

LONG-TERM REGIONAL REQUIREMENTS CLARIFIED THROUGH TRANSPORTATION PLANNERS' SCENARIO WRITING

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abstract: This article aims at proposing a method to create the future vision, which is a qualitative, long-term prospect of regional requirements in the future, providing fundamental conditions for the transportation planning. The future vision is obtained through scenario writing by transportation planners concerned. The future vision consists of several future images, each of which involves current status, policy direction and role of transportation plan in terms of infrastructure building and management.

1. INTRODUCTION

When planning transportation projects over a wide area, the most significant data is the number of the personal trips in one day. The method of surveying the personal trips and analyzing the results have already been systematized during the length of a three-decade-long field study. The quantitative analysis is usually based on a conventional four-step forecasting technique to ensure a reasonable level of satisfaction from a practical point of view. The conventional method has estimated the transportation demand in the future by use of the data taken by the personal trip survey and also have made the plans for counterbalancing the difference between the transportation demand and the existing capacity with new infrastructures(see the right box in Figure 1).

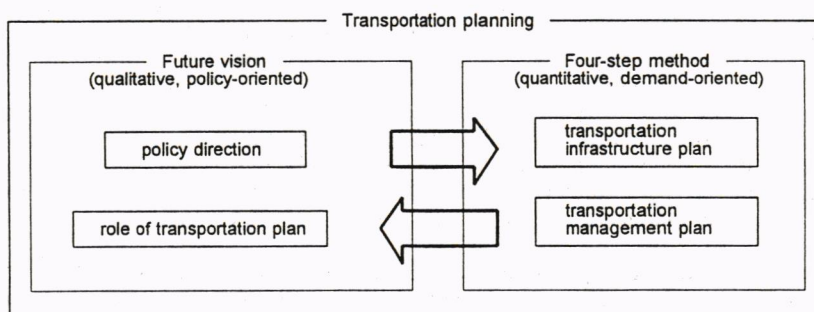


Figure 1 Concept of transportation planning in this study

Indeed the conventional method was very effective in the days of economic growth because it made a rule for the transportation demand to increase, but is not so useful now that there has been a slight growth in economy. Moreover when the target planning period is as long as 15 to 20 years, or when planning in the situation such that the construction of infrastructures indispensable to our daily life is nearly finished, in addition to quantitative discussion, a qualitative analysis should be taken into account. The qualitative analysis can reflect the socioeconomic circumstances both in and outside of the country that influence the transportation trends, and the changes of individual values that will determine travel demand in the future. As illustrated in Figure 1, the quantitative analysis and the qualitative analysis should work together by holding the fundamental information in common and exchanging their proper information.

The present paper aims at attempting to include a new qualitative analysis, which is based on a long-term perspective, in the process of transportation planning with the personal trip survey. Stated in other terms, this paper proposes a new approach to show the long-term regional requirements from the viewpoint of global transportation planning. The approach is rather policy-oriented, and mainly discusses a policy direction, a role of the transportation plan, and so on (see the left box in Figure 1). In this approach scenario writing and Delphi method are important tools. The transportation planners are asked to write scenarios of the future vision for the area that assesses the role of transportation plans. Through Delphi feedback processes, agreement among the planners can be reached on the future image of the area, with clarifying the various problems to be discussed in the transportation planning process. Needless to say, the quantitative and qualitative methods should be complementary to each other. The future vision is expected to create more rational and realistic transportation plans in collaboration with the conventional four-step method.

The study area is the North Kyushu Metropolitan Area (Fukuoka Prefecture and a division of Saga Prefecture, Japan), where the third personal trip survey was carried out in 1993 and the long-term transportation plan is now in the planning stages utilizing the data. The estimated time frame of the completion date of the plan is 2015.

2. PRINCIPLES FOR MAKING THE FUTURE VISION

This article defines the future vision as the specific description of the characteristics of the area for the target year including the policy direction that the area should be leading to. The principles for making the future vision are as follows.

- (1) Future vision is decided for the specific area of the North Kyushu Metropolitan Area.
- (2) Future vision has a number of aspects, because in the same area there are carried out different kinds of activities, both international and local, both economic and cultural. Therefore the area can be an economic center in the East Asia as well as a cultural community adapted to the aged society. In order to describe each future aspect, scenarios are drawn up with a hierarchical structure of 'future image' (top level) - 'current status' (upper middle level) - 'policy direction' (lower middle level) - 'role of transportation plan' (bottom level). Future image is the planning strategy or the title to specify the future vision, while the policy direction and role of transportation plan are more detailed objectives and plans with proposed actions.
- (3) A team of transportation planning experts directly makes the future vision, future image and scenario (Masser *et al.*, 1992). Here the experts include the authors, the transportation engineers, planners and managers in local authorities in the target area.
- (4) In order to increase appropriateness and feasibility, the future vision, future image and scenario should take into account the opinions of various interest groups and their contents should be amended accordingly.

This study employs the Delphi method (for example, see Arai *et al.*, 1984), as it can

clarify the difference between people's perception and opinion, and encourage to share common understanding in the feedback process of repeated questionnaires. The subjectivity and prejudices of the planners are thus excluded and the knowledge and values that the planners lack can be supplemented (Crookall *et al.*, 1995).

3. METHOD OF MAKING THE FUTURE VISION

The flow diagram of making the future vision is illustrated in Figure 2. Initially, the concept and direction of the comprehensive national development plan are summarized. By studying the structural changes over time in the North Kyushu Metropolitan Area and by reviewing the master plan of each city in the North Kyushu Metropolitan Area, the structure of the whole area can be understood. Combining the results with the socioeconomic outlook for the target year yielded an initial version of the future vision, which is referred to as the "primary future vision."

Subsequently, a questionnaire survey was carried out in order to correct errors including in the primary future vision, and to add any missing information. The secondary future vision thus can be obtained after revising the primary future vision by referring to the results of the questionnaire.

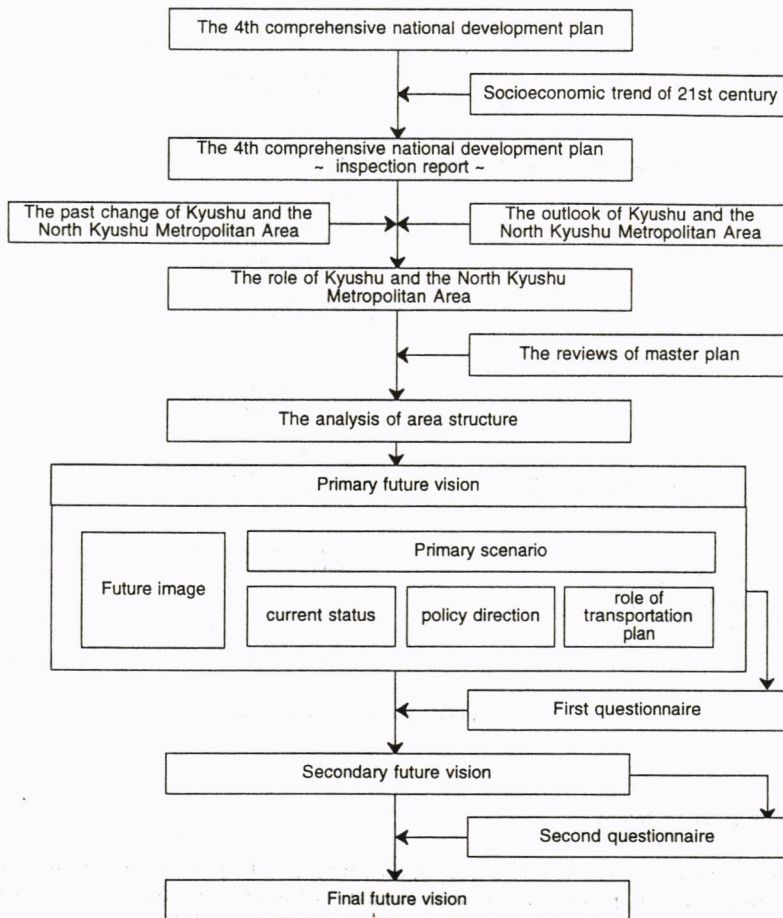


Figure 2 Flow diagram of making the future vision

Finally, another questionnaire survey was conducted to increase the feasibility and consistency of the scenarios. The secondary future vision revised by the questionnaire can thus be used as the final version of the future vision (simply called the future vision). The working procedure is described below.

3.1 Setting of Future Image

Based upon the fourth comprehensive national development plan (see National Land Agency, 1987, 1993), and the analysis of the roles of Kyushu and the North Kyushu Metropolitan Area, the future images of the area in the early 21st century were set as follows.

- (1) Macroscopic viewpoint : Taking account of important economic relationship between surrounding areas, the North Kyushu Metropolitan Area is aimed to be "the center for vital development."
- (2) Microscopic viewpoint : Due to the increasing diversification of personal values, the area is aimed to be "the community providing a comfortable life."
- (3) The above two images were further broken down into seven future images, whose titles are illustrated in Figure 3.

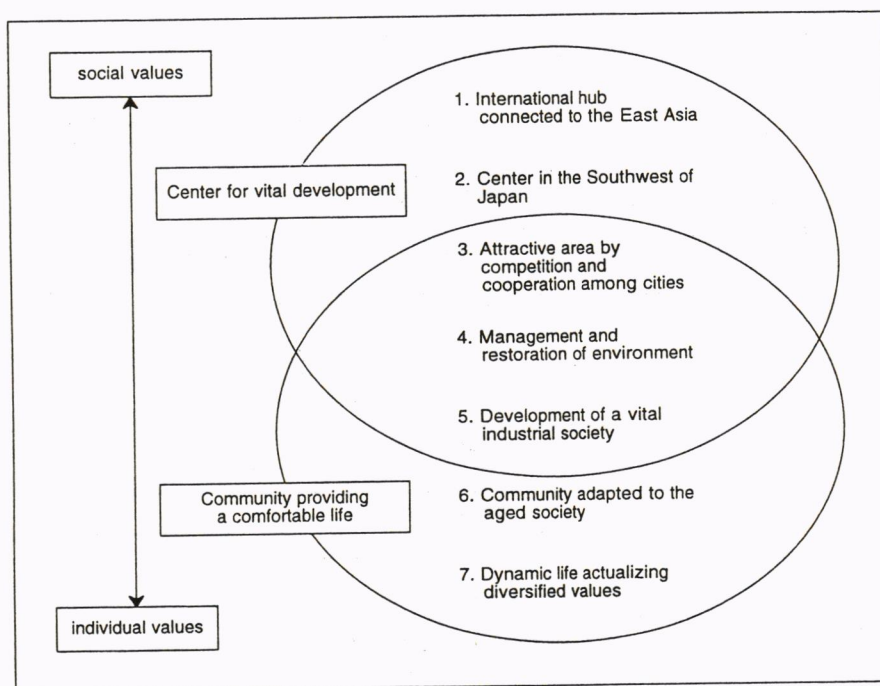


Figure 3 Seven future images

3.2 Primary Future Vision

The detailed content of the seven future images was clarified based on an analysis of the area structure, existing plans and projects under consideration. Next, the transportation planners drew up the scenario to achieve each future image as follows.

- (1) Keywords associated with each future image were collected in brain-storming among the transportation planners.

- (2) The current status of each future image was assessed accurately. The collected keywords were categorized into four classes according to policy direction, role of transportation infrastructure plan, role of transportation management plan and other measures.
- (3) Based on the list of keywords, the scenario was written according to the following viewpoints.
 - (a) Current status : The current status of the North Kyushu Metropolitan Area was described considering the socioeconomic changes from the past.
 - (b) Policy direction : The policy direction of development expected to realize each future image was described.
 - (c) Role of transportation plan : The roles of transportation plan both in terms of infrastructure and management were assessed in order to determine the policy direction of each future image.

3.3 First Questionnaire

The first questionnaire survey was implemented to evaluate the importance of elements, to correct errors, and to add any missing information concerning the primary future vision previously formed. Table 1 illustrates the major survey items. This survey was conducted against people involved in transportation planning or who have technical knowledge about transportation planning; specifically university staff(17 persons), government staff (22) and think-tank staff(17) were selected.

Table 1 First questionnaire

Item	Content
Future image	<ul style="list-style-type: none"> • Evaluation about content of future image (probable or not) • Addition of missing information
Current status	<ul style="list-style-type: none"> • Evaluation about current status (probable or not) • Addition of missing information
Policy direction	<ul style="list-style-type: none"> • Evaluation of importance and feasibility of direction A:important and highly feasible B:important but less feasible C:not important
Role of transportation plan	<ul style="list-style-type: none"> • Evaluation of importance and feasibility of direction A:important and highly feasible B:important but less feasible C:not important • Addition of planning elements (important and highly feasible)

3.4 Secondary Future Vision

The team of transportation planners revised the primary future vision by referring to the results of the first questionnaire(see Figure 4). Every item of the questionnaire was determined to be one among 'Adoption', 'Non-adoption' and 'Re-examination' according to an overall evaluation of the importance and feasibility of the elements. 'Adoption' is subdivided into three categories; 'Adoption with non-amendment,' 'Adoption with slight amendment,' and 'Adoption after revision.' For 'Adoption with slight amendment,' some addition and/or reinforcement were made on the keywords, and for 'Adoption after revision,' the content was revised with referring the responses to the question items. Items determined to be 'Non-adoption' were removed from the future vision.

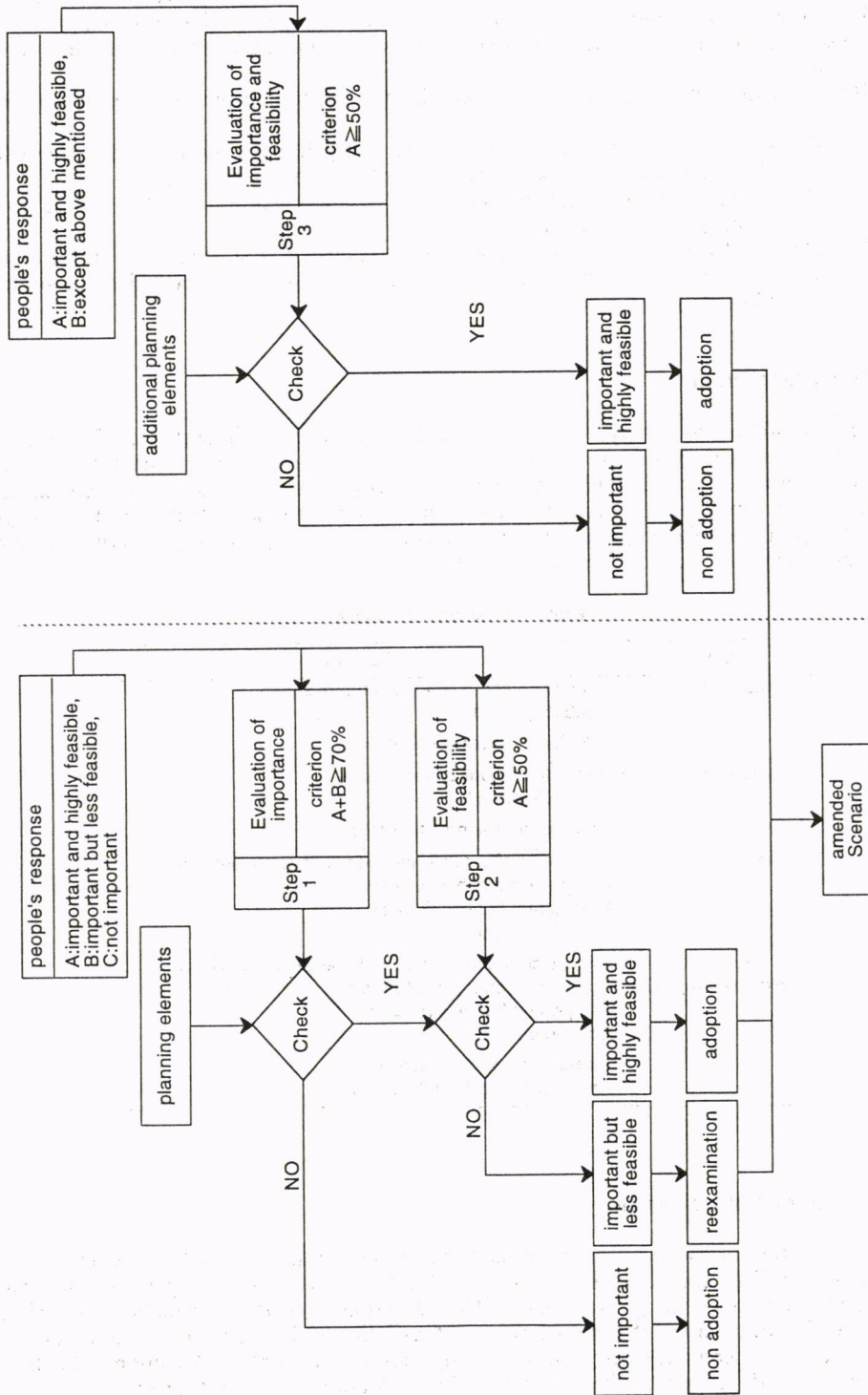


Figure 4 Method of revising the primary future vision based on the first questionnaire

A questionnaire survey was carried out again to assess the difficulty of implementation for those elements that were determined as "important but less feasible."

3.5 Second Questionnaire

The second questionnaire survey re-examined the elements of transportation plan judged in the first survey as "important but less feasible", and asked questions about the regional axis that means here a degree of the socioeconomic relation between regions. The questions were added in order to make to the revised scenario detailed (Table 2).

Table 2 Second questionnaire

Item	Content
Questions about feasibility of transportation plan	<ul style="list-style-type: none"> • Reexamination of importance and feasibility • Important issues to realize the plans (technological, institutional, and financial)
Questions about regional axis	<ul style="list-style-type: none"> • The connecting axis to be strengthened

3.6 Finalizing the Future Vision

Based on the results of the second questionnaire, the secondary future vision was revised in order to obtain the final version of the future vision. The method of revision was as follows.

- (1) Implementation scheme of transportation plans : The feasibility of achieving the transportation plans was re-examined by the same as before. If the degree of importance of an element was more than 70% and the degree of feasibility was less than 50%, amendments were made considering the important issues for its implementation.
- (2) Regional axis : In addition to the results of the questionnaire, considering the existing and future connections among the regions, the desirable way to strengthen the regional axis was clarified.
- (3) Mutual adjustment of future image and scenario : 1Because the scenarios to realize the seven future images were partially overlapped and contradictory to some extent, the contents were adjusted among the future visions and scenarios after the secondary revision.

4. FUTURE VISION OF NORTH KYUSHU METROPOLITAN AREA

As stated above, the future vision of the North Kyushu Metropolitan Area proposed in this study is composed of seven future images, and the scenarios to realize each future image. The structure of the future vision and scenario is illustrated in Figure 5. This chapter describes only a scenario titled "Attractive area by competition and cooperation among cities" as an example.

4.1 Future Image

The North Kyushu Metropolitan Area, which is the leading area of the Kyushu Island, has been urbanized owing to the concentration of population, industry and economy. However, in some parts of this area, because of the stagnation of the industrial and economic activity, their populations have been gradually decreasing.

By predicting the population in various ways, the population is expected to peak in the North Kyushu Metropolitan Area, the same as in Japan, in the beginning of the 21st

century but then expected to decrease.

In order to build an attractive area, it is necessary to activate the area by competition and cooperation based on the characteristics and individuality of each city and region. This activation will maintain the population, stimulate population exchange and form active industry/economy and a highly individualized cultural society.

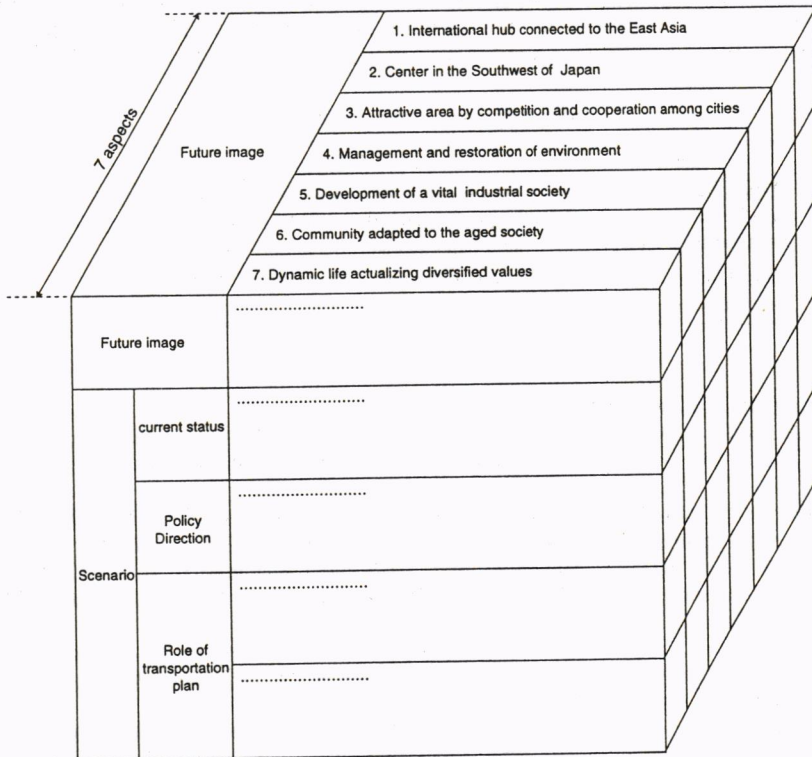


Figure 5 Structure of future vision

4.2 Scenario

4.2.1 Current status

Fukuoka Prefecture occupying most of the North Kyushu Metropolitan Area has a population of 4.83 million, making it the ninth largest prefecture in Japan, and its population has been increasing similar to Kumamoto Prefecture. The urbanization ratio, which is defined as the share of population in the densely inhabited district, is 66.5% and has been gradually increasing. The population of Saga Prefecture, which occupies a part of this area, is about 880,000 and the urbanization ratio is 27.0%. Both have remained constant in recent years. The ratio of population of both prefectures to that of Japan and Kyushu are 4.6% and 42.8% respectively.

By investigating the share of various industries' output of Kyushu to Japan, the area's agricultural productivity is estimated to be 3.7% to 21.6% respectively and the share is predicted to decrease. On the other hand, manufacturing and commercial output have been increasing, and the share of manufacturing is 3.8% in Japan to 50.9% respectively.

Also, the share of commercial output is 3.7% and 55.2% respectively.

Urbanization by the concentration of population and various city functions is in progress in the North Kyushu Metropolitan Area, and its influence is extended not only within this area but also throughout Kyushu and Yamaguchi Prefecture. Within the Fukuoka Urban Area whose core is Fukuoka City, the concentration of population, politics, and culture is advancing. Particularly with the extreme concentration of many city functions, Fukuoka City is now preparing the Fukuoka Dome as a theme-park, the Science Park as a base for the information industry, and Kyushu University as an academic sphere, while Kitakyushu City is planning an international exhibition hall as the international function and a project for western academic zone.

On the contrary, in some fishing and agricultural towns and villages, the stagnation of the main industries forces their population and area activities to decrease.

4.2.2 Policy direction

According to various estimations (Research Institute for Population at the Ministry of Health and Welfare, Kyushu Economics Investigation Association, etc.), the population of the North Kyushu Metropolitan Area is expected to peak in the early 21st century and then to decrease. However, in the Fukuoka Urban Area, the increase of population continues and the peak will be slightly delayed compared with other central cities such as Sapporo, Sendai, and Hiroshima.

In these circumstances, to maintain the activity of all the North Kyushu Metropolitan Area, and to grow into one of the core cities in Japan, commercial development comparable with the three major areas, namely Tokyo, Keihanshin and Chukyo, is required. The North Kyushu Metropolitan Area has a latent potential to grow. But the population concentration in Fukuoka City, the largest city in the area, is not necessarily desirable, which has capacity problems concerning water supply, wasted disposal, etc. Therefore, the development in combination with the Kitakyushu Urban Area that is another core area must be discussed. For medium and small sized cities, links with large cities are strengthened, and by utilizing their impact, promotion of local industries, concentration of advanced industries (e.g., information industry), and welfare infrastructures are encouraged in order to build a comfortable city and region.

Specifically, making efficient use of nature, history and tradition, Fukuoka City plans to become an international exchange base by increasing its concentration of city functions such as information, communication, academic research and international exchanges. Kitakyushu City plans to become an international technological city with a high quality environment, strong industrial activity and advanced research in order to contribute to the international community. These cities will perhaps eventually form one large metropolitan area by competing and cooperating with each other.

Concerning the medium size cities in this area, the promotion plans are as follows. Kurume City will be a technological core city with a focus on research and development. Tosu City will be a core city for trade due to its ideal geographical position. Oomuta City will be a technologically industrialized city based on its existing industries and by attracting new industries. Iizuka City and Munakata City will be promoted as academic research cities in cooperation with some universities.

To give core cities and medium size cities their own directions for growth, effective and strong links between the cities are required such as the cooperation between Fukuoka City and Kitakyushu City. The city and industrial functions of the in-between towns such as Yukuhashi City and Buzen City, which are on the East Kyushu Axis, and Tosu City and Oomuta City, which are on the extension of the Primary National Axis, will be strengthened. Concerning the Chikuhō Area, it is important to increase the links with the

two core cities, namely Fukuoka City and Kitakyushu City. Between the Chikuho Area and Fukuoka City, information and communication, academic research and city connections should be initiated. Also, between the Chikuho area and Kitakyushu City, industrial, information and communication links must be strengthened. In the towns in between, it is necessary to increase the city and industrial functions and enlarge the concentration of city functions.

On the other hand, agricultural and fishing towns and villages offer a better living environment and scenery, therefore such attractions will be combined with the attractiveness of large cities and medium and small sized cities, supplementing each other to form an attractive area.

As mentioned above, the active area will be created by the competition and cooperation among cities and regions within the area, and by enhancing the population mobility that will be caused by inter- and intra-regional exchanges.

Clearly, the understanding and cooperation of local inhabitants is indispensable when implementing the projects as stated above. It is therefore necessary to build a system to reflect the opinions of local inhabitants as much as possible.

4.2.3 Role of transportation infrastructure plan

Expansion of the North Kyushu Metropolitan Area to be one of the leading areas in Japan must be accompanied with the policy for upgrading transportation infrastructures and services to give access to the residential districts within the area and interchange of the population. From the viewpoint of long term planning, high-level trunk roads and high-speed public transportation networks will be constructed between Fukuoka City and Kitakyushu City. Both cities also will require the circular roads and the high-speed inter-city roads to get high mobility, better public transportation such as a subway network, including the extension of existing subways, and a new public traffic system will become key issues. Other cities should improve their accessibility to the two core cities, and upgrade of transportation infrastructures within the regional axis is necessary.

As the trade increases, to promote exchange, a new logistics system should be built, which will automatically run in tunnels under roads. However, the construction cost seems expensive, so the profitability of the system must be considered. In implementation and/or improvement of transportation network systems, active utilization of the terminal areas (such as the vicinity of railway stations) will be also vital.

4.2.4 Role of transportation management plan

In order to promote exchange of population, it is important to provide the convenient and comfortable public transportation. Examples are a common transport fare system between different public transport modes, which is partly in effect (between buses, railways and bus/railway of different companies), a common ticket system, and a common prepaid card system to reduce the complexity of changing between the public transports. They are also important for making the use of public transportation networks more efficient. On the other hand, to reduce the heavy traffic congestion in the cities, the planners should consider better control of automobiles into the city center, time staggering of commuting, flex time system, policies for managing transportation demand, and technical developments of such systems.

With the progress of today's information society, in order for this area to play an important role internationally and domestically, the information and communication infrastructures must be enhanced. A wide-area information network will be newly constructed along the national expressways, and the local information networks will be

built utilizing the existing road networks.

4.3 Direction of comprehensive transportation plan

A comprehensive assessment was made on the direction of comprehensive transportation improvement/plan, considering the regional axis determined in the second questionnaire and the seven future images. This study focused the discussion on which axis should be strengthened to realize the future image. The results were finally summarized and arranged on a map, which is illustrated in Figure 6. This map shows the direction for implementation and improvement of the future transportation infrastructures in the North Kyushu Metropolitan Area.

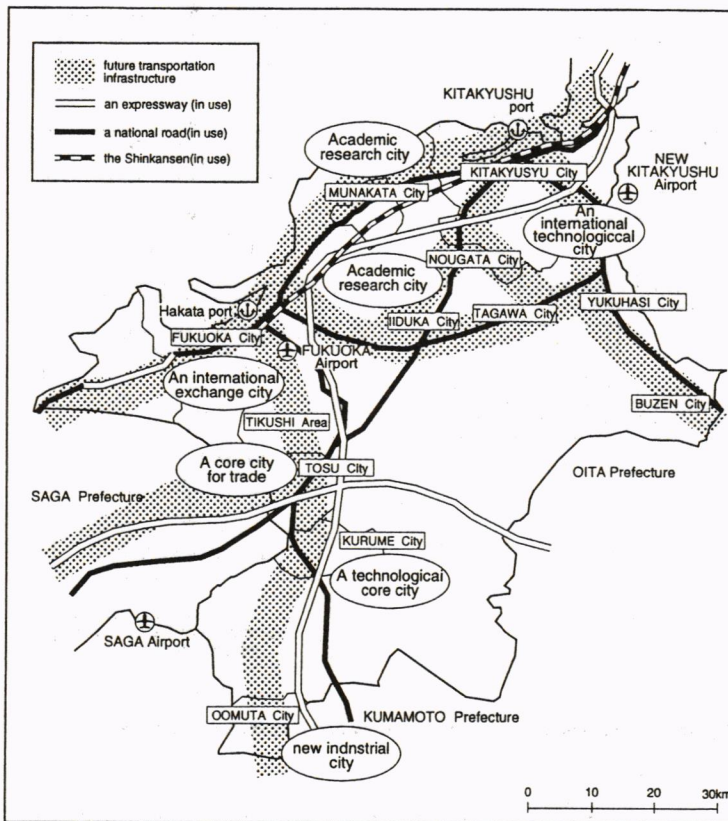


Figure 6 Future transportation infrastructures in the North Kyushu Metropolitan Area

5. RELATIONSHIP BETWEEN PROPOSING PLANNING SYSTEM AND CONVENTIONAL PERSONAL TRIP SURVEY SYSTEM

The new planning system with the future vision is policy-oriented and qualitative, while the conventional transportation planning technique based upon the personal trip survey is demand-oriented and quantitative. Though both methods have their different standpoints, joining the two methods will surely enlarge the effectiveness of planning the transportation projects. This study proposes the method to integrate them, illustrated in Figure 7. The right side of the figure shows the scheme of the conventional transportation planning procedure using the data taken by the personal trip survey. The future vision

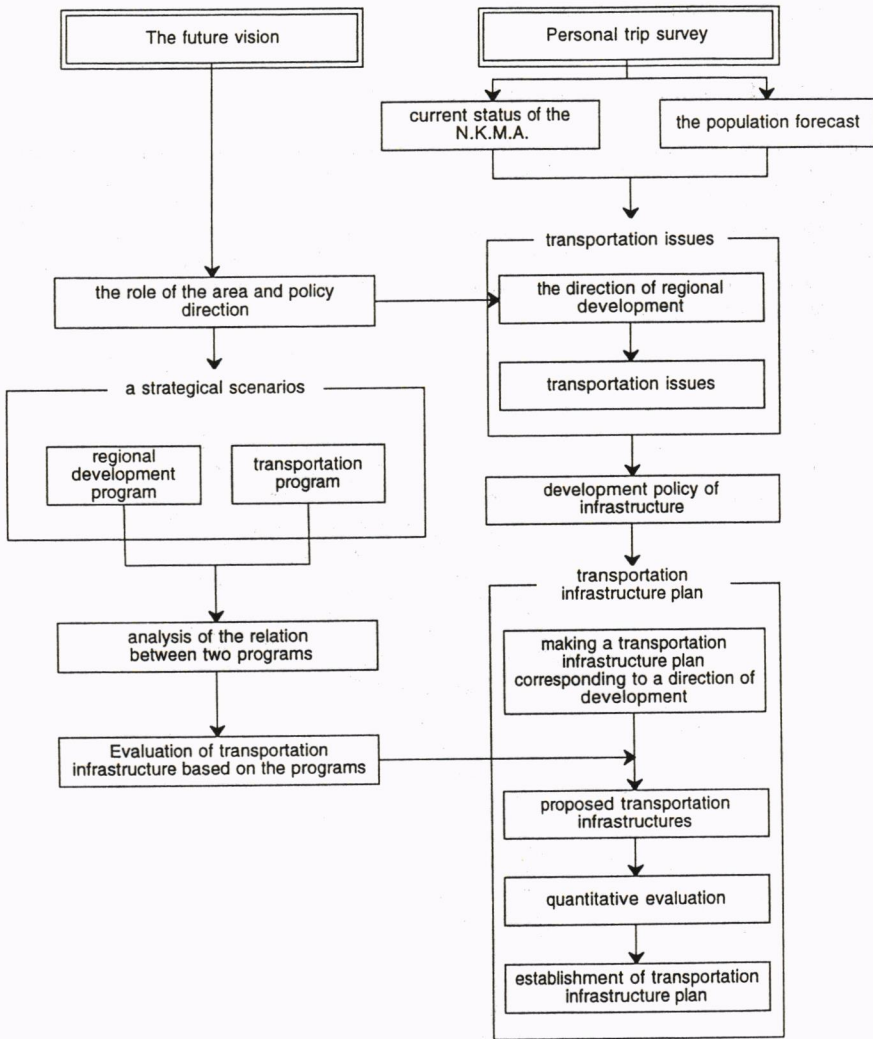


Figure 7 Linkage between the new planning and the personal trip survey

proposed in this paper attaches to the scheme at two points. In the first point it helps to discuss the direction of the area's development. Although the direction of the area is used to be set subjectively in the conventional planning, the future vision can now make it more clear and consistent to the regional policies.

The second criterion is to deliver the well-grounded ideas for the transportation infrastructures and the management principles that are never covered by the demand-oriented approach. In other words, this is the proposal for the transportation infrastructures based on social and/or political consideration. In order to realize this idea, the future vision is rewritten dividing into two more detailed parts; a regional program and a transportation program involving many planners concerned. The regional program gives the direction of regional development described strategically, while the transportation program proposes transportation infrastructures and management plans to implement the regional program. Based on an analysis of the relationship between existing transportation infrastructures and the regional program, an evaluation was made

to determine whether it is possible to cope using only the existing infrastructures, and if not, new infrastructures are proposed from the policy-oriented consideration.

Using the future vision in these two ways can not only make the transportation planning more understandable but also reflect policy-oriented factors in the planning process.

6. CONCLUSION

The following are the conclusions duly arrived at through the present study.

- (1) A new method is proposed to determine the future area structure qualitatively, and the hierarchical structure of future vision, future image – scenario, was successfully obtained. The scenario is composed of current status, policy direction, role of the transportation plan.
- (2) The future vision is finally obtained through two revisions with carrying out the questionnaire survey. The transportation planners prepared by themselves the first version of the future vision mainly by brain-storming. The Delphi method was employed during the questionnaire survey. This approach succeeded in getting the scenarios with important and feasible elements.
- (3) The proposed method was applied to the North Kyushu Metropolitan Area to form the future vision of the area in 2015. This future vision gives the direction for comprehensive improvement/plan of the transportation infrastructures.
- (4) The method of linking between the future vision and the personal trip survey was discussed. The linking enabled us to collect the recommendations of various people in many positions, enhance the transportation planning by sharing and solving anticipated problems, and incorporate more policy-oriented planning elements.

Future issues include the following points.

- (1) The future vision proposed in this paper remains at the conceptual level and linkage to the personal trip survey is incomplete. Therefore, a methodology has to be established to bridge between the future vision and the transportation plan with concrete foundations.
- (2) The method of making the future vision has become rather complicated because of many questions to cover the wide range of the transportation policy. In order to increase the operability of the proposed method, the methodology itself should perhaps be simplified. For the items and subjects questioned by the Delphi method, the effective field must be clarified, and problems that include technical matters may perhaps need to be addressed in workshop-style technique and/or by other methods.

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