Investigation and Analysis on the Management Problem  
and Requirement of Chinese Urban Rail Transit  
Construction and Planning along the Lines

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Abstract 
Urban rail transportation construction in China has entered a brand-new stage of rapid development with integration with urbanization, and the deficiency of related urban supporting planning and financing for rail transportation construction have thus emerged increasingly rigorous. The mode of overall rail transportation development is being accepted by more and more cities in this context. This paper, based on the questionnaire survey on the overall rail transportation development in China as well as the progress of plannings concerned, analyzes on the development of and problems existed in the overall development in China as well as the preparation of related supporting plannings, and calls for making clear the opportunity, standards and main body for preparing plannings concerned to establish the legal status of “related plannings for overall rail transportation development” from the perspective of the mutual integration and feedback between urban planning system and rail transportation planning system. 

Key words: Development along rail transportation; Planning and management; Investigation and analysis 

1. Developing background of rail transportation 

1.1. Construction and investment of rail transportation 

By the year of 2012, cities that have been ratified of the construction of rail transportation have been as many as 35 in our country and the overall permitting mileage has been 3,000 kilometers. The rail transportation in our country which is the biggest urban rail transportation network in the world has entered a period of fast development. The fast development of urban rail transportation reflects the urgent requirement for urban development in our country and it also obviously shows the problem of out-sync between the development of urban rail transportation and urbanization and mechanization: the speed increase of mechanization is much higher than that of urbanization, which leads to the increasing jam of urban transportation, and developing mass urban rail transportation becomes the only choice. Urban rail transportation construction in China has entered a brand-new stage of rapid development with integration with urbanization. 

Chart 1-1a and 1-1b is the statistics of the rail transportation construction and investment of...
country in recent years. From the chart we can see clearly and definitely the blowout type development of rail transportation in recent years, especially during the Twelfth Five Year Plan. The investment of New permitted rail transportation construction is over 1,000 billion yuan. The world's largest single category of infrastructure investment projects - rail transportation investment accounted for the proportion of new urbanization total investment reached 5%-10%.

Rapid development of rail transportation has brought rapid growth in demand for funds, and rail transportation construction investment in the proportion of government financial expenditure is also growing. From 2008, the growth rate of the track investment quota exceeded the growth rate of government revenue, (as chart 1-2 indicates) The role played by the financial revenue in the balance of financing has gradually weakened. This phenomenon is also very obvious from the results of the rail transportation survey of some typical cities. According to the survey, we find that the construction of rail transit accounts for a very high proportion of the entire financial revenue in the course of the construction of rail transportation. From Chart 1-3 and Table 1-1 we can see that it is basically close to 10% in Suzhou and Nannin. This is indeed a high proportion of the city's finance and causes a lot of pressure to the city’s finance. This indicates that the financing channels for the construction of track can not rely on Government Finance. Broadening the financing channels, and making full use of social capital has become the necessary requirements for the construction and development of rail transportation.

Figure 1-2 Comparison of the growth rate of fiscal revenue and track investment in China
After the rail transportation is put into operation, it is also a big challenge to ensure that the rail transportation enterprises can have a reasonable running cost. Figure 1-4 and figure 1-5 are the typical urban rail operating losses and the proportion of the city’s financial subsidies.
Through the above chart we can see clearly that most of the city's rail transportation operating costs accounting for the proportion of operating costs are still high. So how to reduce the government's financial subsidies, how to improve the proportion of non-ticket income sources, and how to realize the sustainable development of rail transportation have become an urgent problem to be solved. From the situation of the world, the operating income of the rail transportation enterprises are generally the following aspects: fare revenue, government financial subsidies, and comprehensive development, and the development of land along the line and so on. In short, the development trend of its business model is a diversified land management.

1.2. Profound impact of rail transportation

The development of rail transportation has a profound impact on the development and layout of the whole city as well as the construction of the city center area. Taking Shanghai and Stockholm as an example (see figure 1-6a and figure 1-6b), it can be seen from the comparison of urban built-up area and rail transit network planning that rail transportation is very obvious to guide the development of urban construction.

As can be seen from figure 1-6b, with the continuous development of Stockholm's rail line network, the overall urban space form has formed the development trend of the growth of the urban space and has a great impact on the expansion of urban space. In fact, after the opening of rail transportation in Shanghai and Beijing, the impact on the layout of urban space is also very significant. This paper is to consider the rail transit construction and urban layout, urban planning on the same platform, so we must pay attention to its great influence, but not limited to the transportation level.

From four circles of the track engineering circle, traffic travel circle, and preference and behavior circle, comprehensive urban circle this article analyzes the interaction and influence of the whole
Rail projects affect the behavior and preferences of travel, business residents, and even affect their choice of cities. Figure 1-7 reflects the effect between the four circles.

Rail transportation construction has such a profound impact that it requires us to plan and design according to the current thinking. Many cities in China have been exploring in this area, especially in Beijing, Shanghai and Hong Kong, which have accumulated a lot of experience in this area.

1.3. Integrated development of rail transportation

The integrated development of rail transportation is the appreciation of land by the rail transportation as the guide and the comprehensive utilization of the rail passenger flow and the track. From the angle of the coordinated development of the urban system, we can achieve the financing of the construction capital and make up the operation loss. Also we should take three goals of the comprehensive social benefits of rail transportation as the starting point, emphasize mutual benefit and prosperity of rail transportation and land development, emphasize the positive impact on urban spatial structure, industrial layout and transportation integration. Comprehensive development is an important basis for improving and increasing the integration of urban rail transit and city and attaining sustainable development of rail transportation.

Our country's rail transit development includes the effective financing of the rail construction capital, making up the operation loss, and playing the comprehensive social benefit of the rail transportation. And the whole city's social development benefit should be the most important. Therefore, the comprehensive development of the rail transportation is not only the sustainable development of the rail transportation construction itself, but also the requirement of the sustainable development of the city. However, in the present conditions, the comprehensive development of the rail transportation can be said to be in a stage of exploration because of the various aspects of the system. Figure 1-8 is a carding of comprehensive development of the current rail transport system.
The graph shows that the current comprehensive development is still free in the urban planning system, and has not yet achieved effective contact with the rail transit planning system. And the comprehensive development of this paper is a design link between the two and in the design of a cross position.

2. Survey information

2.1 Extent of Investigation and scope

The focus of the research is divided into urban planning management department and rail transportation construction and development department according to the research content. A total of 15 city carry out research including Beijing, Shanghai, Nanjing and other cities who has been built in the construction of urban rail transit or in the relevant departments. Figure 2-1 for the distribution of the survey of objects cross nation.

2.2 Investigation content

The survey not only put forward 115 specific issues to urban planning and management departments, but also put forward 16 aspects of the problem to the rail transportation construction, development department. Hoping that through these problems, can form some common understanding,
such as the current situation and problems, especially in the mechanism of the system. We hope to strengthen the planning for the construction of the track and put forward some suggestions.

2.3 Research purposes and methods

2.3.1 Investigation purpose

For urban planning and management departments, we mainly want to understand the following aspects of the situation:
- At present, the recognize of the urban planning and management departments to the "rail transportation comprehensive development";
- At present, the urban rail transit development in the relevant planning;
- At present, the role of the urban planning and management departments in the establishment of the "integrated development of rail transport";
- At present, the understanding and cognition of the relevant supporting plan for the integrated development of rail transportation in the urban planning and management departments.

For rail transportation construction, development department, we mainly want to understand the following aspects of the situation:
- The recognize of railway transportation construction, Development Department to the "rail transportation comprehensive development";
- Ways of financing of urban rail transit construction and the development of "comprehensive development";
- The understanding of the establishment of the relevant planning of the railway transportation construction and Development Department.

2.3.2 Investigation method

This investigation mainly uses two kinds of ways, namely the questionnaire survey and the spot discussion.

3. Survey result analysis

3.1 The necessity of comprehensive development

Departments not only recognize the huge investment in rail transportation, the very long in cycle, but also realize that the rail transportation construction is a great pressure for the public finance, so for the comprehensive development. It can not only play a huge role in the sustainable development of the future rail transportation, but also can be a successful experience in the world.

3.2 Goal analysis of comprehensive development

For the goal of the comprehensive development, the various departments have different views, but its direct goal can be summarized as the construction of capital, make up for the loss of track operations, coordination of the relationship between the relevant units and interests of the main body,
as a platform for its communication and coordination. Besides, there are many indirect targets, such as integrated resources, coordination of public resources layout, guiding line station location, optimizing engineering design, adjusting the function structure, optimizing the intensity of land development, optimizing the distribution of railway passenger flow, improving the operating conditions of the track, maintaining public interests, perfecting market rules and so on.

3.3 The practical significance of comprehensive development

On the practical significance of the integrated development of rail transportation, the survey respondents generally accepted the role of "integrated development", which is highlighted in the following three aspects: first, to integrate, promote and coordinate the construction development (29%); to raise track construction capital (27%). Optimize station, line and engineering design (23%).

![Survey on the practical significance of the comprehensive development of rail transportation](image)

The planning and management departments and the main body of the rail transportation construction and investment have reached a common understanding on the importance of the comprehensive development of rail transportation. The comprehensive development work is of great significance in the rapid development of rail transportation and urbanization. Comprehensive development in the financing of the deficit, space integration, traffic improvement, optimization of engineering and other key aspects as the key of the roll. Integrated development is an important means to achieve sustainable development of rail transportation.

3.4 The analysis of current situation of comprehensive development

3.4.1 Willingness actively to develop

All sectors of the rail transportation is very active in the development of integrated development, and more than 80% rail transportation construction or investment entities have been carried out or are being carried out land reserves, property development or the development of the upper cover property projects and other types of rail transportation comprehensive development projects. The comprehensive development of the important function of the railway construction unit has become an inevitable trend, and through the comprehensive development of the balance of the construction investment has become an inevitable choice.

Almost all development companies are inclined to the choice of the land around urban rail transit
station for development, and there are about 60% of the development companies are willing to consider the railway station or rail facilities on the upper cover of the property, and the combination of different degrees of land development companies are widely favored. Figure 3-3a and figure 3-3b react to this situation.

3.4.2 Limited development benefit

From the investigation of the city of real operation of rail transportation, we learned that the benefits of rail transportation integrated development is not expected so good. We hope that the role of the comprehensive development can play a very big role in financing, but in fact from the completion and operation of the situation concerned, the benefits of integrated development and other aspects of subsidies and other aspects, is a very small proportion. From figure 3-4 can be clearly seen.

From this aspect, we can say that there is still a lot of space for the development of rail transit, but in the other hand, there is still a certain gap between the benefits of the comprehensive development and the expected value of the integrated development. As can be seen from table 3-1, the city of Tokyo and other cities in the country compared to the obvious advantages of business income. But all of the site and transfer center are gathered in the city center area, and its own business development revenue is only 31%, and the box office income compared to still a big gap. Therefore, for the comprehensive development of China’s cities, the challenge is very grim.

3.4.3 Great demand for development

In accordance with approved rail transportation planning 11187 km mileage and 5593500000000 investment calculations (assuming the cost per kilometer of 500000000), assuming that 60% of them are obtained from comprehensive development financing, the required supporting development or
financing of integrated development scale will reach 1678000000 square meters (according to the 20000000 per square meter to provide financing estimates). Such a large amount of development is a huge demand, therefore, the comprehensive development of the huge market, the future may also be a huge benefit. Figure 3-5 is the main urban rail transit planning and construction.

![Graph](image)

3.5 **Effect analysis of comprehensive development**

3.5.1 **Overall evaluation of the implementation effect**

For the overall evaluation of the implementation effect of rail transport, the main track construction is generally considered as a certain effect, but the role of the railway construction financing or make up for the loss of operation is still limited or to be tested. At the same time, as the main administrative department, the planning and management departments also have a general attitude to the comprehensive development of urban comprehensive benefits. Figure 3-6 analysis of what we do.

![Pie Chart](image)

According to the survey, the implementation of rail transport integrated development have a big difference compared to the expectations, and the current comprehensive development of income is not obvious. There is a considerable part of the development cannot be very good, the effect of the proportion less than 20%, can feel the effect of the part only 27.27%, the effect of the poor part more than 1/3. Visible, on the one hand, we are aware of the development and see the great potential. On the other hand, we should realize that the current situation is not ideal for the development effect.
3.5.2 Analysis of factors restricting the implementation effect

Based on the constraints of the comprehensive development of the implementation effect of the factors we also conducted a survey analysis, the results shown in figure 3-7a and figure 3-7b.

Survey results show that the main factors which restrict the comprehensive development effect are: the positioning of the main body of rail transportation is poor; the current land transfer system can not realize the transfer of land resources to the main body of the track construction, the problems of land tenure and transfer policy, the overall positioning of the track construction planning and management objectives are still large improvement and optimization requirements. In addition, China's current rail transport integrated development work is generally lack of public interest in the intervention and protection, and over emphasis on investment performance.

3.6 Optimization analysis of integrated development planning

3.6.1 Analysis of the establishment of comprehensive development planning

Whether from the planning and management departments, or from the rail construction sector is concerned, are very stressed to plan to strengthen the guidance of planning, and have carried out the work in this area to fully play its benefits, figure 3-8b and figure 3-8a as the survey results.
The survey results show that most of the construction units are carried out or plan to carry out the comprehensive development of various types of rail transportation related research, overall planning or implementation plan. Whether it is the railway transportation construction or planning management departments are generally attached importance to the preparation of planning.

3.6.2 Exploration of planning guidance and optimization

According to the survey, the development of rail transportation comprehensive development content covers a wide range, from the overall development of the overall planning or planning, to the control of land and underground space planning, and then to the station based on urban design and detailed planning, the preparation of a wide range of categories. There are statutory planning and planning, as well as in statutory planning, see figure 3-9.
We have carried out many attempts and explorations in this field. We have tried to explore the feedback mechanism of the construction of rail transit and urban planning through the form of non statutory planning and research consultation. At present, we do the planning may be most of the non statutory planning, and this kind of non statutory planning can only serve as a reference, can not play a role in planning, therefore, to really do a comprehensive development, the status of statutory planning is irreplaceable.

For planning of the two departments, rail transportation system and urban planning system, we want to implement a comprehensive development what should do first is to break the system barriers how to better achieve interoperability between the two. So that we can ensure that we can play the best track traffic along the best efficiency, which is not the approval of the general building.

As shown in the existing urban planning system and track construction system into two independent vertical system, only control, approval, no interaction, feedback, can not do process optimization. so we need to adjust its focus on the interaction between the two and feedback, and will be planning to intervene early in the comprehensive development.

3.6.3 Analysis of the limitations of planning

In view of the above problems, we have carried out a survey on the planning and preparation of the situation, and the analysis results are shown in figure 3-10.
According to the results of the survey, the current planning lack of the guidance of national, specific operation chaos, fan out from point to area based lack of comprehensive consideration, planning prepared more concentrated in the surrounding the site level, accounted for more than 65% of surveyed total. The most prominent limitation is manifested in two aspects: late intervention, line stations been set, difficult for the system to guide the construction of rail; lack of co-ordination, and difficult for the system optimization space corridor.

3.6.4 Objective analysis of planning

For the purpose of the plan, we have also done some investigation, the results shown in figure 3-11.

![Analysis of the purpose of planning](image)

From the picture we can see, most of the planning department take plan as the important means to raise the construction capital which its main purpose, and the track development department is more focused on the integration, promotion coordination of the development of the urban construction. Both the purpose of the planning is not the same. And a few have been completed the full line of the comprehensive development plan is lack of effective preparation content guidance. The planning objectives and content is not very clear. The preparation of the contents have larger differences. The understanding of the target and the contents in the overall development exist bias and one-sided.

3.6.5 Inverted analysis of planning sequence

The comprehensive development plan can be divided into five stages: the network planning of the rail network, the fixed line of the railway construction planning, the engineering feasibility research.
station, the design of the whole project, the initial construction design. In view of the current planning time survey results see figure 3-12.

Fig. 3-12 All kinds of planning time survey

As is shown in the picture, at present, the time of China's rail transportation integrated development of the planning is lagging behind, and more than 80% of the relevant planning are in the work, some even after the overall design completed, such as integrated development planning after the completion of the project. Rail transportation as a major construction projects of the government has a special management requirements and procedures, should be early intervention to the initiative, in order to benefit the coordination and interaction between the two.

3.6.6 The lack of the main body of the planning system

In view of the present situation of the preparation of the plan we have done some investigation, see figure 3-13.

Figure 3-13 Rail transportation planning

From what we have done, we have learned that most of the planning lacking of the actual involvement of the main body of the rail development and the interests of stakeholders; The planning of the independent establishment is often lack of effective attention, coordination, operational feasibility to the comprehensive target.

3.6.7 The summary of integrated development planning guidance optimization

In the comprehensive development of PPP model, the existing rail transportation planning lacks the capacity and mechanism of protecting public interest and clear market rules; the lack of the integrated development of urban planning, the lack of effective control and management methods; the lack of the coordination of development performance, financing needs and long-term objectives in urban planning system.

Planning procedures and practices: planning objectives, content and depth, lack of normative constraints and guidance; the lack of clear requirements for the preparation of the timing, the preparation of the main body of the program and other statutory planning, coordination between the need to coordinate the planning, planning and construction of the lack of effective interaction between the system.

3.7 Survey and Analysis on the current situation of comprehensive development and planning

3.7.1 Integration and coordination of relevant planning

Whether it is necessary to make systematic and comprehensive feedback and adjustment to the
planning of the area along the route at the time of the integrated development of the rail transit planning and construction or track. Results see figure 3-14.

In the pre-construction (such as the construction, planning or feasibility study stage) whether there is a need for comprehensive development plan or the overall development plan. The results shown in figure 3-15.

Survey shows that the general awareness of the need to adjust the planning and adjustment, the overall recognition of the need for a comprehensive development plan across the board.

In addition, we have done some other aspects of the investigation, the results of the survey, see Figure 3-16, figure 3-18, figure 3-17.
The survey results show that all departments generally consider the need of national guidelines or standards; the best starting time for the industry to be stage. The most needed planning research is transportation planning, underground space planning, land reserves and transfer plan, control detailed planning, planning management and implementation of research.

3.7.2 Construction planning communication bridge

Integrated development planning system of rail transit needs to provide the basis for the feedback mechanism of the statutory planning system. Specific mechanisms are shown in figure 3-19.
3.7.3 Comprehensive development content

1. overall development strategy
2. line, site selection optimization and site function positioning
3. land optimization adjustment
4. site integrated design guidelines
5. land reserves and the overall development mechanism and planning proposals

4 Conclusion

How to do a good job of rail transportation development needs two aspects. It should carry out the integrated development of rail transport and mechanism research at the whole network level planning stage and determine which areas are integrated development focus and the entire urban space adjustment by the planning department, rail transport sector, the development and Reform Commission. In short, planning the preparation of land need the city planning department to take the lead and the rail transportation departments, the Department of the Department, the municipal, housing management sector active participation, mutual coordination and common completion. The following suggestions are put forward in this paper:

1. the legal procedure and status of comprehensive development plan should be set up to establish the main body and time, and the purpose, content and depth of the system should be put forward;
2. the best time for the establishment of the rail transit project feasibility study stage;
3. the purpose of the comprehensive development plan is to raise the construction capital, integrate, promote and coordinate the development of urban construction, optimize the layout and design of the station and line function.

To make the comprehensive development planning of urban rail transit depends on the innovation of the planning system, and it also depends on the cooperation and cooperation between different departments and stakeholders. As for a city and rail transportation business, power in the future, looking around further active exploration.
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Bid program summary, this paper represents only the initial planning and design stages of research bid Study, planning and design reflect actual results.


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