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A STUDY ON THE STATUS ANALYSIS FOR ESTABLISHMENT OF INTELLIGENT ROAD MANAGEMENT SYSTEM FOR FUTURE ROAD

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ABSTRACT

Domestic road maintenance management systems are not systematic in terms of planning, investigation, efficient budget allocation, and maintenance method selection. Road maintenance budget allocation and priorities are changing according to circumstances. In the road maintenance management system, each facility is not efficiently managed, and management systems such as highways, national highways, provincial roads and municipal roads are maintained differently. Therefore, it is necessary to apply the research, database construction and utilization advancement, budget distribution and decision making advancement from the planning stage to domestic road maintenance management system in depth analysis of the road maintenance management system which is operated effectively in advanced countries. It is believed that this will be an opportunity to enhance the competitiveness of road maintenance system technology internationally by improving the efficiency of domestic road maintenance management system, making budget allocation by scientific method and making optimal decision.

INTRODUCTION

Background And Objective

Because the Ministry of Land, Infrastructure and Transport manages only the DB of the national highway, if a safety accident or a complex disaster occurs outside the national highway, it is difficult to cope with the situation quickly and there is a limit to the national assembly and the media. In other words, it is imperative to play a role as a control tower to respond quickly and systematically to national road safety and disaster.

Road maintenance is conducted systematically and scientifically in general national roads managed by the Ministry of Land. Therefore, it is necessary to establish a strategy to improve the road service by spreading and spreading the road management operation technique of the national highway to the local government. To this end, it is necessary to standardize the maintenance procedures according to the characteristics of road grades (provincial roads, provinces, and archipelago), and to develop a road maintenance management system that is suitable for the characteristics of local roads, tries and islands managed by local governments.

It is also necessary to establish a road management system implementation strategy that can cope with future roads and prepare for multiple disaster through the introduction of next-generation innovative technologies such as ICBMS (IoT, Cloud, Big Data, Mobile, and Security). For example, it is very urgent to prepare for future roads where electric cars, unmanned cars and autonomous vehicles are operated, and it is necessary to establish a smart road management system to cope with these challenges. In addition, road management site information (construction section) and IoT detection information (pothole, rockfall, landslide, etc.) are gathered on the cloud and mobile basis and will be predicted risk factors through big data analysis.

INTERNAL AND EXTERNAL ENVIRONMENT ANALYSIS FOR INTRODUCTION OF SMART ROAD MANAGEMENT SYSTEM

Domestic Status

In Korea, roads are managed differently according to the grade of roads. In other words, general highways are managed by the central government, the expressways are managed by public enterprises(Korea Expressway Corporation), and provincial roads are managed by local governments.

In the case of the national highway, the road management system developed by the Ministry of Land, Transport and Infrastructure is operated, and the expressway is managed through the road management system developed by itself. However, there is no systematic management system for the roads currently managed by local organizations such as local roads.



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In the case of bridges and other facilities, long-term and systematic responses are needed to prepare for the deterioration. However, in most municipalities, basic maintenance and information management are not systematically managed, and management costs due to aging are rapidly increasing.

Also, Many local governments are suffering from lack of manpower and expertise as well as lack of budget for road management.

It is necessary to have specialized technical personnel from construction of the system such as pavement, bridge, slope, etc. which run road management on the national highway, to input, management and operation of data, but in most municipalities, there is a lack of professional manpower. Some local governments in the metropolitan area have developed and operated their own facilities management system, but most municipalities have not.

In conclusion, it is necessary to improve the maintenance process of the municipal road without optimization system.

Domestic Stastus

In the United States, New Zealand, Australia, and other countries, we have established a road management plan to improve the efficiency and effectiveness of road management in order to prepare for and cope with the shortage of resources for deepening aging of road facilities and maintenance.

Minnesota has established a road management plan for the purpose of addressing the maintenance and maintenance problems of state transportation infrastructure in the face of insufficient funding while the demand for services has increased due to the population and economic growth of "Highway Systems Operation Plan 2012-2015" .

It has been established in conjunction with the Minnesota state's 20-year statewide transportation policy plan and its strategic direction (safety, mobility, innovation, leadership, transparency) and provides guidance for road management over the next four years.

Based on recent conditions, infrastructure conditions, and people's expectations, Minnesota is preparing for and responding for the next 10-15 years.

The California State's 2013 10-year State Highway Operation and Protection Program Plan requires that the State Highway Operation and Protection Program Plan be established by the State Highway Act and that the initial plan was established in July 1998, We are renewing.

This plan has been established to identify the activities needed to preserve and protect California's roads and to determine the budgets required. We will respond to the decreasing tendency of road management resources by suggesting both the budget plan necessary for achieving the goal and the budget plan optimized for the financial condition.

New Zealand's roads are largely divided into State Highway and Local Road. The National Highway Traffic Authority (NZTA) established in 2008 is under construction and management. New Zealand Road Asset Management (SHAMP) 2012-2015 is a road user In order to provide reliable and safe passage.

Especially in New Zealand, customer satisfaction was investigated in order to set the target of the plan centered on the customer, and the target as shown in the figure was drawn.



Fig 1 : New Zealand road user satisfaction and planning goals

Australia had a strong interest in maintaining financial sustainability and infrastructure capital earlier and saw the need for strategic road infrastructure management to avoid unnecessary overhead costs for future road users. In 2004, the Road Management Act was passed at the Victorian Parliament in Australia and the Road Management Plan was first established in November 2004 under Road Management Act. Australia has the fastest and most aggressive introduction of asset management in road infrastructure around the world.

ENVIRONMENTAL ANALYSIS INTO THE FUTURE

Entry Into Aging Society

The population growth rate of the Republic of Korea is sharply decreasing. According to the population estimates, the total population of Korea will reach its peak (51.26 million) in 2030 and decrease, and the rate of change for the past 25 years ('15 - '40) With a population similar to the current population. Expected life expectancy will increase rapidly from 71.3 in 1990 to 82.1 in 2013, leading to population decline and population aging. Although the level of aging in Korea is not very high yet, the growth rate is very steep, and the pace of aging is expected to increase rapidly.

The elderly population (population aged 65 and over) will account for 12.7% as of 2014, with 6,386,000. The proportion of the elderly population in 2008 exceeds 10% of the total population, and the proportion of the elderly population in 2026 is expected to reach 20%. [Source: National Statistical Office, 2014, elderly statistics, 2014]

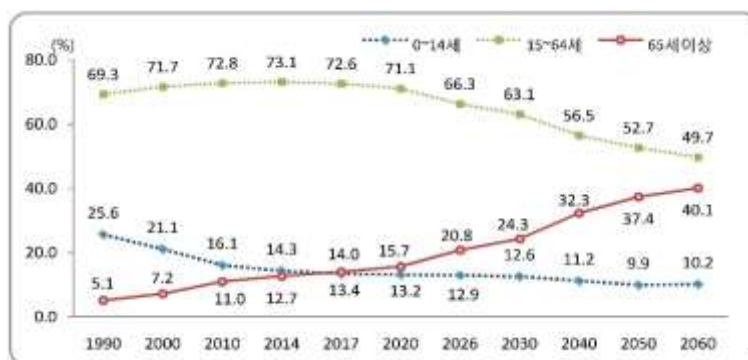


Fig 2 : Aged population trend

Unlike other age groups, where the incidence of traffic accidents is generally decreasing, traffic accidents of elderly people aged 65 years or older are increasing. In particular, the number of injured persons aged 65 or older is increasing from an average of 18,894 in 2004 to 35,352 in 2014, an annual average of 6.5%. Therefore, the demand for comfortable welfare roads is expected to continuously increase, and it is urgent to reflect these demands in the road management system.

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Diversify Social Value Such As Improvement Of Road Service Demand Level

As the living standard increases and the leisure activity population increases, the level of people's service demand on the road gradually increases and diversifies. In the past, the level of demand has changed from "a simple means of movement" to "a comfortable, safe, and enjoyable space". Disasters and risks are increasing due to natural disasters such as heavy snowfall and heavy rains due to climate change. In addition, as concerns and demands for public safety are increasing, there is a need for countermeasures.

SOC Investment Of Decline

SOC investment has been steadily rising along with economic growth, but after reaching 25 trillion won in order to overcome the economic crisis in 2009, the SOC investment has turned to convergence and decline. According to the financial investment plans for the future sectors presented in the "2015 ~ 2019 National Fiscal Management Plan", the total budget will increase by 2.6% per year from 375.4 trillion won ('15) to 416 trillion won ('19) Is expected to decrease by an average of 6.8% per year from 24.8 trillion won ('15) to 18.7 trillion won ('19). The proportion of SOC investments to total spending is also steadily declining, which is expected to drop to 4.5% in 2019, so domestic SOC investment is expected to continue to shrink.

Advancement Of Technology

Advanced technologies that combine ICT-based technology with communications technology will enable a new level of autonomous navigation by enabling V2V (vehicle-to-vehicle communications) and V2I (vehicle-to-infrastructure wireless communications). Most of the smart highway business core technology focuses on safety enhancement functions using C-ITS, such as warning of departure from driving and self-support technology, and development of technology for driving the cluster will proceed. The development of automobile control technology, such as collision avoidance and lane keeping technology, is expected to significantly reduce traffic accidents caused by human factors such as negligence, judgment, and error.

It is believed that it will be possible to improve the efficiency of road operation and management based on the Big Data and ICT. In other words, the efficiency will be improved by utilizing the big data to estimate the traffic volume and traffic situation and to use it to establish the road management policy.

Future cars are expected to increase rapidly after 2020, and there is not much time left for a road management system to prepare for them

CONCLUSION

The objectives and direction of smart road management prepared for the future roads derived from the current analysis study are as follows.

As seen in the direction of road management policy in developed countries. Road safety is a top priority for safety, and next we should focus on 'asset management', 'economic efficiency', 'efficiency and reliability of transportation', and 'environment'.

The results of survey on road user satisfaction showed that the users' needs for safety were the greatest, and happiness values such as convenience and comfort were also important.

The road management plan should set goals and directions considering both the manager and the user in terms of characteristics, comprehensively judging the core value of the national road network plan, road management status and problems, and changes in conditions, It should be set to reflect the contrast and to reflect the important values of safety and happiness on the user side.

REFERENCES

1. *Ministry of Land, Infrastructure and Transport, Highway Management System Maintenance handbook, 2016*