Optimization of transport integration planning and implementation plan in CZT City Cluster (including Strategic Environmental Assessment)

Brief report

Beijing Transportation Research Center (the dominant party)

AECOM Design Centre (JV Member)

Energy and Environmental Development Research Center (subcontractor)

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1. Project Summarization

1.1. Project Background and Significance

In recent years, with rapid economic growth and acceleration of urbanization and motorization in Chinese cities, relevant issues are becoming increasingly prominent, including greenhouse gas emission, traffic congestion, environmental pollution, energy consumption and resource shortage. They greatly affect residents’ living and production activities and hinder the process of sustainable urban development. With the advancement of new-type urbanization in China, urban clusters are becoming the new development mode of Chinese urbanization. In the development of urban clusters, the core areas with the most vitality and potential in the future economic development pattern of China, if no effective prevention and control measures are taken, the above-mentioned issues will arise as well, even more serious.

Transportation is the foundation and “blood vessel” for a city to function normally and the core element for promoting its economic and social development and boosting its comprehensive competitiveness. In the future, the transportation in urban clusters will exert a far-reaching influence on Chinese environment and climate. Healthy development of the clusters depends largely on their comprehensive transportation system. At present, the comprehensive coordination, management modes, policies, laws and regulations are not unified between and within cities in the clusters and between urban and rural areas. No systematic solution is worked out to the issues concerning comprehensive transportation development of the clusters. All these issues constrain their overall effectiveness. So, it is imperative to build a comprehensive transportation system that is safe, smooth, convenient and green.

Against such background, the Global Environment Facility (GEF) provides funds for the Ministry of Transport of the PRC to launch the “Ecological Comprehensive Transportation Development Project of Chinese Urban Clusters”. It is aimed at promoting multi-transportation integration in urban clusters to improve efficiency, thus saving energy and reducing emission.

CTZ Cluster is the “Experimental Zone for Comprehensive Utility Reform for Building a Resource-saving and Environmentally-friendly Society” approved by Chinese government in 2007. In the plan for nationwide main functional zones, CTZ Cluster is classified as the area to which priority is given in the development. In 2015, the State Council has approved the Development Plan for the Urban Cluster along the Middle Reaches of the Yangtze River, determining the urban cluster along the middle reaches of the Yangtze River as one of Chinese five super urban clusters. CTZ Cluster is among important clusters. In addition, Changsha is the key city in the development strategy of China’s "One Belt and One Road".

In terms of transportation, Hunan Provincial People’s Government and the Ministry of Transport have signed the Meeting Minutes of the Ministry of Transport and Hunan Provincial People’s Government on Accelerating the Development of Resource-saving and Environmentally-friendly Transportation, specifying that the building of “a Resource-saving and Environmentally-friendly Society” should be actively advanced and new ideas, approaches and modes should be explored for the transportation development. Therefore, CTZ Cluster has become
GEF “China Urban Cluster Ecological Integrated Transportation Development Project” — Optimization of CZT Comprehensive Transportation Plan & Integration Implementation Scheme (Including Strategic Environment Assessment)

a focus which will be supported by the Ministry of Transport through the “Ecological Comprehensive Transportation Development Project of Chinese Urban Clusters” funded by GEF.

In recent years, remarkable progress has been achieved in the plan work of CTZ area. In 2005, the Development Plan for CTZ Cluster was prepared. In 2008, the Mid-to-long-term Development Plan for the Comprehensive Transportation System in “3+5” Urban Clusters was prepared. The development plan for regional comprehensive transportation system in CTZ Cluster and five cities around it was completed. Up to now, the CTZ planning and integration have been basically completed. However, to really achieve the comprehensive transportation integration in urban clusters, there are still many issues to be addressed, including mechanisms, systems, policies, etc. of relevant provinces, cities and localities. Against such background, Hunan Province prepares the Implementation Plan for CTZ Comprehensive Transportation Integration (hereinafter referred to as the “Plan”).

The Plan is the document for guiding the transportation development of CTZ Cluster for the coming years. Its orientation and implementation play a vital role in subsequent development of this area. So, in the GEF-funded “Ecological Comprehensive Transportation Development Project of Chinese Urban Clusters”, a contract package – Optimize CZT Comprehensive Transportation Plan and Integration Implementation Plan (including Strategic EIA) is arranged to evaluate and optimize the Plan and conduct strategic EIA.

The consulting objectives of this contract package mainly cover the following major aspects: (1) optimization of the comprehensive transportation system and reduction of greenhouse gas emission; (2) intensive utilization of resources such as energy and land; (3) optimization of the plan and making the plan more implementable; (4) transfer of knowledge, training of the personnel from local governments and technical-support organizations to establish a common value orientation in environmental protection and understanding of transportation essence, and advancement of the project implementation.

1.2. Project Objective

1.2.1. Overall Objective

With the objective of creating “resource-saving and environmentally-friendly” integrated transportation, the project optimizes CZT Comprehensive Transportation Integration Implementation Scheme prepared by Hunan Province with the assistance of experts at home and abroad. The Scheme should meet the standard of reducing urban greenhouse gas emission set by the GEF, and it should be operable, advanced and exemplary.

Among the overall objective, the first objective is to reduce the urban greenhouse emission, which is a tenet requirement of GEF for the donation. It is also in line with the orientation and concept of China’s development, and especially in line with the actual demands of CZT Urban Cluster. This region should strive to optimize the traffic structure, improve the percentage of the intensive transportation as well as green transportation in order to reduce the greenhouse emission.

The second objective is to make the Scheme operable, advanced and demonstrative, which is the common requirement of Ministry of Transport of the People’s Republic of China and Department of Transportation of Hunan Province, as well as the emphasis of utilizing the expert
strength to improve the Scheme. Only with a strong operability can the philosophy of the Scheme be effectively implemented. Otherwise, any good idea is a daydream. Advancement is an inevitable requirement in view that the current urban cluster transportation cannot well support the development of urban cluster. Only by realizing comprehensive advancement in respect of mechanism and system, planning concept, designing methods, and technical manners can it break down all existing contradictions and genuinely promote the integration of comprehensive transportation of urban cluster, and support the economic and social healthy development of urban cluster. The CZT Urban Cluster is a pilot site supported by Ministry of Transport of the People's Republic of China. Once the trial is successful, it shall become a good example in China. So it must be of benign demonstration.

1.2.2. Specific Objective

Establish an integrated transportation that meets the requirements of the integration of economic and social development of the CZT City Cluster. Tackle with the relationship between transportation and urban cluster, making the two harmonize in development. The overall volume and structure of transport facilities, operation management, traffic management, and traffic demand management should satisfy the passenger and freight transportation demands of urban cluster. In order to realize a sustainable development, the Scheme should conform to the government’s near- and long-term financial arrangement, and take full consideration of various financing channels and manners.

Integrating the Inter-city, in city and urban-rural public transportation services of Changsha, Zhuzhou and Xiangtan; standardize the management mode and the laws and policies; eradicate the market segmentations among different transportation services. The so-called public transportation service integration is to emphatically ensure that the public passengers should not feel hindrance when having the public transport transfer, and get the most reasonable satisfaction in travelling demands, but not to resulting in meaningless transfer of passengers between different transportation systems. In shortage of host law, it is suggested that a unified policy be established between urban and rural areas of Changsha, Zhuzhou and Xiangtan. Suggestions of coordination mechanism as well as operation and management mode should be proposed.

The transportation infrastructure and the market environment can supplement the advantages of different transportation methods and facilitate multi-mode transportation. The traffic infrastructure is the fundamental guarantee for transportation. An ideal mode of transportation cannot be realized without infrastructure. In the perspective of schemes, it is best to have optional transportation infrastructure, however, in the perspective of resource allocation, it is best to focus on the intensive and green means of transportation. For example, for large-volume passenger transportation demands, it should plan and build large-volume transportation infrastructure. For passenger transfer nodes, it should plan and construct high-level integrated hubs. For water transport, there should be ports and roads connected to them. Besides, the market environment should be favorable for realizing the optimization of resource allocation without barriers. It should utilize the market balance to give full play to all modes and promote the multimodal transport.

Increase the efficiency and profit of transportation services and the efficiency of resource utilization to meet the requirement of energy conservation and environmental protection. Both passenger and freight transportation should be more intensive and green. In respect of passenger
transportation, car use should be restricted, while public transport should be put a premium on; the trunk and lateral lines of public transport should be reasonably matched, in a bid to make the transportation services more efficient. In respect of freight transportation, the advantage of water transport should be made full use of, and multimodal transport should be adopted, in a bid to reach the requirements of energy reservation and environmental protection.

Enhance the share rate of public transportation. There is a significant increase in residents’ satisfaction, as well as the convenience of public transportation. Public transport is an intensive and green travelling manner. At the same time, it is beneficial to energy reservation and environmental protection. We should pay more attention to the improvement of public transport share ratio has attracted what kind of people, rather than the single index of public transport share ratio. We advocate that the mid- and short-distance travelling should take walking and bicycling, while public transport should woo passengers from cars. For that purpose, we should improve the accessibility and service level of public transport, so as to form some competitiveness. We should strive to improve the convenience and travelers’ satisfaction rate in perspective of increasing vehicle speed, lowering the full-load ratio, improving the connection & transfer, and enhance the automobile internal environment.

Short-term implementation can meet the requirements of long-term objectives on coordination and sustainability. The short-term implementation plan has significant impact and practical significance for the CZT comprehensive transportation integration. While, once the transportation infrastructure is completed, the adjustable room is very limited. Therefore, when confirming the recent projects, we should make full considerations both in the short and long term; avoid blind recent construction which shall lead irreversible losses. Hence, the recent construction project should be taken into the short- and long-term plan. At the same time, full demonstration should be made during the construction process.

Meet the GEF’s requirements of reducing the discharge of greenhouse gas in urban areas. We should stick to it. It is a tenet of the GEF, and it is also in line with the local development demand of building “an energy-reservation and environment-friendly society”. In order to reduce the greenhouse gas emission, relevant comprehensive suggestions should be proposed in coordinating the land use and transports, cutting the car using, and gathering transport resources using.

It can provide an implementation scheme for the integration of integrated transportation in other cities in China. The CZT region, a pilot zone of comprehensive transportation integration, is of positive demonstration for China’s nationwide urban clusters. We should actively accumulate such experiences as work mechanism, laws and regulations, operation management and technical manners, so that we can come up with relatively systematic training materials, and launch intensive training on the personnel from the relevant regions in China.

1.3. Work Orientation and Research Scope

Considering the requirements of the task outline, the work of the contract package is optimized targeting at CZT Comprehensive Transportation Integration Scheme prepared by Hunan Province, so it can keep consistent with the Scheme in terms of optimization scope.
1.3.1. Work Orientation

Based on Transportation Department of Hunan Province, on behalf of Hunan provincial government, and against such problems as regional comprehensive transportation inconsistency and non-coordination caused by administrative partition of three cities and administration system partition of different means of transportation, the original Scheme coordinates and balances interests of the three cities and integrates traffic resources of the three cities from the perspective of overall development of CZT area, so as to promote the process of CZT comprehensive traffic integration. The focus is on the cross-administrative region integration of the same means of transportation, and the integration of different means of transportation, as well as the integration of transportation with the social economy and resource environment.

To ensure research integrity and comprehensiveness, the original Scheme moderately refers to the research content of comprehensive transportation integration that can be coordinated within respective administrative responsibilities of Changsha, Zhuzhou, and Xiangtan, but this is not the research focus.

The project optimization is consistent with the original Scheme in terms of object.

1.3.2. Research Scope

Based on CZT Comprehensive Transportation Integration Implementation Scheme and its prospectus (December 2013) issued by Department of Transportation of Hunan Province, some optimizations are made.

Range of space: The core area of CZT is 8,848 square kilometers.

Range of time: It is the same as in the Plan and the Scheme. The near-term is 2015, and the long term is 2020. Long term development will be considered.

Object of research: Centering on passenger transportation, with due regard to water way and freight transportation

Based on population and land range determined by the overall plan of Changsha, Zhuzhou and Xiangtan, the research focuses on CZT urban planning area, and the scope is as follows:
Changsha: According to the 2010 edition of Changsha overall plan, the urban area includes Furong District, Tianxin District, Yuhua District, Kaifu District, Yuelu District of Changsha City (Lianhua Town and Yuchangping Town excluded), Gaotangling Town, Xingcheng Town, Huangjin Town, Leifeng Town, Dingzi Town of Wangcheng County, Xingsha Sub-district, Muyun Town, Huanghua Town, Langli Town, Huangxing Town, Ansha Town, Tiaoma Town and Ganshan Town of Changsha County, and covers an area of 1,930 square kilometers.

Zhuzhou: Based on the 2006 edition of Zhuzhou overall plan and adding parts of Zhuzhou County within the scope of CZT core area, the urban area includes Tianyuan District, Lusong District, Hetang District, Shifeng District, and parts of Zhuzhou County, and covers an area of 773 square kilometers.

Xiangtan: According to the 2009 edition of Xiangtan overall plan, the urban planning area includes two districts (administrative district scope of Yuetang District and Yuhu District, not including Nanzhushan Town) of current Xiangtan City and administrative jurisdiction scope of Yisuhe Town, Hekou Town, Meilinqiao Town, Yangjiqiao Town, Jiangshe Town, Xiangtang Town and Xiangshui Town of current Xiangtan County, and the planning area covers an area of approximately 1,069 square kilometers.

1.4. Project Tasks

According to the working outline, the project is divided into six main tasks:

Task 1. Overall Evaluation of the Scheme
Evaluate the feasibility of the Scheme, the coordination between the short-term implementation scheme and long-term development goal as well as the adaptation of the Scheme to resource-reservation and environment-friendly society.

Task 2. Optimization of the Scheme

Optimize goals, approaches and specific schemes of the Scheme. Including the optimization of ideas, principles, objectives and priorities; the optimization of technical route and working methods; the optimization focuses on the development pattern of comprehensive transportation integration, and the optimization scheme covers such aspects as transportation infrastructure, information platform, transportation market and service, government administration and business operation, policy, regulation and system.

Task 3. Strategic Environment Impact Assessment of the Scheme

Guide the meaning, purpose and main contents of the strategic environment impact assessment in combination with CZT comprehensive transportation integration implementation scheme; evaluate the index system related to strategic environment impact assessment; propose optimized content and method of strategic environment impact assessment; analyze and quantitatively calculate the implementation effect of the strategic environment impact assessment optimization scheme.


Optimize the evaluation indexes proposed by the implementation scheme. Calculate quantitatively the effects in such aspects as improving the efficiency of transportation services, reducing costs, saving resources, reducing pollution emissions and being environment-friendly after optimizing the original implementation scheme.

Task 5. Guarantee Measures

Propose guarantee measures required for implementing the optimization scheme.

Task 6. Problems and Suggestions

Put forward possible problems with the implementation of optimization scheme and practical suggestions for realizing the optimization scheme.

1.5. Technical Route

After its launch, this project improves and optimizes the work plan based on the requirements of the World Bank and the project office, and then comprehensively collect data according to plan, carry on spot survey and conduct a thorough and meticulous research in relevant departments. After detailed spot survey and department research, it forms the opening report to present to the World Bank and the project office.

After the opening report is approved and working direction is determined, the work is conducted in an all-around way. First, conduct overall evaluation and transportation strategic environment impact assessment of the Scheme, and implement scheme optimization on this basis. Carry out benefit analysis and calculation of the optimization scheme after fundamentally finishing the above two tasks; if the benefits fail to meet the requirement, give feedback to the optimization work and re-consider the optimization scheme. Finally, propose guarantee measures, problems and suggestions.

The entire work develops in a circulative-rise mode and is interrelated: consider guarantee
measures, problems and suggestions while conducting evaluation and optimization, and appropriately adjust the optimization scheme while the guarantee measures are hard to implement.

Convene a seminar to discuss about the project after completing the project technical part, and hold training session for interested parties.

1.6. Project Implementation

1.6.1. Main Work Process

The main work consists of four phases: preliminary preparation, opening, mid-term study and final study. The main work contents and time schedule are shown in the following table.
### Table 1-1 Main Work Processes

<table>
<thead>
<tr>
<th>Phase</th>
<th>No.</th>
<th>Time</th>
<th>Main work</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>On June 10th, 2014</td>
<td>Beijing Transportation Research Center (BTRC) and AECOM Ltd. signed the project contract with the Ministry of Transport of the People’s Republic of China, marking the official launch of the project.</td>
</tr>
<tr>
<td>Preliminary Preparation</td>
<td>2</td>
<td>From June 30th to July 4th, 2014,</td>
<td>led by BTRC, AECOM, EED and relevant experts went to Hunan Province to make investigation, and had an informal discussion with the Hunan Provincial Transportation Department, Hunan CZT City Cluster Two-type Society Coordination Committee Office and transport authorities and relevant units in Zhuzhou and Xiangtan to gain in-depth understanding of the ideas of local government for transport integration work in CZT, which established a good communication mechanism for further work and accumulated a wealth of information and materials.</td>
</tr>
<tr>
<td>Opening</td>
<td>1</td>
<td>In July 2014</td>
<td>the project consultant prepared the opening report and reporting materials;</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>On August 6, 2014</td>
<td>the World Bank and Project Office of the Ministry of Transport of the People's Republic of China organized the project opening report review meeting. Experts at the meeting reached consensus on the project opening and proposed suggestions for further work;</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>On September 24, 2014</td>
<td>submitted the revised opening report in English and Chinese versions to the project office;</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>From October to December 2014</td>
<td>the project consultant carried out the project research;</td>
</tr>
<tr>
<td>Mid-term study</td>
<td>1</td>
<td>From October to</td>
<td>the project consultant carried out project</td>
</tr>
</tbody>
</table>
## 1.6.2 Application of Project Results

The research result of this project has realistic instructive significance for Hunan province.

### Final study

<table>
<thead>
<tr>
<th>Month</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 2014</td>
<td>research;</td>
</tr>
<tr>
<td>In December 2014</td>
<td>the project consultant conducted supplementary survey on passenger transportation volume of main roads in Hunan Province and inter-channel passenger demands, and analyzed the survey results.</td>
</tr>
<tr>
<td>In January 2015</td>
<td>completed the interim report, and prepared for mid-term review.</td>
</tr>
<tr>
<td>February 10, 2014</td>
<td>Mid-term assessment;</td>
</tr>
<tr>
<td>February 11 - March 20, 2015</td>
<td>Completing benefits assessment, problems analysis, and formulation of guarantee measures</td>
</tr>
<tr>
<td>March 25 - March 27, 2015</td>
<td>Supplementary studies in Hunan;</td>
</tr>
<tr>
<td>April - May, 2015</td>
<td>Revising and improving the final report;</td>
</tr>
<tr>
<td>June 10, 2015</td>
<td>Hold the Expert consultation meeting for the draft final report</td>
</tr>
<tr>
<td>July 1, 2015</td>
<td>Consulted the suggestion for Hunan province</td>
</tr>
<tr>
<td>August 20, 2015</td>
<td>Hunan Provincial Communications Department in writing to seek advice for the reply</td>
</tr>
<tr>
<td>June-September, 2015</td>
<td>Rived the draft final report according to the suggestion of experts</td>
</tr>
</tbody>
</table>

### Ability Construction

<table>
<thead>
<tr>
<th>Month</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 11, 2015</td>
<td>Hold the Urban Transport Integration Workshop</td>
</tr>
<tr>
<td>August 12, 2015</td>
<td>Hold the Integrated Transport Planning and Management Training Meeting</td>
</tr>
</tbody>
</table>
The 13th Five-Year Plan for Transportation Development of Hunan Province is based on this research, resulting in “strengthening transport infrastructure building and optimizing interconnection”, “coordinating urban and rural passenger transportation development” and “improving comprehensive transportation service guarantee capacity”. These contents take the advises of transport integration, strengthen hub transportation connection and service, emphasize the construction of public transport and service and increase the safeguarding role of smart transport in transportation system. In particular, the key aspects hampering transport integration have been improved, including strengthening hub connection, public transport integration in three cities, promoting the interconnectivity of public transport IC cards and upgrading new energy vehicles.

Figure 1-3 Opinions from Department of Transportation of Hunan Province
2. Project Main Results

2.1. Status quo of Changsha-Zhuzhou-Xiangtan Urban Agglomeration

2.2.1. Basic Situation and Development History

Located in the middle and east of Hunan Province, Changsha-Zhuzhou-Xiangtan Urban Agglomeration centers on Changsha at the radius of 40km. The three cities of Changsha-Zhuzhou-Xiangtan Urban Agglomeration cover an area of 28,000km², accounting for 13% of the area of Hunan Province. It is the core growth pole of economic development of Hunan Province, the region with development potential and vigor in the central region of China and an important part of rise of the central region. See Figure 2-1 for the location of Changsha-Zhuzhou-Xiangtan Urban Agglomeration.

In the National Main Functional Area Plan, the functional orientation of Changsha-Zhuzhou-Xiangtan Urban Agglomeration are as follows: The demonstration zone of national resource-saving and environmentally-friendly society construction. In 2007, the Changsha-Zhuzhou-Xiangtan Urban Agglomeration was approved as the Comprehensive Supporting Reform Pilot Site of National resource-saving and environmentally-friendly Society Construction. In 2009, the People's Government of Hunan Province and Ministry of Transport of the People's Republic of China inked The Protocol of Speeding Up Hunan’s Development of Resource-reservation and Environment-friendly Transportation, in a bid to actively push forward Changsha-Zhuzhou-Xiangtan Urban Agglomeration construction of an energy-reservation and environment-friendly society, explore the new concept, new approach and new mode of transportation development. On July 16th, 2012, the Implementation Guidelines for Hunan to Push Forward New-type Urbanization (2012-2020) (Exposure Draft) was unveiled, which proposed to construct a new-type township system by taking the CZT region as the core. In the future, Changsha-Zhuzhou-Xiangtan Urban Agglomeration will occur as a megalcity, which will further push forward the whole province’s urbanization process. Changsha-Zhuzhou-Xiangtan Urban Agglomeration is the important comprehensive transportation hub of China, transportation equipment, engineering machinery, energy saving and environmental protection equipment manufacturing, cultural tourism and trading logistics base, and strategic emerging industry (such as nonferrous metal, biomedical, new material, new energy and electronic information) base.
2.1.2. Basic Situation of Core Area

The core area of Changsha-Zhuzhou-Xiangtan Urban Agglomeration is an area with the densest population, industries and cities and covers an area of 8448.18km², accounting for 4% of the area of Hunan Province, including downtowns of Changsha, Zhuzhou and Xiangtan, whole Wangcheng District, and parts of Liuyang City, Liling City, Shaoshan City, Xiangxiang City, Ningxiang County, Changsha County, Zhuzhou County, Xiangtan County, Heshan District, Yunxi District, Xiangyin County, Miluo City and Quyuan Management District. See Table 2-1 Core Area Composition Table 2-1.
The core area of Changsha-Zhuzhou-Xiangtan Urban Agglomeration is a regional function.
Advanced manufacturing industry center Changsha Dong’an Advanced Manufacturing Industry Center with Xingsha Advanced Manufacturing Industry Park and Huanghua Airport Industry Park as the main part, Zhuzhou South Advanced Manufacturing Industry Center with Zhuzhou Hi-tech Industrial Development Zone, Tianxin, Jinshan and Airport Industry Park as the main part, and Xiangtan West Advanced Manufacturing Industry Center with Xiangtan Jiuhua Industrial Park and Taiwan Industrial Park as the main part.

Science & technology Cultural Center Cultural & creative and science & technology R&D center with Changsha National Software Base, Changsha National Biological Industry Base, Jinying Cultural Industry Park, Changsha Tianxin Cultural Industry Park, Changsha Advertising Industry Park and Longping Forum Hi-tech Agricultural Park as the main part.

Logistics center Develop many functions (such as logistics, product processing and production service) with Changsha Jinxia Logistics Park, Zhuzhou Shifeng Logistics Park, Zhuzhou Railway Hub Station and Xiangtan Jiuhua Logistics Park as the center and Jinxia, Qinghuatang, Jiuhua and Hetang areas as the main part.

Technical innovation center Centered at Changsha Yuelushan University Town, Lagu H-tech Development Zone, Changsha Economic Development Zone, Central South National Digital Publishing Base, Zhuzhou Hi-tech Industrial Development Zone, Xiangtan University Town and Xiangtan Hi-tech Development Zone and dominated by hi-tech R&D and application such as electronic information, biology, new material, new energy and civil aviation and spaceflight.

In addition, the core area of Changsha-Zhuzhou-Xiangtan Urban Agglomeration also performs local function center. Multi-functional (such as commercial, financial and information) production service center will be formed with Changsha Dong’an Changsha-Zhuzhou-Xiangtan CBD as the center, including main urban area. Multi-functional (such as commerce & trade and leisure & entertainment) living service center with Changsha Dong’an as the center. Multi-functional (such as suburban leisure, theme park and resort) ecological leisure center with Lvxin, Jiuhua Binjiang and Shaoshan as the base. Multi-functional (such as resort, leisure, sightseeing and entertainment) resort and leisure center with Zhuzhou Kongling’an and Dajing scenic areas as the base. Multi-functional urban and rural service center with Hetang District, Nanzhou, Baiguan and Shiting of Zhuzhou City, Yuhu District and area to its west of Xiangtan City, including technical and information services orientated at agricultural areas and large-sized agricultural and sideline product processing, collection and distribution.

2.1.3. Basic Situation of Three Cities

Changsha, the capital of Hunan Province, is an important central city in the middle reach of the Yangtze River and renowned national historical and cultural city. In 2015, the town population of metropolitan area was 5.4 million and construction land was 540km². In 2020, the town population of metropolitan area will be 6.6 million and construction land will be 660km².

Zhuzhou is a cultural memorial place of Shennong, also known as the Emperor of the Five Grains, practice zone of national resource-saving and environmentally-friendly society construction, Circum-Changsha-Zhuzhou-Xiangtan Urban Agglomeration combination center and ecologically livable city featuring by modern industrial civilization. By 2020, the planned urban population of Zhuzhou will be around 1.8 million.
Urban functional orientation of Xiangtan is as follows: Build the system framework conducive to the resource-saving and environmentally-friendly society construction through comprehensive supporting reform, and develop Xiangtan into an ecologically livable modern industrial city and renowned cultural and tourist city oriented at the demonstration area of national resource-saving and environmentally-friendly society construction, strong economic city leading the rise of the central region, urban and rural service center for Changsha-Zhuzhou-Xiangtan Urban Agglomeration to radiate towards west, renowned cultural and tourist city with international quality and modern and ecologically livable city. By 2020, the population of planning area of Xiangtan City will be around 2 million. The population is 1.1 million for central urban area, 0.45 million for Shaohua Group, 0.3-0.35 million for Yisuhe Group, 50,000 for Jiangshe Group, and 40,000 for Yanghe Group. Total land use is controlled no more than 200 km².

2.1.4. Social and Economic Development Status quo of Changsha-Zhuzhou-Xiangtan Urban Agglomeration

1. Population

By the end of 2013, Changsha-Zhuzhou-Xiangtan Urban Agglomeration had a permanent resident population of 13.9564 million, accounting for 20.86% of Hunan’s total population; the core area of Changsha-Zhuzhou-Xiangtan Urban Agglomeration had a permanent resident population of 9.9 million, accounting for 14.8% of Hunan’s total population. In the Changsha-Zhuzhou-Xiangtan Urban Agglomeration, there is no big city with a population of more than 10 million. The population in Xiangtan is the densest (576.27 persons/km²). Most population engages in the secondary and tertiary industries. See Table 2-2.

Table 2-2 Population Overview of Changsha-Zhuzhou-Xiangtan Urban Agglomeration

<table>
<thead>
<tr>
<th>City name</th>
<th>Permanent resident population (10k persons)</th>
<th>Population density (person/km²)</th>
<th>Proportion of employees in the primary industry (%)</th>
<th>Proportion of employees in the secondary industry (%)</th>
<th>Proportion of employees in the tertiary industry (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changsha</td>
<td>660.6</td>
<td>559.09</td>
<td>0.10</td>
<td>47.05</td>
<td>52.85</td>
</tr>
<tr>
<td>Zhuzhou City</td>
<td>395.8</td>
<td>351.91</td>
<td>0.24</td>
<td>58.52</td>
<td>41.24</td>
</tr>
<tr>
<td>Xiangtan City</td>
<td>291.8</td>
<td>582.98</td>
<td>0.06</td>
<td>62.26</td>
<td>37.68</td>
</tr>
</tbody>
</table>

Notes: sourced from China City Statistical Yearbooks 2013.

2. Economic and industrial development

In 2013, the GDP of Changsha, Zhuzhou and Xiangtan was RMB1.053923 trillion and per capital GDP was RMB75,515. The secondary and tertiary industries are major contributors to the GDP of Changsha-Zhuzhou-Xiangtan Region. See Table 2-3. Zhuzhou is the Asia’s largest non-ferrous metal smelting base, hard metal research and manufacturing base and electric vehicle research and manufacturing base. Xiangtan is an important industrial city in China, with a sound development foundation. However, the industrial structures are very similar in the Changsha-Zhuzhou-Xiangtan Urban Agglomeration, which seriously hinders the development. Study shows that, similarity coefficient of industrial structures of Changsha, Zhuzhou and
Xiangtan is above 0.98 and that of Zhuzhou and Xiangtan is 0.99. They should seize the opportunity of building the a resource-saving and environmentally-friendly society to promote industrial upgrading of Changsha-Zhuzhou-Xiangtan Urban Agglomeration. Changing the competition relationship between these three cities into cooperation and win-win relationship will help their industries complement each other and become the key for boosting economic development of the agglomeration.

### Table 2-3 Economic Development Overview of Changsha-Zhuzhou-Xiangtan Urban Agglomeration

<table>
<thead>
<tr>
<th>City name</th>
<th>The provincial GDP (RMB 100 million)</th>
<th>Per-capita regional GDP (RMB)</th>
<th>The primary industry</th>
<th>The secondary industry</th>
<th>The tertiary industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changsha City</td>
<td>6399.91</td>
<td>89903</td>
<td>272.00</td>
<td>4.25</td>
<td>3592.27</td>
</tr>
<tr>
<td>Zhuzhou City</td>
<td>1761.32</td>
<td>45235</td>
<td>144.60</td>
<td>8.21</td>
<td>1062.78</td>
</tr>
<tr>
<td>Xiangtan City</td>
<td>1282.39</td>
<td>46249</td>
<td>110.54</td>
<td>8.62</td>
<td>765.59</td>
</tr>
</tbody>
</table>

Notes: sourced from *China City Statistical Yearbooks 2013*.

3. Spatial development structure

Core area of CZT focuses on intensified, ecologically-friendly and open development, and relies on a spatial structure of “One core, two axises and two belts” in terms of spatial development. Wherein: One core refers to the green core area in the joint part of the three cities, also serving as the window for the building of the two-oriented (resource-conserving and environment-friendly) society. By fully leveraging the excellent ecology of the green core area, we will, on the premise of well protecting the ecological fundamentals and giving full play to ecological screening, innovate urban and rural construction model, scientifically raise the green core value and constitute a high added value public service platform serving the region to transform the green core area of from the “edge” zones of the three cities into an important function area of the urban agglomeration and a function link joining the three cities. Two axises that consist of the key development axis of the east Changsha-Zhuzhou line and the key upgrading axis of Changsha-Xiangtan along the Xiangjiang River constitute two comprehensive corridors for integrated development of city and industry. The former joins the east new town of Changsha City and downtown of Zhuzhou City as well as the periphery zones like Changsha County and Zhuzhou County, which, backed by such outward traffic facilities including airport, high-speed rail and highway, will be focused on the development of high-end industries like central business, advanced manufacturing industry and airport logistics. The latter joins downtowns of Changsha City and Xiangtan City ad well as the periphery zones like the Xianing Port in the north, county seat of Xiangyin, Miluo City and the Xiangtan county seat in the south, which, backed by the universities and colleges, scientific research institutes and the high-tech industrial zone, along the Xiangjiang River, will be built into a longitudinal main development axis accommodating such three major functions as ecological green valley, landscape necklace and economic corridor. The two belts that include the East-West Comprehensive Development Belt in the north region and the East-West Optimized Development Belt in the south region constitute two composite corridors for
aggregated development of urban and industry. The former that joins downtown of Changsha City and the New Town of Airport-High-speed Rail as well as Cangshuipu Town of Yiyang and Liuyang City, etc., will encompass the development of advanced manufacturing, high-tech and modern service industries to establish itself as an importance axis for CZT to radiate Northwest Hunan and expand development hinterland. The latter that joins Zhuzhou, Xiangtan as well as their surrounding towns and extends eastward to Liling and westward to Xiangxiang will enhance the optimization of basic industries and the development of advanced manufacturing industry to make itself an important axis for CZT to radiate Central Hunan and a collaborative area for larger future development scope of CZT.

Three core cities of Changsha-Zhuzhou-Xiangtan Urban Agglomeration are closely associated and highly interact with each other. As the the agglomeration’s development core, their common development will be of great significance to elevate the agglomeration to a new height.

4. Urban and rural function layout

The CZT Urban Agglomeration Core area is divided into seven function zones. Details are as follows:

Comprehensive function areas include downtowns of Changsha, Zhuzhou and Xiangtan Cities, Changsha County, Wangcheng District, Zhuzhou County, Xiangtan County Seat as well as urban downtown districts, county seats and new urban zones including Yunlong, Tianyi, Jiuhua, Pingtang, Xingcheng and North Changsha. We will actively develop modern services, optimize industrial parks, adjust industrial structure, save resources and improve the environment. New town construction and old town upgrading shall comply with the requirements for the building of the two-oriented society.

Industrial parks refer to industrial parks including advanced manufacturing industries, technological industries and airport and harbor economic circles under highlighted development and independent of downtowns of cities. The advanced manufacturing industry parks include such parks as Xingsha, Wangcheng, Jinzhou, Jiuhua, Nangzhushan, Tianxin, Dongjiaduan and Baijing. Technology industrial parks include Changshai Hi-tech Park, Zhouzhou Hi-tech Park and Xiangtan Hi-tech Park. Airport industrial parks include the Huanghua and the Yunlong Airport Industrial Parks. Harbor Logistics Industrial Parks include Jinxia Logistics Park, Shifeng Logistics Park and Jiuhua Logistics Park.

CBDs. The Liuyang River area in the east of Changsha City. Encompassing the construction of high-speed rail Shangsha station and comprehensively considering the layout of the rail traffic hub, we will focus on the development of modern service functions like comprehensive management, circulation trading, financial services and business and leisure and strengthen aggregation of producer services and consumer services to build it into a CBD and regional service center with modern services as the core that drives development of the CZT cities and serves Hunan and even the Mid-south region.

Science and Education Innovation Areas. Zhuzhou Vocational Education Park and Yuelu Mountain and Xiangtan University Towns. We shall improve infrastructure building, integrate scientific and educational resources and give priorities to the development of culture, education and scientific R&D.

Innovative development of the green core area. Joint areas of Changsha, Zhuzhou and Xiangtan. We shall, on the premise of well protecting the ecological fundamentals and giving full play to ecological screening, develop such functions as ecological tourism, vacations, expos and
commercial entertainment.

Ecosystem conservation areas include such ecologically sensitive areas as hills in patch distribution, natural reserves, scenic spots, forest parks and wetlands, etc. All activities damaging ecological environment are prohibited.

High-quality rural areas include featured hilly areas and high-yield agricultural areas distributed along water systems. We will carry out centralized development of ecological agriculture and promote agricultural modernization and rural modernization. We will build ecological towns and new rural communities, improve infrastructure and public services.

2.1.5. Development Status quo of Comprehensive Transportation Integration of Changsha-Zhuzhou-Xiangtan Urban Agglomeration

1. Aviation

Aviation is an important part of external transportation of Changsha-Zhuzhou-Xiangtan Urban Agglomeration. With Changsha Huanghua International Airport as the leading, Changyuechang and Changheng as the two wings of equilibrium, a regional aviation network of "One Main and Three Auxiliaries" is formed. In this network One Main refers to Changsha Huanghua International Airport; Three Auxiliaries refer to Changde Taohuayuan Airport, Yueyang Airport and Hengyang Airport. See Figure 2-3.

The passenger throughput of Changsha Huanghua International Airport in 2013 is 16 million people, and it is the country's 12th airport reaching the level of 16 million throughput. Changsha Huanghua Airport’s passenger throughput is as shown in Figure 2-4.
1. Railway

Railway transportation of Changsha-Zhuzhou-Xiangtan Urban Agglomeration forms the main framework of "One Longitudinal Line and One Latitudinal Line". Beijing-Guangzhou High-speed Railway is “One Longitudinal Line” among the “Four Longitudinal Lines and Four Latitudinal Lines” in China’s Mid- and Long-term Railway Network Plan. It is a backbone in China’s railway passenger transportation system, as well as a passenger transportation main artery.
that connects Southwest, Central South and East China. Shanghai-Kunming High-speed Railway is "One Latitudinal Line" of "Four Longitudinal Lines and Four Latitudinal Lines" in China’s Mid- and Long-term Railway Network Plan. Shanghai-Kunming High-speed Railway not only is the main line of China's railway passenger transportation line, but also a passenger transport artery connecting Southwest, Central South and East China. The main framework of "One Longitudinal Line and One Latitudinal Lines" meets in Changsha, making Changsha-Zhuzhou-Xiangtan Urban Agglomeration become an important transportation hub in the Central China. See Figure 2-5. In 2012, China’s railway system transported 28.92 million people.

Intercity railway: Three ordinary-speed railways (Shimen-Changsha Railway, Beijing-Guangzhou Railway and Shanghai-Kunming Railway) connect Changsha, Zhuzhou, and Xiangtan. Changsha, Zhuzhou, and Xiangtan Intercity Railway is under construction.

2. Water Way

Centering around two national backbone inland waterways (Yangtze River and Xiangjiang River), the port and waterway system of shipping center in the middle and upper reaches of the Yangtze River is formed with Yueyang Port and Changsha-Zhuzhou-Xiangtan Port as the center and the Yangtze River and Xiangjiang River as main channels. It will rely on the Yangtze River’s 5000-tonnage main waterway to build the “Two Longitudinal and Four Latitudinal” regional backbone waterway (1000 tonnage plus). Wherein: “Two Longitudinal Lines” refer to Xiangjiang River (Two-grade waterway available at Zhuzhou-Chenglingji line) and Lizi Waterway; "Four Latitudinal Lines" refer to Lishui River, Yuansui River, Zishui River and Lianshui River waterways. See Figure 2-6. In 2012, a total of 70,000 passengers and 5,114 tons of goods were
transported through waterway.

Figure 2-6 Waterway Network of Changsha-Zhuzhou-Xiangtan Urban Agglomeration

3. Highway

The highway network featuring "Three Longitudinal Lines and One Latitudinal Line" and herringbone expressway framework is formed. "Three Longitudinal Lines" refer to separately from east to west Changzhu Highway, Jinggang'ao Highway and Changtan Highway West Line; "One Latitudinal Line" is the Shanghai-Kunming Highway; Expressway Framework of herringbone Structure is composed of the G107 (i.e. the Furong Avenue) and Hongyi Avenue. See Figure 2-7. In 2012, a total of 539.41 million people were transported by the highways.
2.1.6. Environment Quality Status quo of Changsha-Zhuzhou-Xiangtan

1. Atmospheric environment

Changsha-Zhuzhou-Xiangtan Region has started to do assessment according to the 6 indicators stipulated in the "Ambient Air Quality Standard"(GB3095-2012) since 2013. The 6 indicators are Respirable Particle (PM10) and Sulfur Dioxide (SO2), Nitrogen Dioxide (NO2) and Fine Particulate Matter (PM2.5), Ozone (O3) and Carbon Monoxide (CO). The Annual Report on Environmental Protection of Hunan Province in 2013 shows that the ratio of days reaching the standard in three cities of CZT Region in 2013 was respectively 54.0%, 59.0%, 53.4%. Among the nationwide 74 cities under the special monitoring, Changsha was ranked No. 53 in terms of the ambient air quality.

From January to May 2014, the average control rate of city environment ambient air quality in CZT reached 53.2%. And the respective control rate of Changsha, Zhuzhou and Xiangtan was 53.6%, 51.0% and 55.0%. The proportion of over-control days reached 46.8%, including 26.3% of mild contamination days, 10.6% of moderate contamination days, 6.4% of serious contamination...
days and 3.5% of severe contamination days. The key pollutant that has influenced the ambient air quality of the three cities of CZT is the particulate matter (PM). And the primary pollutant in 94.8% of the over-control days is fine particulate matter (PM$_{2.5}$).

Meanwhile, analyzed from the Report on the State of Environment in Changsha, Zhuzhou and Xiangtan and Annual Statistic Report on Environment in China during the period from 2008 to 2012, the air pollutant emission behavior in the three cities between 2008 and 2012 are shown in Figure 2-8 to Figure 2-10.

The analysis result shows that the overall trend of air pollutant emission is declining year by year. In addition, the motor vehicle pollutant emission quantity in the three cities of CZT has been calculated since 2012, see Figure 2-11.
2. Xiangjiang River Water environment

The river system within CZT Region, which is located on the middle and lower reaches of Xiangjiang River, the biggest river in Hunan Province, is developed. Within the region of the CZT Urban Agglomeration, 7 main branches of Xiangjiang River are lying successively from the upper reaches to the lower reaches, including the Lushui River, the Juanshui River, the Lianshui River, the Jinjiang River, the Liuyang River, the Laodao River and the Weishui River (see Figure 2-12 CZT River System LayoutFigure 2-12). These branches have provided convenient transportation and sufficient water resource for the development of the cities and towns.
The Annual Report on Environmental Protection of Hunan Province in 2013 shows that: water quality of Xiangjiang River basin was optimal overall. Among the 42 cross-sections under the monitoring of control at the provincial level or higher level, the amount of cross-sections in the water quality of Type I-III was 39, and the amount of cross-sections in the water quality of Type IV, Type V and Substandard V was respectively 1. The rate of reaching the standard of 42 cross-sections under the monitoring of control at the provincial level or higher level was 92.8%, with an increase of 4.7% over the previous year. Xiangjiang River enjoys a overall optimal water quality that the water quality of 18 sections at the provincial controlled level meet or exceed Category III standard, and the concentrations of heavy metal cadmium, mercury, arsenic, lead and hexavalent chromium reach the Category II water quality standards stipulated in the Environmental Quality Standards for Surface Water. In which, the concentrations of cadmium, arsenic and lead have shown a decreasing trend, while those of mercury and hexavalent chromium remain stable. The proportion of Category I-III river water quality sections of the provincial-controlled monitoring sections of the 24 branches of the Xiangjiang River has decreased by 4.8% than the previous year. Main contamination index include NH$_3$-N, TP and COD.

Meanwhile, Shi Zhu, Li Jianzhao and Li Xiaodong from Hunan Provincial Environmental Monitoring Center studied the water environmental capacity of Xiangjiang River sections within CZT region in 2008. The results showed that COD environmental capacity of Xiangjiang River sections within CZT region was 66,052 t/year and NH$_3$-N environmental capacity was 6,600.2 t/year (see [Reference]). Currently, the COD discharge quantity is 102,052 t/year, which is 1.5 times of the environmental capacity. And the COD discharge quantity is 19,951 t/year, which is 3 times of the environmental capacity. Respectively, the discharge quantity of COD and NH$_3$-N shall be cut by 35% and 67% to meet the demand of permitted discharge quantity. Within the calculated area, there is merely any environmental capacity available in the Xiangjiang River.
sections within CZT region, the majority of which need to cut the wastewater discharge quantity so as to meet the water quality target.

In recent years, Hunan Province has strengthened its environmental treatment on Xiangjiang River water. The situation is turning for the better, however, the development of this area must be conducted in a more prudent way during the implementation of total quantity control of water environment administration. See Table 2-4.
Table 2-4 Water Environmental Capacity of the Xiangjiang River Sections within CZT Region

<table>
<thead>
<tr>
<th>Unit</th>
<th>Length (km)</th>
<th>Flow Quantity Q (m³/s)</th>
<th>Flow Rate u (m/s)</th>
<th>Ideal Water Environmental Capacity (t/year)</th>
<th>Current Discharge Quantity (t/year)</th>
<th>Deducted Quantity (t/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>COD</td>
<td>NH₃-N</td>
<td>COD</td>
</tr>
<tr>
<td>Xiangjiang River Zhuzhou Urban Drinking Water Source Zone</td>
<td>11.5</td>
<td>443</td>
<td>0.206</td>
<td>3338</td>
<td>1350</td>
<td>13048</td>
</tr>
<tr>
<td>Xiangjiang River Zhuzhou Xiawan Port Contamination Discharge Zone</td>
<td>4.1</td>
<td>446</td>
<td>0.206</td>
<td>15972</td>
<td>778</td>
<td>20009</td>
</tr>
<tr>
<td>Xiangjiang River Zhuzhou Majiahe River Transition Zone</td>
<td>12.2</td>
<td>446</td>
<td>0.206</td>
<td>1079</td>
<td>108</td>
<td>1153</td>
</tr>
<tr>
<td>Xiangjiang River Xiangtan Urban Drinking Water Source Zone</td>
<td>19.0</td>
<td>509</td>
<td>0.18</td>
<td>8669</td>
<td>1860</td>
<td>8773</td>
</tr>
<tr>
<td>Xiangjiang River Xiangtan Zhaoshan Industrial and Agricultural Water Zone</td>
<td>12.5</td>
<td>509</td>
<td>0.18</td>
<td>4529</td>
<td>1553</td>
<td>8480</td>
</tr>
<tr>
<td>Xiangjiang River Xiangtan Zhaoshan-Muyun Transition Zone</td>
<td>4.2</td>
<td>509</td>
<td>0.18</td>
<td>859</td>
<td>26</td>
<td>41</td>
</tr>
<tr>
<td>Xiangjiang River Changsha Muyun-Fujiazhou Drinking Water Source Zone</td>
<td>29.1</td>
<td>511</td>
<td>0.2</td>
<td>18082</td>
<td>524</td>
<td>33262</td>
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<td>Xiangjiang Changsha Sanchaji Industrial Water Zone</td>
<td>14.3</td>
<td>212</td>
<td>0.2</td>
<td>5963</td>
<td>176</td>
<td>7249</td>
</tr>
<tr>
<td>Xiangjiang Changsha Kaifu District Industrial Water Zone</td>
<td>2.8</td>
<td>314</td>
<td>0.2</td>
<td>500</td>
<td>15</td>
<td>3874</td>
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<tr>
<td>Xiangjiang River Changsha Liuwei River Estuary-Laodao River Estuary Transition Zone</td>
<td>1.0</td>
<td>318</td>
<td>0.2</td>
<td>106</td>
<td>3.2</td>
<td>47</td>
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</table>
### GEF “China Urban Cluster Ecological Integrated Transportation Development Project” – Optimization of CZT Comprehensive Transportation Plan & Integration Implementation Scheme (Including Strategic Environment Assessment)

<table>
<thead>
<tr>
<th>Zone</th>
<th>Area 1</th>
<th>Area 2</th>
<th>Area 3</th>
<th>Area 4</th>
<th>Area 5</th>
<th>Area 6</th>
<th>Area 7</th>
<th>Area 8</th>
<th>Area 9</th>
<th>Area 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xiangjiang River Laoxia Industrial Zone</td>
<td>10.5</td>
<td>318</td>
<td>0.2</td>
<td>3710</td>
<td>110</td>
<td>260</td>
<td>431</td>
<td>1109</td>
<td>321</td>
<td></td>
</tr>
<tr>
<td>Xiangjiang River Xianing Transition Zone</td>
<td>6.0</td>
<td>534</td>
<td>0.2</td>
<td>1582</td>
<td>47</td>
<td>336</td>
<td>43</td>
<td>/</td>
<td>/</td>
<td></td>
</tr>
<tr>
<td>Xiangjiang River Changsha Wangcheng Drinking Water Source Zone</td>
<td>6.2</td>
<td>545</td>
<td>0.2</td>
<td>1663</td>
<td>50</td>
<td>3088</td>
<td>441</td>
<td>1425</td>
<td>391</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>66052</td>
<td>6600.2</td>
<td>10252</td>
<td>19951</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: sourced from Shi Zhu, Li Jianzhao and Li Xiaodong. Research of Water Environmental Capacity on the Xiangjiang River Sections within CZT Region. *Hunan Forestry Science & Technology*, 2012 (02).
3. Acoustic environment

The Annual Report on Environmental Protection of Hunan Province in 2013 shows that: The quality of acoustic environment in urban area of Hunan Province was in comparatively high level overall in 2013. According to the monitoring results from the point position which are intentionally set up, 14 cities achieved the secondary standard for the quality of acoustic environment in the noise of regional environment in the daytime and in the point position monitoring traffic noise on the road; as for the noise of regional environment in the nighttime, Xiangtan achieved the secondary standard for the quality of acoustic environment, while Changsha and Zhuzhou are out of limits; as for the traffic noise on the road in the nighttime, Changsha and Zhuzhou achieved the secondary standard for the quality of acoustic environment, while Xiangtan is out of limits. Compared with the previous year, the urban traffic on the road and the quality of regional acoustic environment stayed stable overall.

4. Environmentally sensitive spots

For the environment sensitive spots within the scope of transportation integration planning of Changsha-Zhuzhou-Xiangtan, see Table 2-5.

Table 2-5 Environment Sensitive Spots within the Scope of Transportation Integration Planning of Changsha-Zhuzhou-Xiangtan

<table>
<thead>
<tr>
<th>City</th>
<th>County District</th>
<th>Town</th>
<th>Sensitive Spot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changsha</td>
<td>Furong District, Tianxin District, Yuhua District, Kaifu District, Yuelu District (not including the Lianhua Town and Yu Changping Town)</td>
<td>Gao Tangling Town, Xingcheng Town, Huangjin Town, Leifeng Town, Dingzi Town</td>
<td>Tianji Ridge National Forest Park, Scenic Spots in Yuelu Mountain; Yanghu Yuan Wetland Park</td>
</tr>
<tr>
<td>Wangcheng County</td>
<td></td>
<td></td>
<td>Wu Mountain Forest Park (Huangjin Town), Shutang Mountain Forest Park(Dingzi Town), Gu Mountain Forest Park (Gushan Plains)</td>
</tr>
<tr>
<td>Changsha County</td>
<td></td>
<td>Xingsha Street, Muyun Town, Huanghua Town, Langli Town, Huangxing Town, Ansha Town, Tiaoma Town and Ganshan Town</td>
<td>Shi Yanhu Ecological Park</td>
</tr>
<tr>
<td>Zhuzhou City</td>
<td>Tianyuan District, Lusong District, Hetang District, Shifeng District and some regions in Zhuzhou County</td>
<td></td>
<td>Shennong City Theme Park of Zhuzhou: Dajing Scenic Spots (Zhuzhou County), Jiu Langshan Forest Park, Wu Yunfeng Forest Park</td>
</tr>
<tr>
<td>Xiangtan City</td>
<td>The scope of administrative district, Yuetang District</td>
<td></td>
<td>Zhao Mountain Scenic Spots, Fa Huashan Forest Park (not yet)</td>
</tr>
</tbody>
</table>
2.2. Overview and Overall Evaluation of the Scheme

2.2.1. The Original Scheme Summarization

(I) Background of Scheme Compilation

In 2011, CZT was taken into the state-level regional development plan as a major economic zone in China. Together with Wuhan Metropolitan Circle, the central China urban cluster, and Wanjian urban belt, it has become an emphatically developing region in central China. To ensure a scientific development of the CZT region, the relevant authorities have successively compiled The Development Plan of Changsha - Zhuzhou - Xiangtan Urban Cluster, and The Mid- and Long-term Development Plan of “3+5” Urban Cluster Comprehensive Transportation System, which have confirmed the regional comprehensive transportation development plan of CZT Urban Cluster and the surrounding five cities. In order to promote the implementation of the plan, this research has extended from the comprehensive transportation plan integration to the implementation scheme of the integrated transportation, which emphasizes the operability of the scheme implementation. The super-ministry reform has laid a sound foundation for the CZT comprehensive transportation integration in respect of mechanism.

(II) Orientation

The CZT Comprehensive Transportation Integration Implementation Scheme Comprehensive Transportation Integration Implementation Scheme and its prospectus emphatically study the cross-administrative region integration of the same means of transportation, and the integration of various means of transportation, as well as the integration of transportation with the social economy and resource environment.

(III) Research Scope

The core area of CZT is 8,848 square kilometers.

(IV) Research Duration

The near-term is 2015, and the long term is 2020.

(V) Object of Research

The comprehensive transportation system covers the CZT urban cluster region. It mainly consists of outbound transportation, Inter-city transportation and urban transportation.

(VI) Review of Scheme Compilation

The Scheme takes the relevant plans concerning the regional and comprehensive
communication gratified by the national, provincial and ministerial authorities as the proofs. By carrying out investigations on the status of the CZT comprehensive transportation system and making predictions on demands, it has analyzed the challenges for the CZT comprehensive transportation integration. On this basis, it has proposed implementation schemes in four aspects: “Coordinating and constructing the CZT outbound transportation system”, “Developing an ecologically integrated CZT Inter-city transportation system”, “Forging CZT ‘Transit Metropolis’ Urban transportation system”, and “Building up an integrated CZT intelligent transportation system”, and proposed the implementation steps and guarantee measures in the short and long term.

(VII) The Main Contents of the Scheme

1. Coordinating and constructing the CZT outbound transportation system

It shall review the CZT outbound transportation development in the holistic perspective of the CZT core area, take “the same transportation network” as the objective, gradually eliminate the barriers and bottlenecks of CZT comprehensive transportation, optimize the three cities’ comprehensive transportation channel and comprehensive transportation hubs, coordinate and construct the outbound transportation system for CZT integration, and improve the service efficiency and level of CZT outbound transportation. The major tasks include:

- Forge an international aviation hub in central China
- The CZT outbound railway network with a well-organized layout
- Optimize the Xiangjiang River’s waterway function
- Developing ring road for transportation of both passengers and goods

2. Developing an Ecologically Integrated CZT Inter-city Transportation System

Based on the Inter-city travelling demands of Changsha, Zhuzhou, and Xiangtan, it will center around the Inter-city passenger transportation hub featuring zero-distance transfer and seamless hitch, and gradually form the integrated, humanized and low-carbon Inter-city transportation system by taking the CZT Inter-city rail as the backbone, CZT Inter-city bus as the foundation, taxi as the supplement, and making use of social buses (including private and unit buses). The major tasks include:

- Speed up promoting the three cities’ Inter-city transportation infrastructure construction.
- Push forward the public transport operation of the Inter-city passenger transportation market.
- Improve the Inter-city public passenger transportation administration level.

3. Building an Urban Traffic System of CZT City Cluster

Implement the strategy of putting a premium on public transport, speed up the construction of transportation infrastructure, combine the intelligent transportation manners, and improve the transit service level and appeal, in a bid to provide convenient & well-rounded, rapid & timely, economical & comfortable, green & environment-friendly, safe & reliable high-quality public transport service, and encourage the citizens to choose public transport as the primary travelling manner within the city. By 2020, the public transport percentage in the core area of Changsha, Zhuzhou, and Xiangtan for urban citizens should be no less than 40%. The percentage in Changsha should be no less than 45%. The percentage in large-sized passenger transportation hub distribution structure should be no less than 50%.

4. Building up an Integrated CZT Intelligent Transportation System

Break down the mechanism of each authority going their own business, turn to top-management design, overall plan, implementation and coordination, and realize the open-end
mode of resourcing sharing, establish the combined structure of traffic comprehensive information platform, public transport all-in-one card, traffic information one-stop service, and passenger transportation ticket-selling all-in-one network, and realize the “information connectivity and service interoperability” of CZT. Enable the CZT public travelling to be more intelligent, and improve the information service level and travelling efficiency. Enable the government administration to be more intelligent, and improve the government’s scientific decision-making level and the public service capability. The major tasks include:

- Construct the CZT traffic comprehensive information platform;
- Provide CZT traffic information one-stop service;
- Realize CZT public transport all-in-one card application;
- Realize CZT passenger transportation ticket-selling all-in-one network.

### 2.2.2. The Original Scheme Appraisal

Through the assessment of the integrity of the original Plan and notes, and difficulty, coordination and adaptability of external, intercity, internal and intelligent transportation, with a total of 296 items assessed, including: 92 items of difficulty assessment, 102 items of compatibility assessment, 102 items of suitability assessment; problematic proposals have been optimized item by item; altogether 32 items have been optimized, including: 16 items were optimized in difficulty level, 12 items were optimized in compatibility, and 4 items were optimized in suitability. (See Annex 2 for details)

<table>
<thead>
<tr>
<th>Categories</th>
<th>Contents of Assessment</th>
<th>QTY of Assessment</th>
<th>QTY of Optimization</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>Integrity Assessment</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>External Transportation</td>
<td>Difficulty Level Assessment</td>
<td>31 (1 infeasible item)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Compatibility assessment</td>
<td>31 (2 incompatible items)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Suitability assessment</td>
<td>31 (1 unsuitable item)</td>
<td>1</td>
</tr>
<tr>
<td>Intercity transport</td>
<td>Difficulty Level Assessment</td>
<td>32 (3 comparatively difficult items)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Compatibility assessment</td>
<td>32 (5 incompatible items)</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Suitability assessment</td>
<td>32 (3 unsuitable items)</td>
<td>3</td>
</tr>
<tr>
<td>Urban transportation</td>
<td>Difficulty Level Assessment</td>
<td>25 (10 comparatively difficult items)</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Compatibility assessment</td>
<td>25 (4 incompatible items)</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Suitability assessment</td>
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<td>0</td>
</tr>
<tr>
<td>Intelligent Transportation</td>
<td>Difficulty Level Assessment</td>
<td>4 (2 comparatively difficult items)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Compatibility assessment</td>
<td>14 (1 incompatible item)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Suitability assessment</td>
<td>14</td>
<td>0</td>
</tr>
</tbody>
</table>

Through evaluation, this report thinks that, on the basis of full reference to the superior plan,
the implement and construction plans and corresponding guarantee measures are proposed for the above four aspects in the original Plan and notes. The research methods are correct. The planning system is complete. Views are solicited from many parties. Thus, the Plan is implementable.

However, a period of “transition” is needed to implement these measures by steps and stages. This report thinks that, in the current stage of CTZ development, energy saving and environmental protection from proposal should combine factors impacting the environment. Starting from the environment aspect, it is found that less than 60% environment and air quality in Changsha-Zhuzhou-Xiangtan area reach the standard. Sewage discharge keeps increasing. The indexes on air, water, noise, biodiversity and environment sensitive region have been established. The optimization is based on the environmental protection. Under the guidance of the optimization principle, part of project has the improvement space. Specific problems are as follows:

Regarding external transportation as the second runway of the airport is established, we will carry on to enhance the connection between the airport and the periphery. The site selection for airport will be the central town of Zhuzhou and Xiangtan. The passenger terminal of Zhuzhou and Xiangtan is in preparation for opening Huanghua Airport and will be finished by the end of 2014. It is relatively difficult for recent implementation. Adjust the highway network layout of the CTZ core area and form the “loop + radiation” highway layout. It is excessively advanced and goes against to intensive external channel.

Regarding intercity transportation: In terms of recent construction of other roads including Hongqi Road-Xiangyun Road, Tanyang Road-Qingxia Road, Changxiang Highway, CTZ South Outer Ring, National Highway 320 South Section, Furong East Road-Changshi Road, the necessity for recent construction requires assessing. “Subsidies for the intercity bus should be established according to the city bus standard, and ensure that the intercity bus is of social commonweal”. Further studies and assessments are required.

Regarding intercity transportation: In terms of “increasing the share ratio of the public transit by 2% each year from 2012 to 2013, and by 3% each year from 2014 to 2015”, incompatible development exists with the public transits between the three cities.

Regarding intelligent transportation: It is relatively difficult for recent implementation of establishing a CTZ traffic information platform (“One Platform”).

2.3. Optimization of the Original Scheme

2.3.1. Judgment of Future Trend of CTZ Development

As the demonstration area of a national “Resource-saving and Environmentally-friendly Society”, an important growth pole of the rising of middle areas and leading area of new-type urbanization & industrialization and new socialist countryside construction, CTZ – a internationally-class modern ecological urban cluster, particularly its core area development, will give strong impetus to the leapfrog economic and social development of the whole province and even the whole nation through its advantageous region coordination and priority in development. The report analyzes the future development trend in terms of CTZ population, urbanization process, industry and intercity transportation:
(I) In view of slow population growth, short-term infrastructure construction should be moderate.

Based on the population development characteristics of worldwide urban clusters, not all clusters can maintain rapid population growth. Take the population development of three major metropolis circles in Japan as an example. With rapid economic growth in Japan during the period of 1950-1970, the population of these three circles grew rapidly. However, during the period of 1970-1997, the population of Nagoya and Osaka circles ceased to grow and even declined because of population aging, bubble economy and population migration towards the Tokyo circle. In terms of the development level of urban clusters, the development is fast in east China while the central China is developing. CTZ is among the central developing clusters. In the future economic new normal, the population of the central region won’t grow as fast as that of the east region due to slow economic growth. Thus, the infrastructure construction should be moderate.

(II) The faster and more convenient passenger transportation is required to cater for increasing external connection.

At present, the proportions of three industries in CTZ area are 12%, 52% and 37%. Based on the development experience of worldwide urban clusters, the mainstay of all mature urban clusters or metropolis circles shift to the tertiary industry from the primary and secondary industries. E.g., the tertiary industry of Greater London accounts for over 90% and that of Osaka metropolis circle accounts for 76%. In light of such development trend, the tertiary industry of CTZ will occupy a larger proportion gradually.

The development of modern service industry imposes higher requirements on the passenger transportation of CTZ area. External transportation conditions of opened high-speed railways and increased international flights should be fully used to provide good linking and thus enable CTZ to be more accessible to the “world” and to take advantage of more external resources, with a view to making it more attractive to talents and capital.

(III) The secondary industry will continue to exist. External freight transportation structure is to be optimized.

CTZ area is at the middle stage of industrialization, dominated by the secondary industry accounting for 52%. The existence of the secondary industry needs the freight transportation support. The traditional freight transportation via highways cannot meet the requirements of the “Resource-saving and Environmentally-friendly Society”. Thus, the freight transportation structure should be optimized.

(IV) The integrated transportation may be achieved for Changsha, Zhuzhou and Xiangtan in the long term. However, business trips remain dominant in the short term.

The distance between Changsha, Zhuzhou and Xiangtan is 30-40km. According to the plan and long-term development, there is a chance to achieve the “integrated transportation” between the three cities. However, the trips between the three cities are not substantial (about 1000 person-time in rush hour), and trips between them are business-oriented. It takes several decades for both Tokyo and Beijing to form a commuting circle. So, it is impracticable and unnecessary to build an integrated commuting system between them in the short term.

In the short term, the transportation development of CTZ area should be focused on the reduction of trip cost and promotion of resource allocation optimization. In this way, they can share some infrastructures and social services, and essential productive factors can flow freely within wider scope.

(V) Urban boundaries will extend to make urban-rural connection closer.

With continuous development of the urbanization in CTZ area, the population in towns and townships will migrate to the core area with advantages of economic and social development. In light of such development trend, close attention should be paid to the relationship between urban form change and infrastructures so as to promptly adjust the infrastructure construction scale and time sequence. In addition, attention should also be paid to the urban-rural public transportation. Convenient trips should be provided between urban and rural areas.

(VI) The water resource protection of Xiangjiang River has drawn increasing attention.

It is proposed that in the Regulations of Hunan Province on the Protection of Xiangjiang
River which came into effect on April 1, 2013: “The protection of Xiangjiang River should follow the principles of protection first, coordinated planning, comprehensive control and rational utilization to attain the goals of water guarantee, better water quality and ecology and smooth waterway.” So, the protection of Xiangjiang River is the precondition for planning and construction of future freight transportation and infrastructures in CTZ area.

2.3.2. Evaluation of the original scheme

Based on the report of the evaluation of the original scheme, the report proposes the following specific optimization suggestions on the original Plan:

(I) The portal role of Huanghua International Airport should be strengthened. The Airport roadside collection and distribution structure should be optimized. The radiation scope of the Airport to three cities should be expanded. Overall external linking should be strengthened for CTZ area.

The Airport roadside collection and distribution methods mainly include: Car, taxi, commercial vehicle, airport bus as well as rail transit and intercity rail lines to be completed in the future. The collection and distribution structure is dominated by taxi and car (accounting for about 80%). Public transportation only accounts for 20%. Compared with typical international airports, the transfers of intensive transportation occupy a small proportion, and even lower from the Airport to Xiangtan and Zhuzhou. Through the analysis on the only available intensive transportation – airport bus, the above situation is mainly attributable to two factors, namely, inadequate coverage of the airport bus lines and too long waiting time.

In order to optimize the Airport collection and distribution structure for faster and more convenient intensive transportation and attract more travelers to go to Zhuzhou and Xiangtan via intensive transportation means for energy saving and emission reduction, the short- and long-term optimization measures are proposed in the report:

(1) In the short term, before CTZ rail line is opened, the airport bus should be fully used. It is recommended to adjust the vehicle type structure and operation services by replacing “long-time-interval big vehicles” with “short-time-interval small vehicles”, so as to shorten the waiting time and save resources.

(2) In the long term, with increasing demands for transportation to Xiangtan and Zhuzhou from the Airport, CTZ Intercity Railway should be fully used on the basis of current airport buses, so as to strengthen the linking between the Airport and railway stations and expand the Airport’s radiation scope. As Changsha Railway Station is an important station of the intercity railway lines and the transfer center for tours and business trips, it is recommended to conduct the feasibility study on setting an airport terminal at Changsha Railway Station. In addition, to strengthen the linking between the Airport and Changsha Railway Station, it is recommended to extend the maglev railway under construction to the Station via Changsha South Railway Station or build the Line 6 branch to directly connect the Airport and the Station.
(II) Considering the water resource restriction, the transportation via Xiangjiang River should be very prudent.

With regard to freight transportation, the original Plan proposes that: “In the CTZ freight transportation structure, the proportion of water transportation should be increased to 15%-20% from current 9%”. Meanwhile, according to the short-term plan, “Xiangjiang River pivot project will be advanced and great breakthroughs will be made in the construction of Xiangjiang River waterways”. The Phase I (Zhuzhou-Chengliji) of 2000 tonnage Waterway Project has been completed and put into use. Water transportation has advantages over land transportation in energy saving and environmental protection. So, Xiangjiang River should be fully used to optimize the freight transportation structure and develop water freight transportation. It is proposed that in the Regulations of Hunan Province on the Protection of Xiangjiang River which came into effect on April 1, 2013: “The protection of Xiangjiang River should follow the principles of protection first, coordinated planning, comprehensive control and rational utilization to attain the goals of water guarantee, better water quality and ecology and smooth waterway.” The report proposes that, the feasibility of use of Xiangjiang River to develop freight transport proposed in the original Plan should be studied by the water environment control department and transportation department in accordance with the Regulations of Hunan Province on the Protection of Xiangjiang River. The transportation via Xiangjiang River should be very prudent, provided that the protection of water resources in the Xiangjiang River watershed has been ensured.

(III) On the basis of CTZ Intercity Railway, their transportation resources should be integrated through addition/deletion.

CTZ Intercity Railway will become an important form of transportation connecting the three cities. Intensive transportation is characterized by energy saving and environmental protection. So, CTZ Intercity Railway should be fully used to provide fast, convenient and high-quality trips between them. The public transportation lines above the ground should be optimized to provide approximately “door-to-door” trip services. Specific suggestions proposed in the report are as follows:

(1) Overtaking conditions should be reserved during the construction of CTZ Intercity Railway. When future passenger flow rises to certain quantity, the railway operation organization can be optimized.

(2) After the intercity railway is opened to traffic, relevant lines should be optimized, including intercity/urban public transportation lines and passenger transportation lines. The linking between public transportation lines and the intercity railway within the three cities should be strengthened to expand the radiation scope of intercity rail lines. The lines with the same function with the intercity railway should be reduced or the operation services should be adjusted.
(IV) Internal transportation evaluation indicator of the three cities is changed to “green transportation ratio” from “public transportation ratio”.

At present, Changsha and Zhuzhou earn the title of “Public Transportation Metropolis” from the Ministry of Transport. Xiangtan is applying to the Ministry of Transport for “Demonstration City of Comprehensive Transportation”. To build a public transportation metropolis and demonstration city, their public transportation services should be improved to provide a full coverage of people whole-process superior service and diversified service modes. This can attract more people to choose public transportation and reduce car trips, so as to build a green transportation system. Internal transportation evaluation indicator of the three cities is being changed to “green transportation ratio” from “public transportation ratio” gradually. Specific suggestions are as follows:

1. Their public transportation service modes should be optimized. The mode of “urban rail transit + medium-capacity land system + regular public bus + public bicycle” should be established to provide approximately “door-to-door” trip services. Meanwhile, public transportation network above the ground should be optimized. The construction of utilities should be intensified, including special lane for public buses and public bus depots/stops.

2. With constant adjustment of town/township space structures, urban-rural public transportation should be developed in light of local conditions. Multi-level and different services should be offered in terms of service mode, line network organization mode and operation organization mode. A dynamic adjustment mechanism should be put in place in response to actual passenger flow demand changes, so as to adapt to the urbanization development. For the service mode, different service modes (such as fixed-route, fixed-shift and 24h, fixed-route, fixed-shift and rush-hour, and demand-response) should be adopted according to trip characteristics such as passenger flow demand and time distribution. For the operation organization mode, different operation methods (such as 24h, rush-hour or unfixed-time) are adopted according to actual passenger flow demands. For the line network organization mode, the mode of point-to-point or urban-rural public transportation-main hub- BRT- main functional zones is adopted. In addition, efforts should be made to build utilities for urban-rural public transportation, including roads, passenger transportation depots/stations, waiting room environment and information service.

3. With the focus on “internet + transportation” development idea, public transportation services should be improved through intelligent means. Intelligent means should be used to improve public transportation services in terms of operation dispatching, information release and public participation.

(V) The full-coverage and guiding hub classification system should be established to strengthen effective linking between the hubs of different levels within the urban cluster.
To make hub linking facility planning more people-based, strengthen effective linking between various forms of transportation and provide more convenient trip services, the report classifies hubs within the CTZ area into urban cluster hub, city-level hub and section-level hub as per the internal hinterland scope of the hubs instead of traditional standard. The urban cluster hub is the hub whose hinter covers the whole CTZ Cluster or bigger cluster, such as Changsha Huanghua Airport and Changsha South Railway Station (including Lutuo Long-haul Bus Station). The city-level hub consists of city-level primary hub and city-level secondary hub. The city-level primary hub is the primary hub whose hinterland covers the whole city, such as Changsha Railway Station (including CTZ Long-haul Station) and Xiangtan North Railway Station. Although the city-level secondary hub can radiate the whole city, its scale is smaller. The city-level secondary hub includes Changsha West Railway Station and Changsha West Long-haul Station (Hexi Transportation Hub Transition Station). The section-level hub is the hub on which the trips within the city sections and sections mainly rely, such as Muyun Station and Hetang Station.

Take Zhuzhou West Railway Station and Hexi Transportation Hub Transition Station as the example. Their collection and distribution systems are optimized to achieve the goals of energy saving and emission reduction.

(VI) The integrated intelligent CTZ transportation system should be built. In this regard, the following suggestions are given in the report:

1. In the short term, it is difficult to build a “platform” proposed in the original Plan. It is recommended that efforts should be made to fulfill three tasks in the short term, namely, strengthening data interface standardization, releasing the data resource catalogue and establishing the CTZ information resource interaction and coordination mechanism.

2. The “IC card data analysis and utilization” system should be built. Various big data processing technologies should be used to fully tap value-added potential of IC card data, convert IC card data to comprehensive passenger flow indicators of public transportation and apply them to the fields such as transportation decision-making support, transportation survey and public transportation network optimization.

3. The “urban transportation monitoring and analysis” system should be built. Transportation indexes should be used to achieve “stereoscopic” description of road network congestion characteristics. Traffic congestion plaguing the cities such as Changsha should be analyzed in an all-round, scientific and systematic way. The crux should be identified.

2.4 Strategic EIA

High attention is paid to environment and climate issues in the world and in China. The development of the transportation industry significantly affects environment and climate while promoting economic growth and fast and convenient trips. The results of recent analysis on atmospheric pollution sources show that, the haze is mainly attributable to transportation. Urban clusters are becoming a new mode of the urbanization development in China. Increasing attention will be drawn to the effect of urban cluster’s transportation on regional environment and climate in China.

For the strategic EIA for the project, the contents and methods of the strategic EIA suited for the Plan are put forward according to relevant domestic requirements on environmental protection and strategic EIA regulations and based on the CTZ transportation integration plan and foreign experience. The indicator system suited for the strategic EIA of the transportation project is established. The environmental impact prediction and assessment are conducted for different plans. In addition, the assessment is conducted regarding energy saving and emission reduction effectiveness and resource environment bearing capacity. The results show that,

Zero plan (if no task plan): CTZ is becoming larger in scale and stronger in power. The comprehensive coordination, management modes, policies, laws and regulations are not unified between and within Changsha, Xiangtan and Zhuzhou and between urban and rural areas. No systematic solution is worked out to the issues concerning comprehensive transportation development of the clusters. All these issues constrain their overall effectiveness. Existing transportation cannot meet the city’s development demands, which hinders social and economic development of CTZ Cluster.
Original plan: No comprehensive consideration is given to current water environment of Xiangjiang River. It is planned to make major breakthroughs in the construction of Xiangjiang River waterways, push forward the construction of CTZ waterways and ports as well as water/freight transportation development and open sightseeing routes on Xiangjiang River. This fails to meet the environmental protection requirements of Xiangjiang River. The arrangement of planned project construction sequence is irrational.

Optimized plan: The plan reflects a balance to be struck between social and economic benefits brought by the transportation integration and its effect on environment and society. For water transportation, it is recommended to prudently use Xiangjiang River to develop freight transportation and tourism to minimize the effect on water environment, provided that the water environment safety has been ensured. The purpose of “Resource-saving and Environmentally-friendly Society” is reflected in terms of low carbon and emission reduction of greenhouse gases.

Optimizing the CTZ comprehensive transportation integration plan and implementation plan is consistent with relevant national industrial policies. After the project implementation, atmospheric pollution emission can be significantly reduced. No significant effect will be caused to ambient environment if proper measures are taken against sensitive-point noise, and centralized collection/treatment and harmless treatment are effectively implemented for wastewater and solid wastes. Besides, the project implementation can bring economic and social benefits.

To sum up, from the prospective of environmental protection, the optimized plan – “Optimizing the CTZ Comprehensive Transportation Integration Plan and Implementation Plan” is feasible.

2.5. Benefit Assessment

Transportation is very external-oriented. It brings considerable economic and social benefits which may exceed the direct payment made by people for it. Meanwhile, it causes excessive impact on environment. Its development has significant adverse effect such as increasing traffic accidents, noise, pollution and climate change. Its external effect amount (i.e., how much is its monetary value and its proportion in GDP) is very vital for evaluating the environmental quality related to it. Its monetary value assessment also serves as an important basis for the transport department to make effective allocation decisions.

The main reasons why we assess external costs of transportation are as follows: 1) make effective use of environment, the scarce resource; 2) get macroeconomic estimation of external costs of transportation; 3) provide the decision-making basis for the transport department to formulate control and pricing policies. Microeconomic data about environmental impact caused by different forms of transportation is essential for making accurate decisions and strategies; 4) EIA constitutes an important part of the assessment and analysis of transport investment costs and benefits.

Based on full analysis and assessment of original and optimized plans and summarization of domestic and foreign experience as well as the theories such as sustainable development theory and externality theory in economics, the optimization effect of zero, original and optimized plans is analyzed by using the scenario analysis method.

For the benefit assessment, the implementation plan is optimized. The scientifically reasonable indicator system for ease of operation and quantization is established according to the benefit analysis requirements of various aspects, including promotion of multi-transportation integration of CTZ Cluster, elimination of market segmentation to facilitate transportation service integration and increase comprehensive transportation service combination efficiency to achieve resource saving, emission reduction and environmental friendliness. The indicator calculation is conducted for the optimized plan in terms of economic, social and environmental benefits.

Through the assessment of social and economic benefits of the original and optimized Plans, the report thinks that, with high priority given to intensive resource utilization and environmental friendliness, the optimized Plan gives coordinated consideration of infrastructure construction sequence in terms of coordinated development of transportation and city and construction cost saving and achieves comprehensive transportation integration for better social and economic
2.6. Guarantee Measures and Relevant Suggestions

With regard to the issues mentioned in the original Plan such as inconsistency of public-transportation and public-welfare orientated modification of “intercity passenger routes” with market orientation, and nonuniformity in system & mechanism and legal guarantee of CTZ area, the report proposes that a balance should be struck between governmental and corporate responsibilities and guarantee measures should be provided such as establishing proper system & mechanism, capital and legal systems. Furthermore, suggestions should be given on the infrastructure construction time and optimized plan implementation guarantee mentioned in the original Plan according to actual demands of CTZ area.

3. Project Experience Sharing and Demonstration

3.1. Project Demonstration

3.1.1. Advancement

Driven by energy conservation and emission reduction and sustainable development, the project has introduced strategic environmental impact assessment to urban cluster transportation planning for the first time and carried out social and economic benefit assessment synchronously with the transportation planning process.

The project, driven by energy conservation and emission reduction and sustainable development, has introduced strategic environmental impact assessment to urban cluster transportation planning for the first time, referred to successful overseas assessment experience and scientific analysis method, carried out environmental impact assessment on the CZT urban cluster on the early planning stage with strategic environmental impact assessment as the focus, optimized the scheme reasonably by analyzing the CZT urban cluster population and its economic development trend in combination with environmental quality status covering air, water, sound and ecology and the resource bearing capacity and carried out assessment on environment quality, energy conservation and emission reduction and social and economic benefits synchronously with the transportation planning process. As it has mitigated or reduced adverse impact on the surrounding environment in the construction of the CZT integrated transportation facilities from the source, geared itself to international practice from ideology and methods and given full play to the ecological destruction and environmental pollution role of the decision-making source, it is of advancement.

With emphasis on integrated transportation of urban cluster as a starting point, the optimized scheme attaches importance to facility integration, transportation integration and information service integration.

The study has promoted integration of infrastructure and operation and management integration between intra-city transportation and external transportation by optimizing the airport distribution system, explored the capacity of existing roads among the three cities by optimizing
the dead end highway construction scheme and strengthened information service interconnection by optimization suggestions on intelligent transportation information platform and IC card connectivity.

3.1.2. Exemplariness

The exemplariness of the study method lies in its preparing the comprehensive transportation integration plan at an urban cluster level and integrating strategic environmental impact assessment into the comprehensive transportation integration plan to mitigate or reduce adverse impact of the transportation facility construction on the surrounding environment.

The project fully investigates and summarizes domestic and international strategic environmental impact assessment and successful experience. Based on this, bearing the environmental protection in mind, this project follows the principles of “aligning with the transport planning, comprehensive and diversified assessment standards, public participation and feedback”. This project analyzes the planning schemes in combination of comprehensive integrated transport planning. Through field visit and onsite survey, the environmental quality status is identified through adopting such methods as comprehensive index, overlay analysis and ecological analysis. The environmental impact assessment indexes are selected through matrix analysis, network analysis, overlay analysis, grey system analysis, layer analysis, scenario analysis, and expert consultation. The assessment indexes of air, water, noise, biological diversity, and environmental sensitive zones are established. The planning schemes are analyzed from the perspective of environmental impacts and energy saving in the areas of external transport, intercity transport, intra-city transport, and smart transport, based on the assessment index system, by adopting elastic coefficient method, trend analysis, system dynamics method, input-output analysis, balanced demand and analysis analysis, numerical simulation, and environmental economics analysis. The program is evaluated to avoid or reduce the negative environmental impact brought by developing CZT Urban Cluster. Research and assessment methods are feasible, with referential values to be popularized.

At the technical level, strategic environmental impact assessment made interaction with transport planning and Established environmental, social and economic benefit assessment indicator, developed benefit assessment methods at the layer of urban cluster planning.

Based on the sustainable development, the comprehensive integrated CZT transport plan starts from the angle of environmental protection, and introduces strategic EIA in the planning process, aiming to assess the environmental impacts of plan implementation and its alternative schemes. Starting from the planning scheme, strategic EIA identifies transport development space and direction through analyzing demographic and economic development trend in CZT urban cluster, analyzing the status of environmental quality, resource capacity and environmental capacity. The transport system is planned from the environmentally friendly perspective through assessing planning by the EIA indicator system.

This research firstly assesses the environmental, social and economic benefits from the layer of urban cluster. The planning assessment index system is established from environmental, social and economic benefit aspects in combination of domestic and international experience. At the same time, establishing suitable assessment methods. The implementation results are assessed
by selecting CZT Urban Cluster as a case. This project will provide a reference for assessment the results of urban cluster planning scheme and its optimized schemes.

3.1.3. Operability

In the process of implementing this project, the consulting party keeps contact with local governments and pays attention to local survey, in order to accurately identify the development trend of Changsha, Zhuzhou, and Xiangtan and optimize the scheme so as to make it more operable. Since the outset of the project, the consulting party has attached great importance to the research and study on the CZT region. The expert group has travelled to Hunan province 5 times to conduct field studies, and had an informal discussion with 13 organizations, including the Hunan Provincial Transportation Department, the Hunan CZT Urban Cluster Two-type Society Coordination Committee Office, the transport authorities of three cities and relevant enterprises. The consulting party has established a sound communication mechanism, through more than 40 telephone or e-mail discussions to solve various problems. During the field studies, more than 29 sets of study files have been collected, more than 330 questionnaires have been completed, the experts understand the hotspot issues cared by local governments, and put forward practical and feasible solutions in terms of adjusting bus routes to accommodate intercity rail transport, extending dead-ended roads, and optimizing the hub collection and distribution.

The 13th Five-Year Plan for Transportation Development of Hunan Province drafted by Hunan Province, fully leveraging the research results of consulting agency, has covered such contents as “strengthening transport infrastructure building and optimizing interconnection”, “coordinating urban and rural passenger transportation development” and “improving comprehensive transportation service guarantee capacity”. These contents take the advices of transport integration, strengthen hub transportation connection and service, emphasize the construction of public transport and service, and increase the safeguarding role of smart transport in transportation system. In particular, the key aspects hampering transport integration have been improved, including strengthening hub connection, public transport integration in three cities, promoting the interconnectivity of public transport IC cards and upgrading new energy vehicles.

3.2. Sharing experience

3.2.1. Sharing the experience accumulated in the project implementation process

Paying attention to the interaction with Party A

The exchange with Party A is important for ensuring the successful consulting project. It’s important to understand the requirements of Party A and win over their support. During the project implementation, the consulting party should pay attention to the communication with the World Bank and the project office, and timely respond to their requirements, with project working report prepared and project progress reported timely. In particular, in project proposal stage, the consulting party hereby establish the team led by core experts to hold meeting with the World Bank for clarifying unclear research contents and result requirements. After the consensus reached, the memorandum should be drafted and actively implement.

Promoting public participation
The project respects and protects the citizen’s information, participation, expression and supervision rights about environment. Establishing the social action system, encouraging all citizens to participate in environmental protection, strengthening promotion and mobilization, releasing environmental protection information, smoothing channels for public to express their opinions and requests, strengthening citizen’s participation from the beginning and in the whole process, and ensuring the wide range of public participation.

Winning over local support

In the process of project implementation, it is important to win over local support and timely know local demands, in particular, when project scheme needs to be implemented. In implementing this project, the expert group have attached great importance to the research and study on the CZT region. In nearly one year since implementing this project, the expert group has travelled to Hunan province 5 times to conduct field studies, and had an informal discussion with 13 units, including the Hunan Provincial Transportation Department, the Hunan CZT Urban Cluster Two-type Society Coordination Committee Office, the transport authorities of three cities and relevant enterprises. The expert group has established a sound communication mechanism, through more than 40 telephone or e-mail discussions to solve various problems. During the field studies, more than 29 sets of study files have been collected, more than 330 questionnaires have been completed, the experts understand the hotspot issues cared by local governments, and put forward practical and feasible solutions in terms of adjusting bus routes to accommodate intercity rail transport, extending dead-ended roads, and optimizing the hub collection and distribution.

Strengthening communication in the sector

During the project implementation, the project results are timely exchanged with experts in the sector, to sharing project experience. It is important to exchange with each other for optimizing project results. On August 11-12, 2015, according to the requirements of project outline, the consulting party organized “the workshop on comprehensive integrated transport in urban cluster” and “the training on comprehensive transport governance in large cities”. The participants include government officials, experts from research institutions, university and college students and more. The experts present delivered their speeches and commented on a series of topic, such as the development of intercity and intra-city railway in China, airport hub, regional integration, the transportation development thought and strategy during the 13th Five-Year Plan period, comprehensive integrated transport plan strategic EIA, theory and empirical studies on optimizing comprehensive transportation structure, TOD project planning and design, basic rules (characteristics) of comprehensive transportation system in the context of urbanization, the future trend, strategic tasks and solutions, traffic congestion control in large cities and development solutions. The government officials, experts from research institutes, university and college students proposed their questions and exchanged with each other. Many good ideas were shared and summarized.

3.2.2. Technical experience sharing of the project

Except sharing of the experience obtained in the working process of last section, technical experience obtained in the optimization process of the project is worth learning and sharing. Taking comprehensive transportation hub of Hexi, Changsha as an example, summarize successful
experiences of Hexi comprehensive transportation hub from the aspects of project idea innovation, project operation mode, management mode and investment and financing mode, so as to provide experience for the construction of relevant projects in the future.

Project idea
The technological path for promoting the modernization development of transportation is jointly constructed through associated and complementary “four transports” with comprehensive transport as the core, intelligent transport as the key, green transport as the guide and safe transport as the basis. Taking the comprehensive transportation hub of Hexi, Changsha as an example, this project comprehensively develops the transport in accordance with the transport planning of “the 12th Five-Year Plan” of China, adopts market-based operation mode and professional team, and improves service level, logistics efficiency and overall efficiency; through comprehensive research and analysis on project environment, traffic organization, intelligent application, building energy conservation, etc. and comprehensive application of information technology, this projects aims to achieve intelligent management and realize connectivity and interworking of information, management modernization, information networking and business electronization; adopts idea of green construction, takes the lead in applying sewage source heat pump (renewable energy sources) system, effectively controls energy consumption through energy consumption control and monitoring system and heat recovery system in later operation, and meanwhile adopts vertical roof landscaping to fully reflect the characteristic of green and resource-saving and environmentally-friendly society; the project subject accepts the supervision of the government and the industry, perfects the security system, and implements the safety responsibility.

The implication of comprehensive project development on newly built and renovated passenger transportation hub
While newly establishing and renovating traditional passenger transportation hub, if permitted by policies and regulations, the commercial development could be carried out in line with the market rules, to maximize land utilization and increase commercial value. We could effectively use traffic flow to guide consumption, transfer business opportunities and source construction fund. The station quality could be improved through increasing supporting facilities and services, to change the image of traditional station and avoid becoming obsolete in a certain period. The transport planning is reasonable and clear with functional modules clarified and preventing unlicensed cabs in the hub.

The average daily capacity is designed at 250,000 people/trips in Dahexi Hub. We will comprehensively consider such factors as transport advantages, effective traffic flow and commercial space, passenger and freight traffic flows. Various commercial facilities are planned in advance such as spatial scale, designed load, firefighting requirements, smoke exhaust and pollution discharge, as well as passage. The well-equipped commercial facilities are conducive for investment invitation and business operation, ensuring profitable business.

The implementation of product construction management model for road transport infrastructure investment
The infrastructure could be invested through a diversified equity structure, to establish efficient corporate governance mechanism based on checks and balances. Through design and general contracting model, the project construction costs could be fixed initially to effectively control and reduce costs. Total construction and management budget is controlled. Along with annual (phased) budget verification and approval, the construction and management expense is
The implication of project financing and investment method and channel in the new situation

Through the comprehensive development, the infrastructure project possesses certain profitability and meets the bank loan requirements. Also, the infrastructure project and commercial project are combined. The construction fund is sourced from commercial development profit. The financing principal and interests are paid back from commercial operation profits. The project realizes the sustainable development through normal operation and management. With well-designed plan and successful operation, the project could go public and offer re-financing conditions for new infrastructure construction.

Document [2014] No.43Wen Xin Zheng issued by the State Council clearly states that “the financing vehicles shall not newly increase government debt.” Also, “the social capital is encouraged to participate in urban infrastructure and other public welfare investment and operation with certain profits through franchise and other methods”. At the national policy level, China has promulgated guideline polices for infrastructure construction and adopted a comprehensive development model, to improve the operation and service quality of public welfare endeavours.

The significance of the project managed by a professional team

Featured as “professional, progressive, practical, effective, dedicated and loyal”, the professional team accepts the new model in the shortest time demonstrating strong learning capability. They fast integrate into the team and achieve results by matching up their respective positions. All team members are from the market from the management team to grassroots employees. Their work results are ensured through performance management, with strong competitiveness. They involve in the whole process with strong management accountability. The professional talents could be supplied in line with project demands. The team could also be orderly disassembled at the end of project according to the contract, without any invisible employment benefit expense. Human resource cost is under control, aligning with the employee’s performance. Meanwhile, the management experience could be summarized regularly to optimize the project model, continuously provide the best products and high-quality services, making positive contribution to the long-term sustainable development.

Technological route for “four-transport” project concepts

The project is centered on comprehensive transport, smart transport as the key, guided by green transport, and based on safety transport. These four transport concepts are interconnected and complemented with each other, consisting of the technological route and promoting the development of modern transport system.