,996	120,000	182,392,996
	Water plant	Construction, renovation and supporting facilities of water plants	Including construction, renovation of and supporting facilities for 11 water plants.	2016-2020	27,200	41,342,412	26,800	40,734,436
	Small water source	water source improvement and protection	Water storage capacity will be increased by 310,000 m³, and leading to an annual water supply of 210,000m3.	2016-2020	12,810	19,470,452	12,810	19,470,452
	rural drinking water improvement	drinking water improvement project and pipeline renovation	21 projects for improving drinking water safety and pipeline renovation of 257.5km.	2016-2021	17,490	26,583,779	17,490	26,583,779
	Sum				**413,704**	**628,805,934**	**376,300**	**571,954,037**
Sewage treatment	New (expanded) sewage treatment plant	Sanjaing sewage treatment plant	Treatment capacity is 10,000m³/day.	2020	13,300	20,215,224	13,120	19,941,634
		Daishan sewage treatment plant	Treatment capacity is 100,000m³/day.	2017-2019	113,000	171,753,405	113,000	171,753,405
		Daodong waste water treatment plant (phase I)	Treatment capacity is 15,000m³/day.	2018-2020	15,000	22,799,125	15,000	22,799,125
		Zhejiang Petrochemical supporting waste water treatment plant and pipeline construction for the integrated project whose capacity is 40 million tons/year	Waste water treatment capacity is 66,000m³/day.	2016-2025	90,000	136,794,747	45,000	68,397,374
	construction and renovation of pipeline and network	Daodong waste water treatment plant's supporting main pipeline project	Two pup stations and 9 km pipeline.	2017-2019	7,500	11,399,562	7,000	10,639,591
		Xincheng sewage pipeline renovation and expansion	Overhaul and repair damaged sewage pipelines and expand the pipelines.	2016-2019	6,000	9,119,650	6,000	9,119,650

Sewage treatment	construction and renovation of pipeline and network	Rainwater and sewage pipelines and network for Donghai road.	Renovate 1.1km pipeline and network	2019-2021	5,000	7,599,708	5,000	7,599,708
		Rainwater and sewage pipelines for East Ring road	Renovate 1.8 km pipeline and network	2019-2021	5,000	7,599,708	5,000	7,599,708
Sewage treatment	Upgrading and improvement of existing sewage treatment	Renovation of Xiaoyu Waste water treatment plan for improving standards	The discharged water should meet Grade One-A standard.	2017	15,000	22,799,125	15,000	22,799,125
		Zhoushan Putuo Liuheng Waste Water Treatment Plant	The discharged water should meet Grade One-A standard.	2017	5,000	7,599,708	5,000	7,599,708
		Zhoushan Putuo Zhujiajian urban waste water treatment plant	The discharged water should meet Grade One-A standard.	2017	5,000	7,599,708	5,000	7,599,708
	rural household sewage	Rural household waste water management	This action covers 200 administrative villages, with 42,473 households being newly incorporated and 27,823 households whose waste water quality is improved.	2016	40,670	61,816,026	40,670	61,816,026
	Sum				**320,470**	**487,095,696**	**274,790**	**417,664,762**
Sum of water resource management projects					**734,174**	**1,115,901,629**	**651,090**	**989,618,799**
(2)Waste Management Projects								
Waste management **Waste treatment facilities**	Waste transfer facilities	Qingling environmental sanitation base	Garbage transfer stations, vehicle repairing plants and environmental sanitation warehouses will be built.	2016-2020	6,000	9,119,650	6,000	9,119,650
	Waste treatment facilities	Zhoushan project for treating centralized dangerous waste , phase II	Industrial soil waste treatment capacity is 50 tons/day.	2016-2020	6,000	9,119,650	6,000	9,119,650
		Zhoushan sludge treatment plant	Increased sludge treatment capacity is 200 tons/day and the moisture content is 80 percent.	2017-2019	8,000	12,159,533	8,000	12,159,533
		Zhoushan medical waste incineration project expansion project	Medical waste disposal facility with a capacity of 3,300 tons/year.	2016-2020	3,000	4,559,825	3,000	4,559,825
		Zhejiang Petrochemical supporting dangerous water treatment plant for the integrated project whose capacity is 40 million tons/year.	Landfilled dangerous waste will be 22,000 tons/year and landfilled general waste will be 1,000 tons/year.	2016-2025	60,000	91,196,498	60,000	91,196,498
Sum of waste management					**83,000**	**126,155,156**	**83,000**	**126,155,156**

(3) Green and Resilient Water Conservancy Facilities								
Green water resource	Sea water desalination	Zhoushan Island desalination project phase I	Newly built sea water desalination plant will produce water of 100,000 m^3/day.	2020	42,500	64,597,519	10,000	15,199,416
		Daishan County Daushan desalination project phase I	Supporting facilities for sea water desalination plant of 270,000 m^3/day.	2016-2020	270,000	410,384,241	50,000	75,997,082
Green water resource	Water-saving irrigation	Standard energy saving irrigation project for the whole Zhoushan	307 ponds in mountains will be overhauled, irrigation area of 133.4 hectares will be improved, and newly added highly efficiency water saving irrigation area is 683 hectares.	2016-2020	51,704	78,587,062	51,704	78,587,062
	Sum				**364,204**	**553,568,823**	**111,704**	**169,783,560**
Anti-flood and disaster reduction	Seawall improvement and reinforcement	New seawall project in Dinghai Changbai island	Seawall of 2km will be built and can defense against sea disaster rarely seen in 50-year period.	2018-2019	20,000	30,398,833	20,000	30,398,833
		New sea wall project in Dinghai Cezi island	Seawall of 5km will be built and can defense against sea disaster rarely seen in 50-year period.	2019-2025	80,000	121,595,331	20,000	30,398,833
		Sea wall reinforcement project in Dinghai, Baiquan	Seawall of 4.14km will be built and can defense against sea disaster rarely seen in 100-year period.	2017-2018	20,000	30,398,833	20,000	30,398,833
	Sluice expansion	New seawall project in Yushsan island, Zhoushan	Seawall of 12 km will be built and can defense against sea disaster rarely seen in 200-year period.	2016-2021	215,000	326,787,451	165,000	250,790,370
		New sluice project in Chashanpu, Zhoushan	A sluice of 5 openings*3m will be reinforced and a supporting pump station will be built.	2018-2020	7,000	10,639,591	7,000	10,639,591
		New middle sluice(Shipijiao sluice) in Diaoliang, Zhoushan	A sluice of 3 openings *8m will be built with the bottom elevation of -1.5m.	2016-2020	5,000	7,599,708	5,000	7,599,708
		Yanhe seawall supporting project in Yancang, Dinghai	A sluice of 6 openings*3m will be reinforced and the supporting pump station capacity is 27m^3/s.	2017-2018	5,500	8,359,679	5,500	8,359,679
		Seawall reinforcement project phase I in Baiquan, Dinghai	A sluice of 10 openings*4m and 10 pump stations will be reinforced.	2016-2017	10,298	15,652,359	10,298	15,652,359
		Dinghai Laoqitou sluice demolition and reconstruction project	A sluice of 13 openings*3 m will be reinforced with a designed flow of 315m^3/s.	2017-2018	5,500	8,359,679	5,500	8,359,679
	Sum				**368,298**	**559,791,464**	**258,298**	**392,597,884**

Reclamation with silt	Reclamation with silt	Dredged soil disposal base phase I in Shengsi Yangshan deepwater port area's	Reclamation area is 153.34 hectares with an embankment of 1.54 km long.	2017-2019	69,700	105,939,932	69,700	105,939,932
		Bodaozu reclamation project in Shenjiawan, Shengsi	Reclamation area is 160 hectares with an embankment of 1.5 km long.	2017-2020	100,000	151,994,163	100,000	151,994,163
		Yanshen Dadai reclamation project (silt embankment)	An area of 113.34 hectares will be created by silt	2017-2020	12,000	18,239,300	12,000	18,239,300
	Sum				**181,700**	**276,173,395**	**181,700**	**276,173,395**
Water eco-logic environment	Water management	Comprehensive management of Dinghai's middle and small watersheds	Riverways of Baiquan, Xiaosha, Shuangqiao, Cengang and Jintang will be comprehensively overhauled.	2016-2020	51,000	77,517,023	51,000	77,517,023
		Putuo Zhujiajian watershed	Comprehensive management of Avalokitesvara cultural park and periphery water environment in Zhujiajian, Putuo	2016-2020	885,000	1,345,148,346	60,000	91,196,498
		Zhoushan Island watershed in Putuo	Management of middle and small watersheds of Zhoushan Island in Putuo	2016-2020	55,260	83,991,975	20,000	30,398,833
		Putuo Liuheng watershed	Management of middle and small watersheds in Liuheng island, Putuo	2016-2020	62,462	94,938,594	20,000	30,398,833
		Daishan Guitai watershed	Management of middle and small watersheds in Qushan island, Daishan County	2016-2020	20,000	30,398,833	20,000	30,398,833
		Gaoting and Daixi watersheds in Daishan	Management of middle and small watersheds in Daishan island, Daishan County.	2016-2020	30,000	45,598,249	30,000	45,598,249
		Comprehensive overhaul of Zhoushan drinking water source land	Management of upstream ecology for some water sources and silt removal for reservoirs		87,500	132,994,893	87,500	132,994,893
	Clean river project	Zhoushan Island clean river project	100 km riverway will be overhauled, 7 water pump stations will be newly built or renovated, with water transmission line of 32.85 km, designed flow of 4.5m^3/s and water supply of 27 million m^3/year.	2016-2020	38,600	58,669,747	38,600	58,669,747
	Silt removal	Zhoushan silt removal project	Zhoushan will remove silt from rivers, lakes, reservoirs and ponds.	2016-2020	45,600	69,309,339	45,600	69,309,339
		Comprehensive management of water loss and soil erosion of Zhoushan	The overhauled area totals s 21 km^2	2016-2020	13,900	21,127,189	13,900	21,127,189
	Sum				**1,289,322**	**1,959,694,188**	**386,600**	**587,609,436**
Sum of green and resilient water conservancy projects					**2,203,524**	**3,349,227,870**	**938,302**	**1,426,164,275**

Appendix H: Forecast of Zhoushan Green and Resilient Housing Demand

In this Report, the green ecological housing demand model based on preference theory (Chen Hong et al, 2006; Ma Jing and Deng Yu, 2014) is used to predict Zhoushan people's demand for green and resilient housing by analyzing the consumer preference for green and resilient housing.

1. Basic model and its hypotheses

Purchase of green and resilient housing is aimed to obtain the maximum utility. Assuming u represents the utility given to purchaser by one unit green and resilient housing; x, the area of one common housing (non-green and resilient housing) purchased by consumer, y, the area of equivalent green and resilient housing purchased by such consumer, p1 and p2, the prices of such common housing and green-resilient housing, respectively, s, the maximum purchase area, m, the currency that such consumer can actually pay, α, the standards of green-resilient housing, e, the recognition level of consumer to the green-resilient housing environment. As a result, the mathematical model for purchaser's utility maximization is expressed as follows:

$$\max U(x, y, \alpha, e) = \alpha x[1-(x+2y)/2s] + (1+e)y[1-y/2s]$$

$$x + y \le s; p_1 x + p_2 y \le m; x \ge 0, y \ge 0$$

The hypotheses for this model are listed below:

Hypothesis 1: Hypothesis of rational, ecological and economic man. With the improvement of people's economic level, requirements raised by purchaser are not only about area and quantity, but more about improvement of housing environment, and pursuit of health and comfortableness. So purchaser can identify and chose green and resilient housing rationally.

Hypothesis 2: Hypothesis of ecological standards. China has issued some standards to measure green and resilient housing, with which, relevant organization design and built housing. Assuming the highest standard scale is 1 and is known to all purchasers. Then purchaser can compare the actual housing with such standard and give the house-to-be-bought a quantitative value $\alpha(0 \le \alpha \le 1)$, which reflects the willingness of purchaser to buy such house.

Hypothesis 3: Hypothesis of confidence level e. Confidence level means the probability that purchaser chooses the labeled green and resilient house and believe that such house will give healthy and comfortable ecological benefits. This measure is proportional to income. Since green and resilient housing standards in current market are not uniform, purchasers are hard to differentiate the real from the false ones, which therefore affects the confidence level.

Hypothesis 4: Hypothesis of zero-sum. This model is used to predict demand for green and resilient housing under consumer preference and current income level, which is equal to theoretical value minus current quantity of green and resilient housing. Since development of green and resilient housing in Zhoushan is at initial stage, and statistical standards applied to green and resilient housing are different, it is difficult to get the accurate statistical data. So it is assumed the current production of green and resilient housing meeting the previous definition is zero.

Hypothesis 5: Hypothesis of median man. Green and resilient housing demand from Zhoushan is the sum of personal demand. However, it is hard to get personal information and calculate all individuals' demand. In this Report, it is assumed that there is a median man P in Zhoushan society, such man's demand for green and resilient housing y(P) is the average of all Zhoushan residents' demand.

U(x,y,α,e) is an inseparable utility function indicating that green-resilient housing is closely related to common housing, and not an independent commodity. Without restraints, the maximum value of U is obtained at the point of (x,y)=(0,s), then y(P) can be solved by using a set of linear equations. So, the total demand from Zhoushan is expressed as Y= N·y(P), where N refers to the total population needing green and resilient housing. Assuming M1<m<M2 and α/(1+e)>p1/p2, then basic demand model could be described as follows:

$$Y = N \bullet \frac{\alpha(p_2 - p_1)m - [\alpha p_2 - (1+e)p_1]sp_1}{\alpha(p_2 - p_1)^2 - (\alpha - e - 1)p_1^2}$$

$$M_1 = sp_1[\alpha p_2 - (1+e)p_1]/(\alpha p_2 - p_1) \qquad M_2 = sp_2$$

2. Data source and selection

It is obtained from investigations that, average commercial residential housing price of Zhoushan in 2015, i.e., p1 was 11,060 RMB/m^2 (1,75.74 USD/m^2), and p2 was 13,300 RMB/m^2 (2,135.4 USD/m^2), and annual increase rate of average commercial residential housing price in Zhoushan during the last decade was 2.1 percent. s is represented by Zhoushan market standard area, 90m^2.

According to Overall Urban Plan of Zhoushan (2012-2030), it is expected that urban permanent population of Zhoushan will reach 1.5 million and 1.8 million by 2020 and 2030,respectively.

According to Statistical Communiqué of Zhoushan on the 2015 National Economic and Social Development, per capita disposable income for Zhoushan's urban permanent population in 2015 was 44,845 RMB (7,200 USD). After analysis, the annual increase rate of per capita disposable income for urban permanent population in the last decade was 9.2 percent.

By interviewing experts and scholars studying or whose works are related to real estate in government bodies, we have obtained the confidence level for Zhoushan real estate, standard recognition and possibility of buying satisfactory ecological housing based on their judgment. Therefore, α and e are 0.99 and 0.185, respectively.

As green and resilient housing demand represents household demand, the largest part of disposable income of one household is from male family members, it is assumed that the purchaser of each household is male aged between 25 and 45 years old. Additionally, average life expectancy in Zhoushan is 79.58 years old and males take up about 49.4 percent of total population.

Therefore, N_{2015}=1,152,000×49.4%×20÷79.58=143,023

3. Demand Forecast

Based on above formula and parameters and by combining relevant statistics and survey data from housing market, in this Report, we expect that demand for green and resilient housing of Zhoushan will be 296,700 m^2 and 719,400 m^2 by 2020 and 2030, respectively. It should be noted that consumer preference is time-varying, so the long term forecast in this Report might be deviated from the actual results.

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