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**A STRATEGIC APPROACH FOR SAFETY:
PUTTING KNOWLEDGE INTO PRACTICE**

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ABSTRACT

In Japan, rapid motorization during the 1950s led to a sudden increase in traffic accidents. Laws related to traffic safety policies were updated and policies were systematically implemented. This resulted in swift improvement for a time, from 1970 through 1980. As the amount of road traffic increased, however, the number of traffic accidents began to climb again. Additional traffic safety measures were subsequently adopted. These included a crackdown on drivers that violate traffic rules, improvement of intersections where many accidents occurred, and upgraded sidewalks. Consequently, the number of accident fatalities has declined since 1993, and the numbers of accidents, and fatalities and injuries since 2005. As for the incidence of fatalities and injuries, from 1970 through 1980, when traffic safety improved, they fell from 300 per 100 million vehicle kilometers travelled to 100 per 100 million vehicle kilometers. The rate has remained at about that level ever since, despite various measures taken against traffic accidents. Although various measures against traffic accidents have been implemented, it has been difficult to obtain positive results. In 2009, there were 700,000 traffic accidents in Japan. They caused 4,914 fatalities and 900,000 fatalities and injuries. Even more emphasis on measures against traffic accidents are needed as Japan works to become a safe and secure society.

Japanese policy to date has proceeded with arterial roads and community roads considered two halves of the whole. Japan's fiscal situation recently has been very difficult, leading to large cuts in public works spending. Furthermore, the public is taking a very strict view of public works. Any public works undertaken must be thoroughly explained to the public.

Based on this social and fiscal background, Japan's new initiatives must intensively and efficiently tackle locations where accidents are common. At the same time, when projects are implemented, their results must be examined scientifically, and the management cycle must be applied. In order to obtain the maximum results from smaller budgets, results-oriented management that pursues performance is being implemented to undertake efficient and effective traffic safety measures.

1. INTRODUCTION

As a maritime state surrounded by ocean, Japan had historically relied on ships to move people and goods. Additionally, in part because of its limited land area and steep topography, Japan's road infrastructure had historically been weak. Following World War II, the nation entered a period of high economic growth, which was accompanied by rapid motorization. This led government to prioritize smooth handling of traffic volume in order to try to keep up with rising traffic demand.

This brought increased comfort and wealth in the lives of the Japanese people. At the same time, however, traffic safety infrastructure lagged behind, and the number of traffic accidents increased rapidly.

In light of these circumstances, government sought to balance the improvement of traffic safety with the smooth handling of traffic. It undertook a number of ongoing initiatives. During the 1970s, infrastructure-oriented measures such as better sidewalks achieved good results, bringing about significant improvements. Since then, however, the incidence of death or injury accidents, which indicates road safety, has leveled off. Despite the various measures that have been implemented against traffic accidents, it has become difficult to obtain effective results.

Japan has therefore begun to attempt more efficient and effective new initiatives. This report will describe these new initiatives, as well as the other measures taken to date.

2. OVERVIEW OF TRAFFIC ACCIDENTS IN JAPAN

In 1955, rapid motorization began as Japan transitioned from postwar reconstruction to high economic growth. The number of automobiles in 1950 was in the 400,000s. By 1970, the number had increased roughly 50-fold, to more than 19 million.

Over the 10 years from 1960 to 1970, annual fatalities from traffic accidents increased by 40 percent, from 12,000 to 17,000. The number of fatalities and injuries in traffic accidents every year jumped to 3.3 times the previous level, from 301,000 to 998,000.

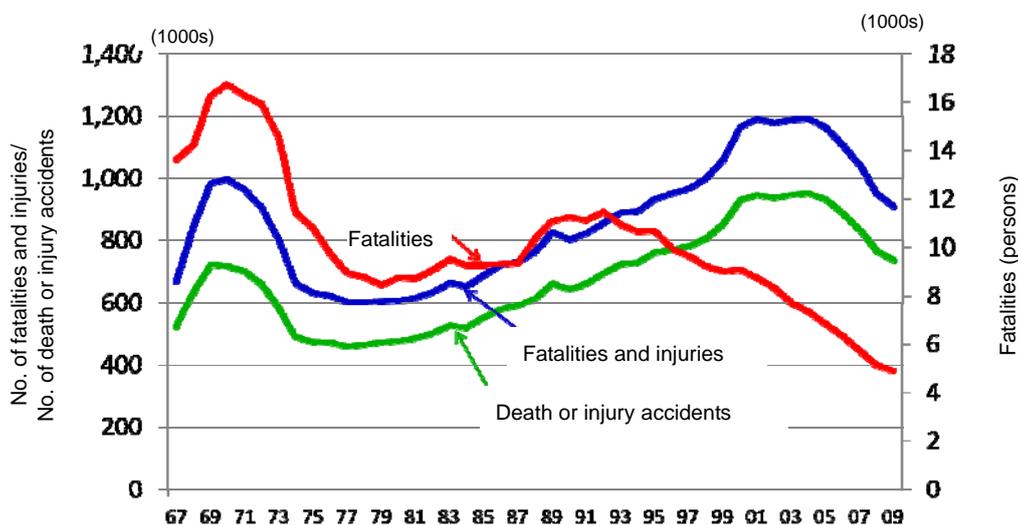
The rapid increase in traffic accidents was considered a serious social problem. During the 1970s, it became known as the "traffic war."

The legal framework had been upgraded in 1966 to permit the rapid implementation of traffic safety measures to address the increase in traffic accidents. Traffic safety infrastructure such as sidewalks and guard fences was quickly improved. Traffic safety

measures including infrastructure such as medians, road lighting, and traffic signals were vigorously promoted along with safety education. As a result, the number of fatalities from traffic accidents in 1979 was half that in 1970.

Although improvement of traffic safety infrastructure such as sidewalks continued after that, increases in the number of licensed drivers and the amount of automobile traffic were accompanied by another increase in traffic accidents and fatalities. The number of fatalities surpassed 10,000 again in 1989. It continued increasing through 1992, when it passed 11,000. Some even called this period the "second traffic war." Subsequently, however, fatalities began to decline once more. The number of accidents, and fatalities and injuries, however, continued to increase until 2004. In other words, from 1992 to 2004, the number of traffic accidents increased, but the number of fatalities decreased. The main reasons for this are probably that the safety performance of automobiles themselves improved and that seatbelt use was made mandatory.

Since 2005, the number of accidents and fatalities and injuries has been falling. In 2009, the number of fatalities was in the 4900s, the first time in 57 years there were fewer than 5,000. This is less than 30 percent of the peak number. It is believed that finding the sections of arterial roads with high rates of death or injury accidents and prioritizing measures against accidents there contributed to this success.



Source: Compiled from National Police Agency materials

*Number of fatalities refers to those dying within 24 hours of an accident. (The number who died within 30 days of an accident was 5,772 in 2009.)

Figure 2.1 - Changes in the number of fatalities from traffic accidents, fatalities and injuries, and fatal accidents

3. MEASURES TO DATE AGAINST TRAFFIC ACCIDENTS: OVERVIEW AND EFFECTS

If traffic accidents are divided between those on arterial roads (national highways, prefectural roads, etc.) and those on community roads (municipal roads), arterial roads account for only 15 percent of the total length of all roads. Even so, about the same percentages of accidents and fatalities and injuries occur on arterial roads and on community roads, and arterial roads account for two-thirds of all fatalities. (See Figure 3.1.)

Looking at the incidence of death or injury accidents on arterial roads and community roads, the rate on arterial roads has declined in recent years, but the rate on community roads has held steady. The incidence of death or injury accidents on arterial roads is approximately 90 per 100 million vehicle kilometers travelled, while that on community roads is about 210 per 100 million vehicle kilometers travelled. The incidence of death or injury accidents on community roads is thus more than double that on arterial roads. (See Figure 3.2.) In addition, fatalities in Japan from traffic accidents involving pedestrians or bicyclists are frequent. They occur at double or triple the rate in the US and European countries and account for about half of traffic accident fatalities. (See Figure 3.3.) Sixty-five percent of traffic accidents involving pedestrians or bicyclists happen on community roads. (See Figure 3.4.) Along with traffic safety measures on arterial roads, safety measures on community roads are extremely important.

Safety measures in Japan are therefore proceeding based on the idea that arterial roads and on community roads are equally important.

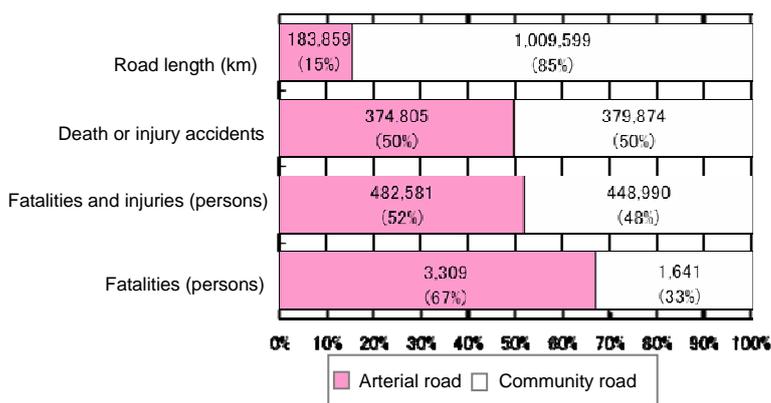


Figure 3.1 - Traffic accidents on arterial roads and community roads

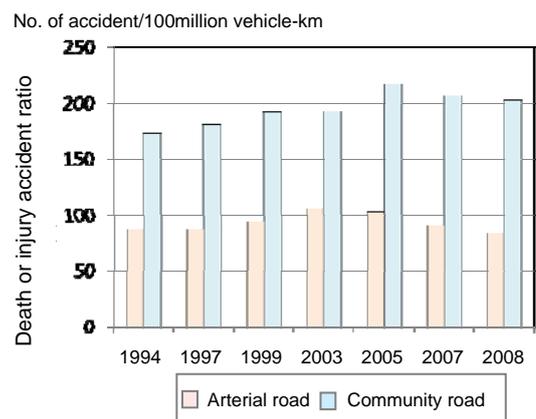


Figure 3.2 - Changes in incidence of death or injury accidents on arterial roads and community roads

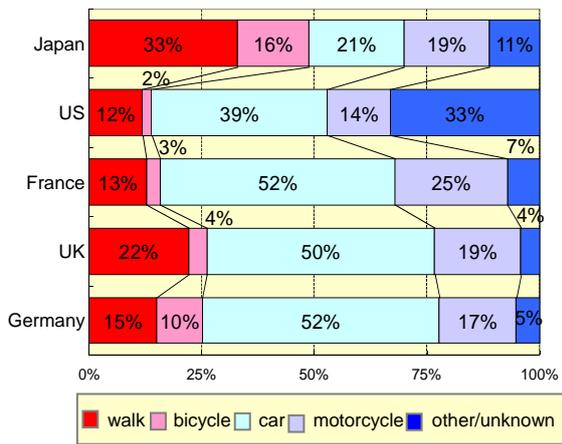


Figure 3.3 - World death rates by circumstance

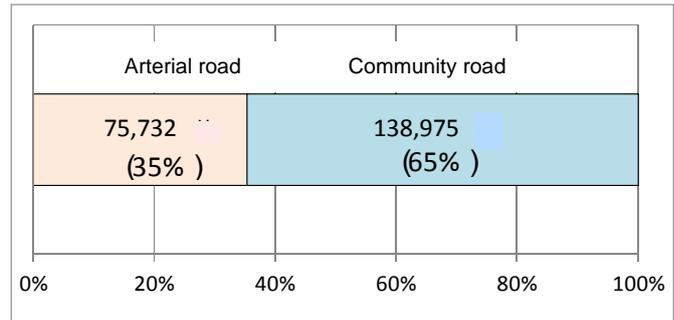


Figure 3.4 - Number of accidents involving pedestrians and cyclists on arterial roads and community roads

3.1. Measures on arterial roads

In order to ensure road traffic safety, systematic road improvement to networks, from national expressways to roads in residential areas, is promoted in order to appropriately divide functions. At the same time, use of national expressways with higher safety compared to general roads is promoted.

On arterial roads such as national highways and prefectural roads, sections where accidents are especially common have been identified. Those where measures can be taken within five years are designated accident hazard sites. Police and road administrators cooperate on prioritizing the measures to be taken. There have been two rounds of accident hazard site designation so far. The first took place in FY 2003, designating 3,956 sites, and the second in FY 2008, designating 3,396. The aim is to reduce the number of accidents at a given site by around 30 percent through measures such as installing or upgrading traffic signals, using signals to segregate vehicle and pedestrian traffic, making road signs brighter, upgrading sidewalks, improving intersections, bettering visibility, adding lanes, putting in median zones, adding stopping lanes in bus lanes, guard fences, upgrading markings, installing road lighting, safety posts. Goals have been met, with accidents at sites designated during the first round falling by 31.25 percent.

In order to ensure safety and smooth automobile traffic on national expressways, detailed analysis of factors such as rain and darkness are performed for sections where many accidents occur and urgent action should be taken. Based on this analysis, improvements guard fences such as median-improvement, light-emitting delineators, high-performance pavement, and high-visibility markings are implemented on a priority basis. In addition, for two-lane sections where traffic is not divided due to road structure, in order to prevent

serious accidents caused by entering the oncoming lane, separation measures are taken. These include improving driver recognition of simple division through installation of high-visibility postcones, and lane markings, placement of raised lane markers, and installation of medians. Furthermore, in order to prevent accidents through wrong-way driving, comprehensive accident prevention measures such as upgraded signs and road markings are being implemented.

In addition, utilization of national expressways is being promoted by adding interchanges to create an environment where they are easier to use.

3.2. Measures on community roads

As for measures against traffic accidents on community roads, in FY 1996, an area-wide, comprehensive traffic policy was implemented. Police and road administrators began designating certain areas as Community Zones. This is done in order to improve safety, comfort, and convenience in residential areas where pedestrian traffic should be given priority. Police and road administrators collaborate in order to reduce automobile speed in Community Zones. Structural measures such as speed bumps and road narrowing are used to slow vehicles, speed limits are set to a maximum speed of 30 km/h, and traffic is directed around the zones by banning trucks and use of one-way routing. Implementation of these measures in appropriate combinations has occurred in about 160 locations around Japan over seven years.

Beginning in 2003, in addition to traffic safety measures inside the Community Zones, the National Police Agency and the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) undertook comprehensive safety measures including preventing through traffic by taking steps to make traffic run smoothly on surrounding arterial roads. Locations where measures are needed because of a high incidence of death or injury accidents involving pedestrians or bicyclists were designated Safe-to-Walk Areas. Police and road administrators collaborate to implement comprehensive measures. There have been two rounds of designations to date. The first round, in FY 2003, designated 796 areas. The second round, in FY 2008, designated 582. The goals for the first round were to reduce death or injury accidents by about 20 percent, and accidents involving pedestrians or bicyclists by about 30 percent. The goal for the second round was to reduce accidents involving pedestrians or bicyclists by about 20 percent. The following measures were taken towards those ends.

The police generally set speed limits at 30 km/h on roads where speed restriction is necessary. In addition, safety measures were taken inside the zones, including making signs and markings more visible, switching to LED signal lights, and installing or widening

side strips. On arterial roads around the zones, measures are being taken to improve traffic flow. These include making traffic signals more visible and providing real-time traffic information through optical beacons and electronic traffic signs. In addition, steps are being taken to make roads barrier free where necessary. These measures include installation of barrier-free traffic signals such as acoustic signals and traffic-actuated signals for the elderly and other pedestrians. Additionally, adoption of signals to separate the flows of pedestrians and automobiles so that they do not conflict is promoted in order to prevent accidents between automobiles and pedestrians.

Road administrators improve networks of walking spaces by upgrading sidewalks and so on, so that pedestrians can move safely and install speed bumps and so on to calm traffic where pedestrians and bicyclists have priority. They implement measures to ensure smooth traffic flow on surrounding arterial roads and install speed bumps and narrow roads at zone entrances in order to control through traffic.

At locations designated during the first round, the accident reduced by 17 percent, while the accidents involving pedestrians or bicyclists reduced 8 percent. These figures were below the goals. A major reason for this is that the measures were implemented as planned without coordinating them with local communities. This has become an issue in the implementation of policies regarding community roads.

In order to ensure the safety of children on their way to schools, kindergartens, daycare centers, children's recreation centers, and so on, improvement of sidewalks and so on in school zones is actively promoted. In urban areas and other locations where improving sidewalks is problematic, creation of safe and secure walking spaces is promoted. This includes simple methods such as installing guard fences or colored pavement on shoulders. Other improvements being made to school zones include pushbutton traffic signals, pedestrian lighting, grade separation for pedestrian crossings, and better crosswalks.

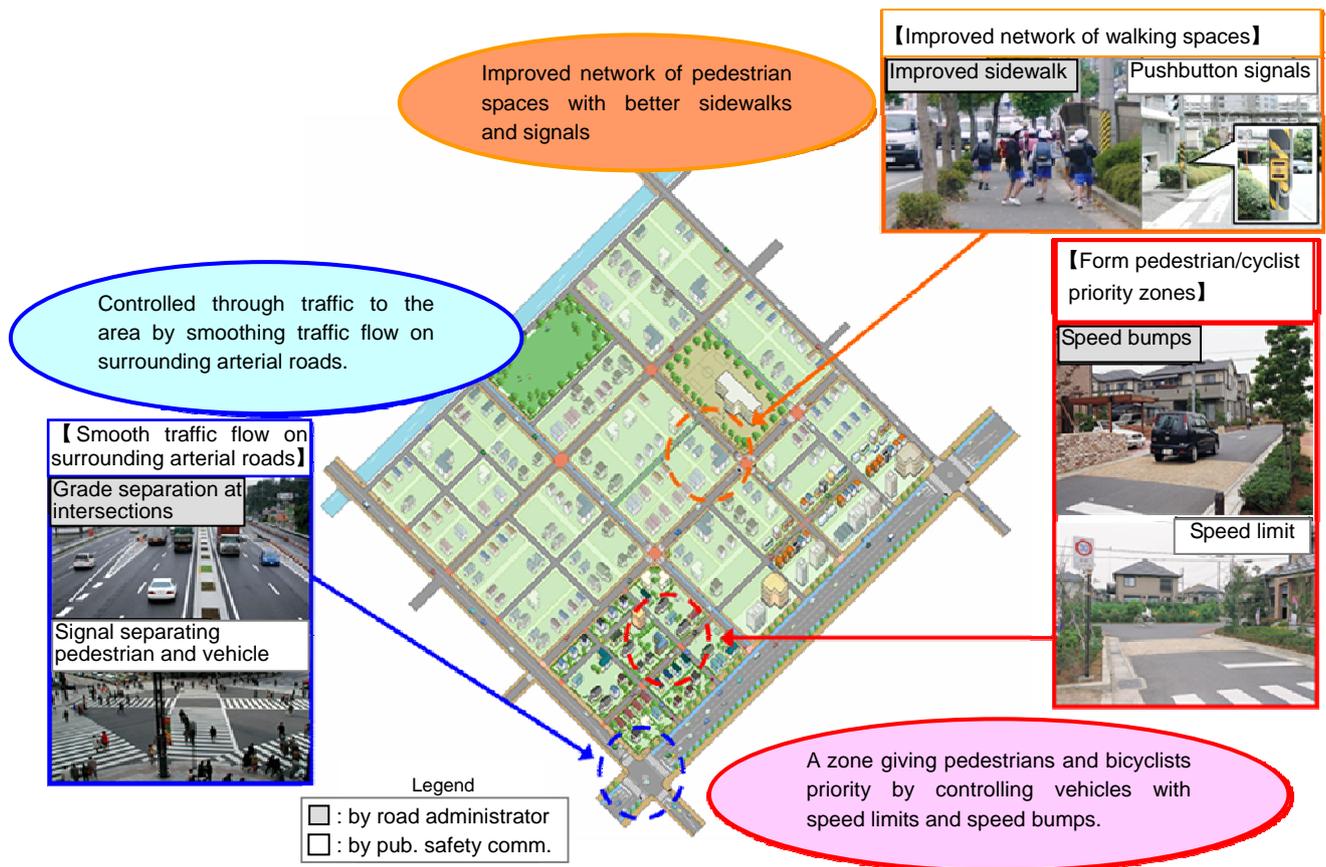


Figure 3.5 - Measures taken in Safe-to-Walk Areas

3.3. Creation of environments for bicycles

In order to realize a clean, energy efficient, and sustainable transportation system, pedestrians, bicycles, automobiles must be appropriately separated according to their traffic volumes. In light of the increasing number of accidents involving pedestrians and bicyclists, safe and comfortable environments for bicycles must be created. Road administrators are therefore promoting the creation of networks of bicycle spaces. These include bicycle paths and lanes, and designated sections for bicyclists on sidewalks that they share with pedestrians. Furthermore, road administrators cooperate with police and other relevant agencies to actively promote bicycle use through bicycle sharing programs and so on, as well as engaging in education on cycling rules and etiquette.

In areas where demand for bicycle parking is high or where it is expected to increase markedly, depending on how bicycles are used, the building of on- and off-road bicycle parking facilities is promoted.

In Japan, bicycles are considered an inexpensive, familiar, and simple means of transportation. They are widespread among the public. In 2008, there were an estimated 69.1 million bicycles in Japan, about one for every two people. However, even though

bicycles are considered light vehicles under the traffic laws, since 1970 for safety's sake they have been allowed to use sidewalks when heavy traffic makes use of roads unsafe. Today, bicyclists usually ride on narrow sidewalks. This leads to constant accidents between pedestrians and bicycles. Over the last 10 years in particular, such accidents have increased to about 3.7 times the previous level. It has become a serious social problem.

In order to restore order to bicycle traffic, the National Police Agency upholds the principle of riding on the street. The law was revised in 2007 to clarify the exceptional circumstances under which bicycles may be ridden on sidewalks.

It will be necessary to fully enforce the rules so that bicycles are ridden in accordance with the revisions to the law.



Figure 3.6 - An improved bicycle road (Mitaka, Tokyo)



Figure 3.7 - Improved bicycle lanes (Amagasaki, Hyogo)

4. RESULTS-ORIENTED MANAGEMENT

Japan has used measures such as those described above to aggressively address the rapid rise in traffic accidents that accompanied the development of motorization. However, the environment related to public works in Japan is significantly different today. Japan is therefore attempting new initiatives in order to develop efficient and effective measures against traffic accidents. These initiatives are described below.

4.1. Japan's fiscal environment

Japan's population peaked in 2005 at about 127 million. It has begun slowly declining, and is expected to fall to around 95 million in 2050. The percentage of the population that is 65 or older is expected to climb from about 20 percent in 2005 to as high as about 40 percent in 2050. There is concern that major increases in healthcare and social welfare spending

will be required. In addition, Japan's long-term (national and local) government debt to GDP ratio has increased over the past several years. It is expected to reach about 180 percent at the end of FY 2010. Japan's fiscal situation is becoming more difficult every year.

As for public works under these circumstances, the aging of infrastructure stocked to date is a serious problem. For example, of Japanese bridges longer than 15 meters on general roads, about 6 percent are at least 50 years old. By 2026, however, that number is expected to reach about 50 percent. It is thus feared that bridge maintenance/renovation costs and other expenses related to maintaining and operating roads will increase. Amidst the difficult fiscal situation, however, budgets for public works are shrinking every year. More efficiency in public works is greatly needed.

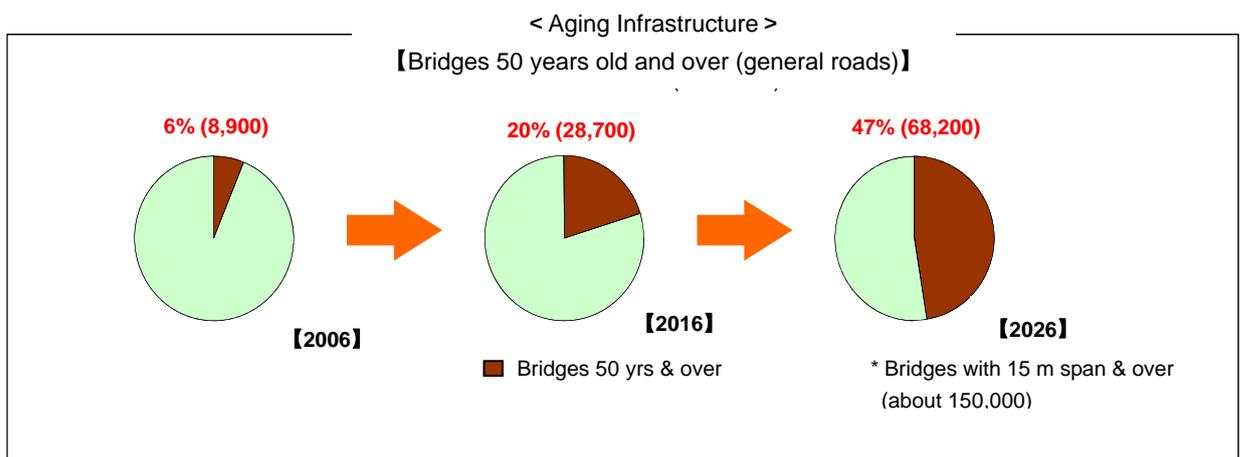
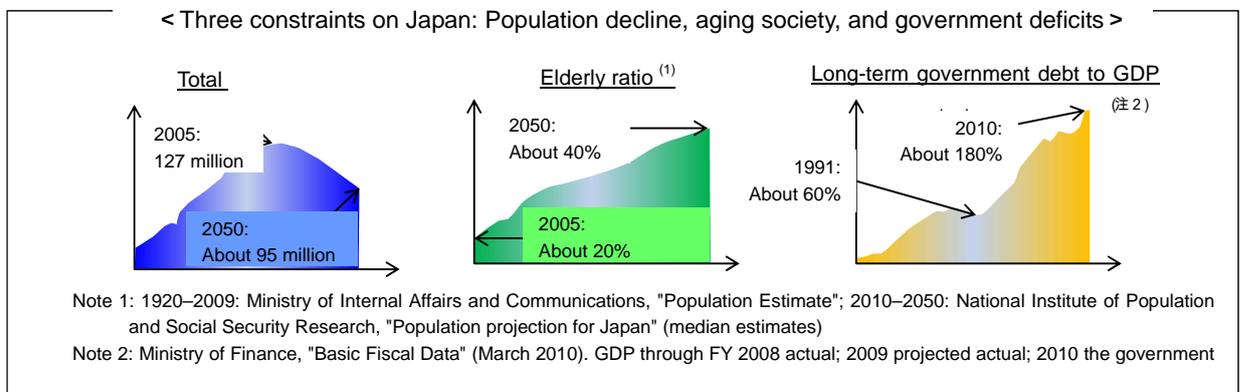


Figure 4.1 - Japan's fiscal environment

4.2. Public works management initiatives

In order to proceed efficiently with public works amidst a difficult financial situation with limited budgets, projects must bring steady results. Furthermore, the goals and results of projects must be fully explained to the public. By widely publicizing results and making the administrative process transparent, accountability to the public can be accomplished. The

MLIT therefore adopted a system for evaluating projects in terms of policy goals in FY 2010, as illustrated in Figure 4.2. At the same time, results-oriented management was adopted for road administration.

Evaluation of projects in terms of policy goals adopts project evaluation from the planning stage in order to make it possible to examine the content and necessity of projects. At the same time, policy goals are clarified so that the issue the project is designed to address can be recognized and alternatives can be compared and evaluated.

In the case of road projects, projects that will have a significant impact on traffic flow (bypasses, widening, etc.) still undergo rigorous evaluation through calculation of cost-benefit and so on. Even local projects (traffic safety, disaster management, etc.) where cost-benefit had not been performed are adopting results-oriented management for the sake of improving transparency and efficiency.

Results-oriented management begins by understanding local issues through data and community voices. Based on this understanding, sites requiring action are listed and announced. Causal analysis and comparative examination of measures are performed, and then a policy proposal is decided.

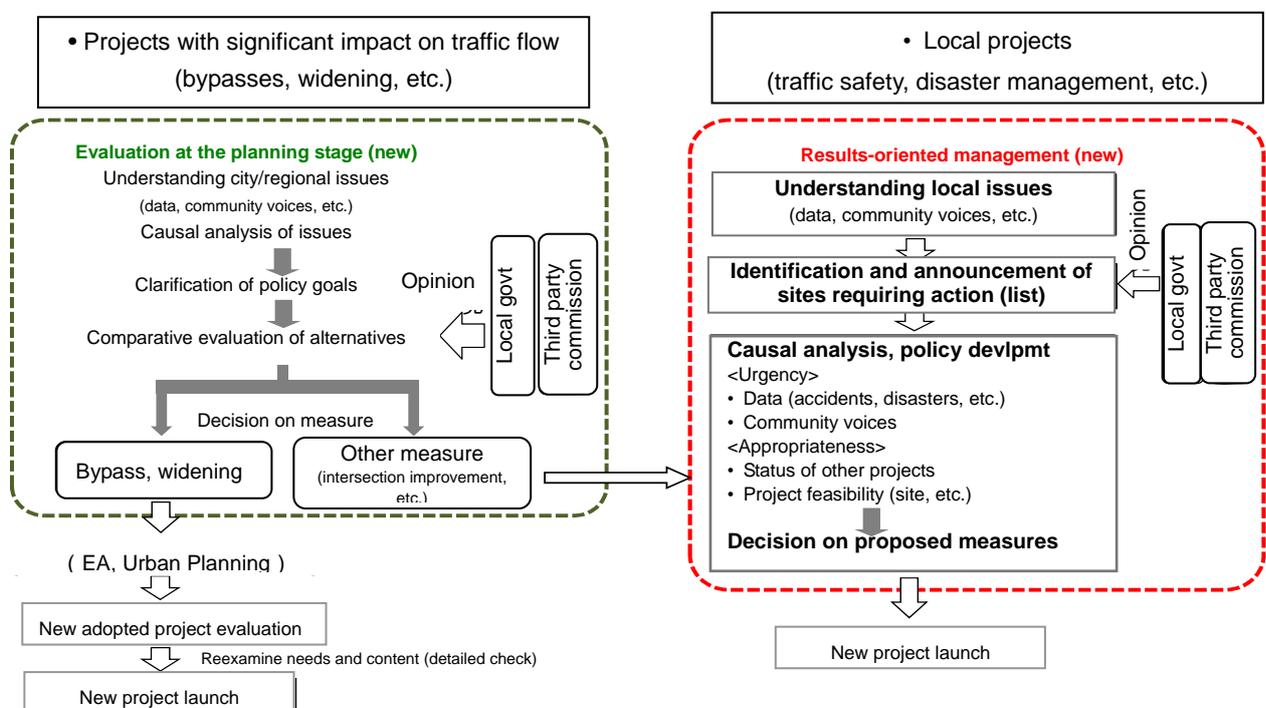


Figure 4.2 - Flow chart for evaluation of projects in terms of policy goals

4.3. Results-oriented management: overview and initiatives

Since 1993, road administrators have been combining police data on accidents on arterial roads with traffic volume data in a single traffic accident database. Based on the traffic accident database, the approximately 180,000 kilometers of arterial roads have been divided into about 710,000 sections averaging 200–300 meters apiece. Using data through 2003–2006, the accident rate for each section was calculated. They line up from the highest rate to the lowest as shown in Figure 4.3. Sections with incidence of death or injury accidents above the national average of 100 per 100 million vehicle kilometers travelled are shown in red on the graph. As indicated by the graph, only 22 percent of the sections of arterial roads are above the national average, and those sections account for 71 percent of all accidents. In 2005, Japan therefore began intensively addressing sections with high accident rates. It was hoped that this would be an efficient way of reducing accidents.

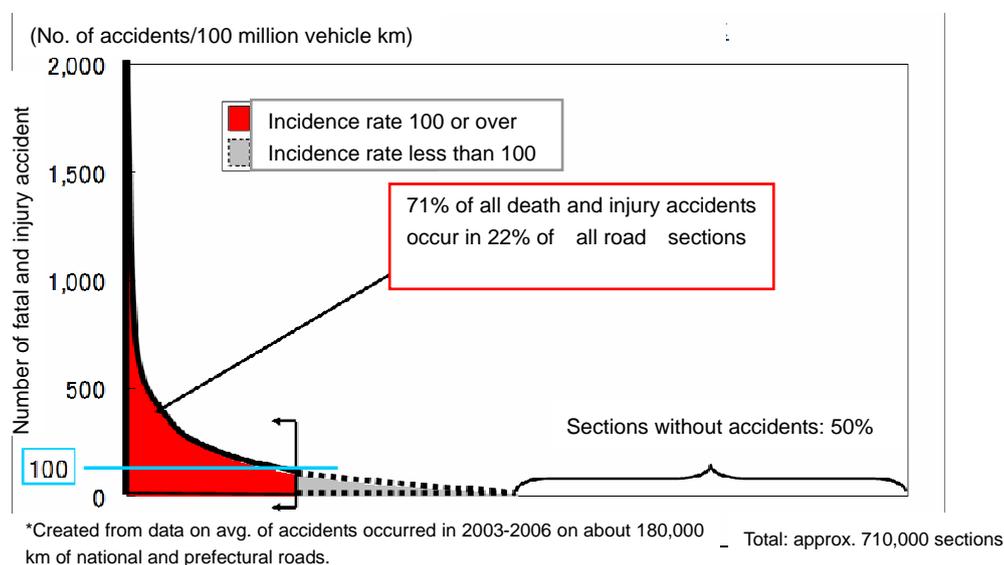


Figure 4.3 - Nationwide incidence of death or injury accidents on arterial road sections

However, the expected results were not obtained in some cases because policies were implemented after insufficient causal analysis.

In FY 2010, Japan therefore began engaging in results-oriented management as shown in Figure 4.4. The upper half of the figure depicts the tasks of MLIT itself, while the lower half shows tasks to be carried out by offices opened locally. The right half is concerned with budget compilation and execution, while the left is concerned with goals and evaluation of results. Each office must first compile a list of high-accident sections. This is done based on the sections with high incidence of death or injury accidents and the local traffic safety situation, while seeking the opinions of experts and of local residents regarding sections with a high danger of accidents. From the sections placed on the list, sites for priority action are determined and projects are begun.

Measures are selected by analyzing accident causes accumulated in the traffic accident database in order to identify the leading causes of accidents at the site being addressed. A menu of solutions to the causes is selected, and projects are carried out. After project completion, the measures' effectiveness is analyzed and assessed, and their effectiveness is examined. At the same time, ongoing improvement is sought, with additional measures implemented as needed. The PDCA cycle is vigorously advanced in order to carry the results into the next project.

At MLIT itself, each site's results are collected and evaluated in terms of the government's long-term goals and so on. Budgets are to be allocated based on the results. Additionally, effectiveness data for measures against traffic accidents are collected nationally and fed back to each site so they can be used in the study of methods used at each site.

This cycle is beginning to be used at local sites and national level.

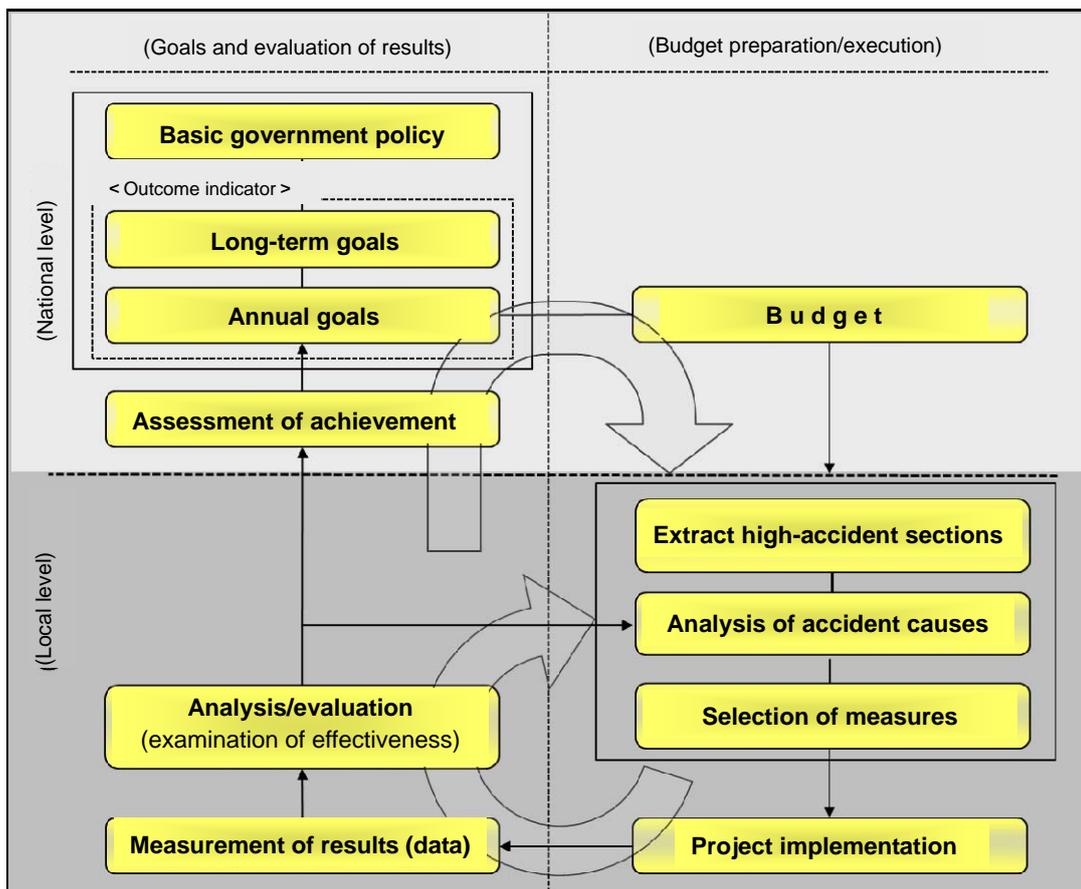


Figure 4.4 - Results-oriented management cycle

4.4. Future Issues

In order to promote effective measures amidst the existing difficult financial situation, the investment efficiency of limited budgets for measures against traffic accidents must be maximized. It is necessary to carry out results-oriented management on an ongoing basis. Doing so will likely require more time and labor for policy study than was necessary in the past. Various steps should be taken to ensure efficient operation. It is therefore necessary to compile a database for local offices to reference when examining measures to be taken. From sites around the country where measures have been taken, the database should collect data on accident causes, the type of measures, and their results. Signs that shows danger should be placed at local accident hazard sites to promote caution on the part of pedestrians and drivers. Local offices should be upgraded and work closely with police and other relevant organizations.

5. CONCLUSION

In Japan, promotion of measures against traffic accidents must continue to treat arterial roads and community roads as two halves of the whole. Limited budgets make more effective use of funds necessary. As discussed above, results-oriented management should be used on an ongoing basis in an effort to raise effectiveness. At the same time, another necessity is a proactive attitude that involves local communities and residents in measures against traffic accidents on familiar community road systems in order to create a society with safe and secure transportation. Frameworks for their active participation and cooperation in deciding plans and carrying out projects must be built. Japan intends to take such efficient and effective measures against traffic accidents.