

Chapter 3

Major Efforts Made in the Fields of National Land and Transportation

Chapter 2 has discussed and explored directions for the policies for maintaining, managing and upgrading social infrastructures from the three perspectives of “Using it Wisely,” “Supported by Everyone” and “Taking a Far-sighted Vision.” While many of the schemes exemplified in Chapter 2 have already been initiated by the MLIT, it would still be necessary to continue developing measures aimed at “Using it Wisely,” “Supported by Everyone” and “Taking a Far-sighted Vision” in order to achieve the goals of maintaining, managing and upgrading social infrastructures. This chapter introduces the principal actions to which the MLIT is currently committed from these three perspectives.

Section 1 Effort to Use Social Infrastructures Wisely

1 Effective Road Space Utilization

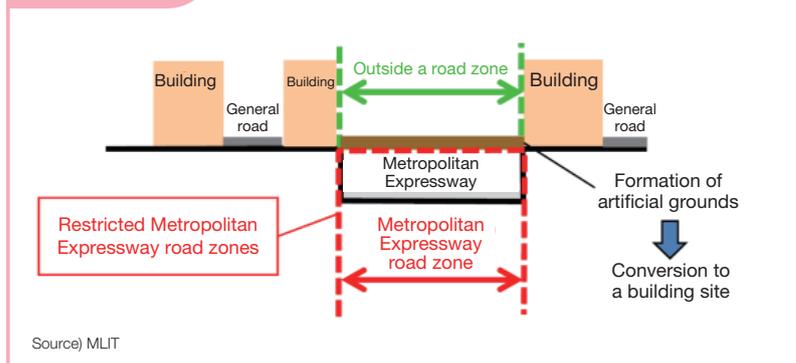
As explained in Chapter 2, the functionalities of social infrastructures can be augmented and made easier to use effectively by utilizing them as they are and their spaces. The space of a road as exemplified earlier can be put to diverse uses, such as local revitalization or disaster preparedness. The development of an environment allowing for effective road space utilization is also sought.

In this background, the Law for Making Partial Amendments to the Road Law, etc. came into effect in May 2014 to expand the scope of the three-dimensional road system (while a road zone covers both upper and lower spaces in principle, the system exceptionally allows a vertical range to be set for a road zone either spatially or underground) to include existing freeways when it had been restricted to the construction of new roads or reconstruction of existing roads. The system has made it possible to form artificial grounds on top of an existing freeway built in a canal structure, for example, and then build an architectural structure on such grounds (Figure 3-1). Revenues accruing from the utilization of the space that is no longer a road zone can be appropriated to maintain, manage and upgrade Metropolitan Expressways and other freeways, facilitating the work of upgrading freeways and rejuvenating cities in an integrated fashion by leveraging private fund. In addition, even though there

are clearances available outside a road zone, spaces under the elevated structures can be occupied. If occupancy of such spaces is useful for making fair and effective use of road spaces, the occupants can be chosen by tendering.

Figure 3-1

Expanded Scope of Application of the Three-Dimensional Road System (Amendments to Paragraph 7, Article 47, Road Law) to Existing Freeways



2 Forging a Compact City

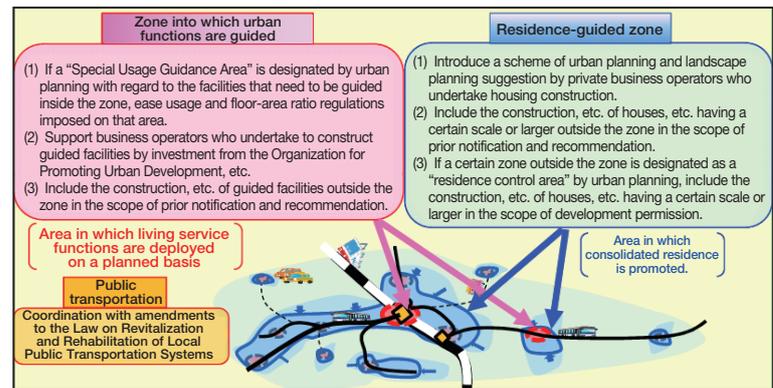
As reviewed in the foregoing chapter, forging local municipalities into a compact city each is important as they are confronted with financial constraints amid diminishing population.

To move ahead with the forging of a compact city in which living service functions, such as welfare, and dwelling are guided and in which elderly people can live at ease, the Law for Making Partial Amendments to the Law for Special Measures concerning Urban Reconstruction, etc. came into effect in May 2014. The Law has opened a way for those municipalities that have drawn up a comprehensive master plan (location normalization plan) concerning the location of dwelling functions, and urban functions, such as welfare, medical care and commerce, enhancement of public transportation and so on to ease the floor-

area ratios and land use regulations for those functions they want guided within a designated urban function zone. Moreover, if any function a municipality wants guided is located outside a designated urban function zone, the Law allows the municipality to submit a notification to work around the location problem, or to attract urban and dwelling functions into a desired area. A program has also been set up whereby the government extends its direct support to municipalities that provide publicly owned real estate to those private business operators undertaking to develop urban functions within a designated urban function zone.

Figure 3-2

Summary of the Law for Making Partial Amendments to the Law for Special Measures concerning Urban Reconstruction, etc.



(Source) MLIT

Section 2 Supporting Social Infrastructures by Everyone

1 Driving PPP/PFI

(1) Promoting concession usage

As explained in Chapter 2, the implementation of PFI businesses, such as financially independent businesses, needs to be driven in the future. The use of concessions is seen important among else. The government has committed itself to a key policy of broadening the scope of concession-ready businesses in its implementation of "Action Plan for Drastically Reforming PPP/PFI," "Japan Revitalization Strategy" and "The Basic Policies for Economic and Fiscal Management and Structural Reform." The MLIT is stepping up its support of efforts to introduce the concession scheme, and to the work of local governments, in the fields of airports, sewerage systems and toll-road businesses administered by Local Road Corporations.

In the field of airports, the Law concerning the Administration, etc. of State-Managed Airports, etc. Leveraging Private Resources came into effect in June 2013 to allow concession-based management of state-managed airports, etc. Pursuant to this Law, a basic business scheme plan was published at Sendai Airport in November 2013, followed by the publication of an implementation policy in April 2014. The airport management entity was selected on public invitation in fiscal 2014. Outsourcing of port management is scheduled to start during fiscal 2015 (Figure 3-3). In the meantime, Kansai International Airport and Osaka International Airport entered into an administrative merger in July 2012

under control of New Kansai International Airport Co., Ltd. in a bid to revitalize Kansai International Airport as an international hub airport and expand demand for air transportation through appropriate, effective utilization of both airports. The new-born airliner is committed to keeping the two airports under consolidated management to augment their business values and realize the implementation of concessions at both airports as soon as practicable.

In the sewerage field, “Guidelines for the Implementation of Business Operations, etc. of Public Facilities, etc. in Sewerage Works (draft)” was formulated in March 2014 through discussions at an expert council to support local governments, sewerage systems management bodies, in their effort to pursue concession-based management of sewerage systems. Updates to the Guidelines are scheduled to reflect issues, etc. evolving in the course of pursuit of specific tasks while efforts continue to promote its broader dissemination.

As for the concession-based management of toll-road businesses by Local Public Road Corporations, efforts are underway to realize the concept of a structural reform special zone proposed by Aichi Prefecture by working in conjunction with the government ministries and agencies concerned to reflect findings of its review.

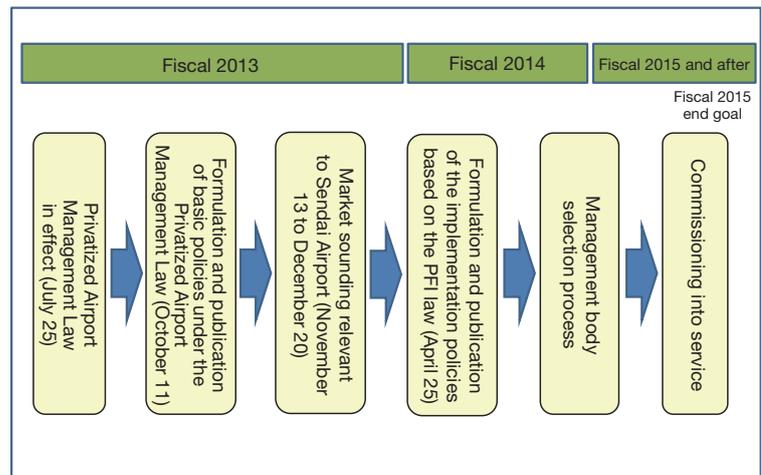
(2) Expanding scope of comprehensive work consignment to private sector

In its bid to address the challenges of ensuring the mid- and long-term availability of HUMAN RESOURCES to work for the construction industry, correcting dumped order-taking, maintaining and managing local social infrastructures and so on, the MLIT has decided to abandon its previous adherence to a uniform scheme of tendering and contracting and promote the introduction and practice of a choice of more diverse tendering and contracting methods selectable to meet the needs of the

times and characteristics of the projects. Starting from fiscal 2014, the Ministry has started subsidizing the local governments working with such new tendering and contracting methods in their model projects. Among these new methods, comprehensive work consignment to private sector (multi-year contracting, multi-service batch ordering) aims to provide a precise maintenance and management solution to local social infrastructures. The Ministry has a policy of promoting the wider dissemination of diverse tendering and contracting methods, etc., including comprehensive work consignment to private sector, by preparing purchaser documentation that reflects the accomplishments of implementation

Figure 3-3

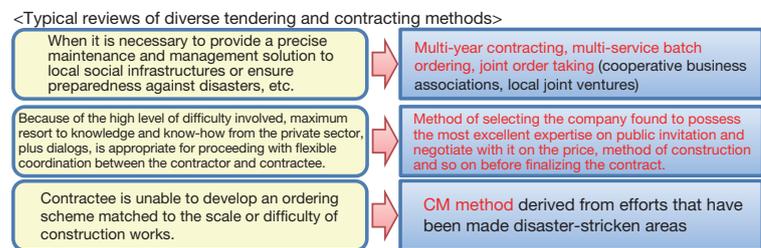
Status of Progress towards Sendai Airport Management reform



Source) MLIT

Figure 3-4

Examples of typical reviews of diverse tendering and contracting methods



Source) MLIT

of model projects.

2 Resident Cooperation in Maintenance and Management

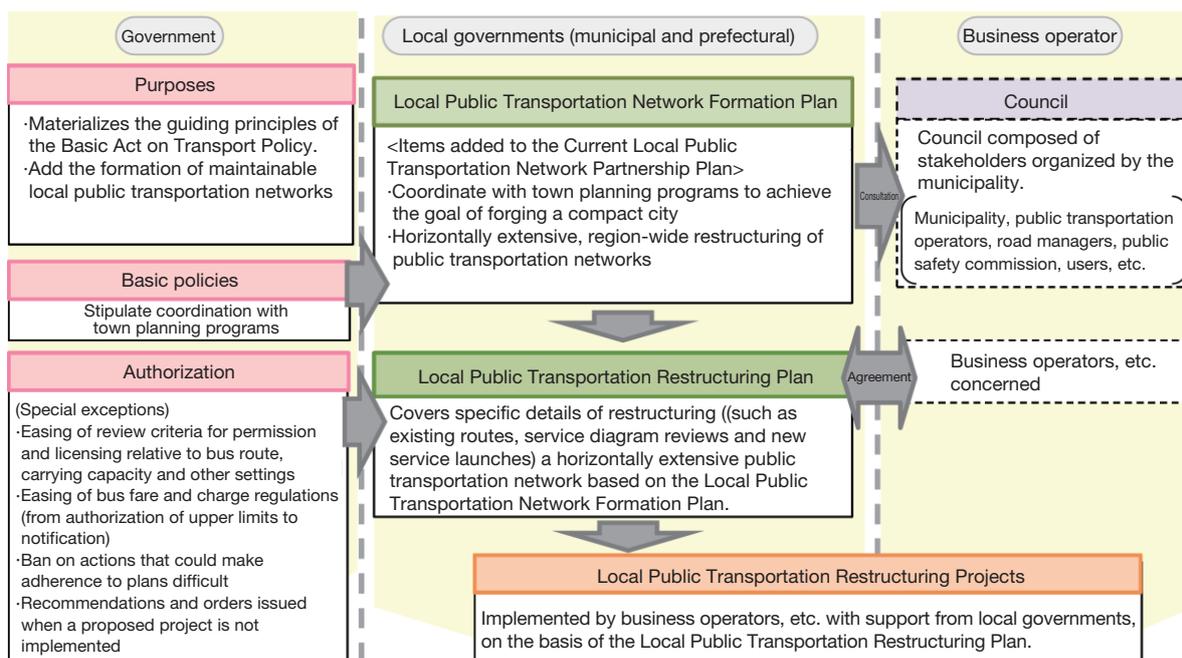
Efforts designed to back up active resident participation are needed to encourage more of the residents to participate in the work of maintaining and managing social infrastructures. As one of such efforts, the Law for Making Partial Amendments to the Coast Law was enacted in June 2014 to introduce the Coast Supporting Organization Program, which aids corporate bodies or entities (such as NPOs) in their voluntary efforts to maintain seacoasts, preserve seacoast environments and so on. The program is to designate corporate bodies or entities (such as NPOs) working to help maintain and manage seacoasts in partnership with coastal managers as coast supporting organizations and encourage their voluntary activities to help boost the maintenance and management of seacoasts in a way suited to local conditions.

3 Maintaining Local Public Transportation

As the climate in which local public transportation is placed grows increasingly tougher than before, it could risk the current level of scheme of management. When this happens, the local residents, administrators and business operators, as well as the business management bodies, would have to work in partnership to support the local public transportation. In the circumstances, the Basic Act on Transport Policy came into effect in December 2013 to lay a framework for driving the implementation of traffic policies on a comprehensive and planned basis. In connection with this, the Law for Making Partial Amendments to the Law on Revitalization and Rehabilitation of Local Public Transportation Systems came into effect in May 2014. The Law provides for the preparation of local public transportation network formation plans by municipalities, etc., the preparation of local public transportation restructuring plans to implement local public transportation restructuring businesses as specified in the local public transportation network formation plans and so on to revitalize and animate local public transportation to help form connectable local public transportation networks. As horizontally extensive, region-wide public transportation networks are thus restructured in the initiative of local governments subject to agreement between the business operators and stakeholders, such as local residents, they are supported by the government (Figure 3-5).

Figure 3-5

Summary of the Law for Making Partial Amendments to the Law on Revitalization and Rehabilitation of Local Public Transportation Systems



Source) MLIT

Section 3 Efforts to Take a Far-Sighted Vision of Social Infrastructures

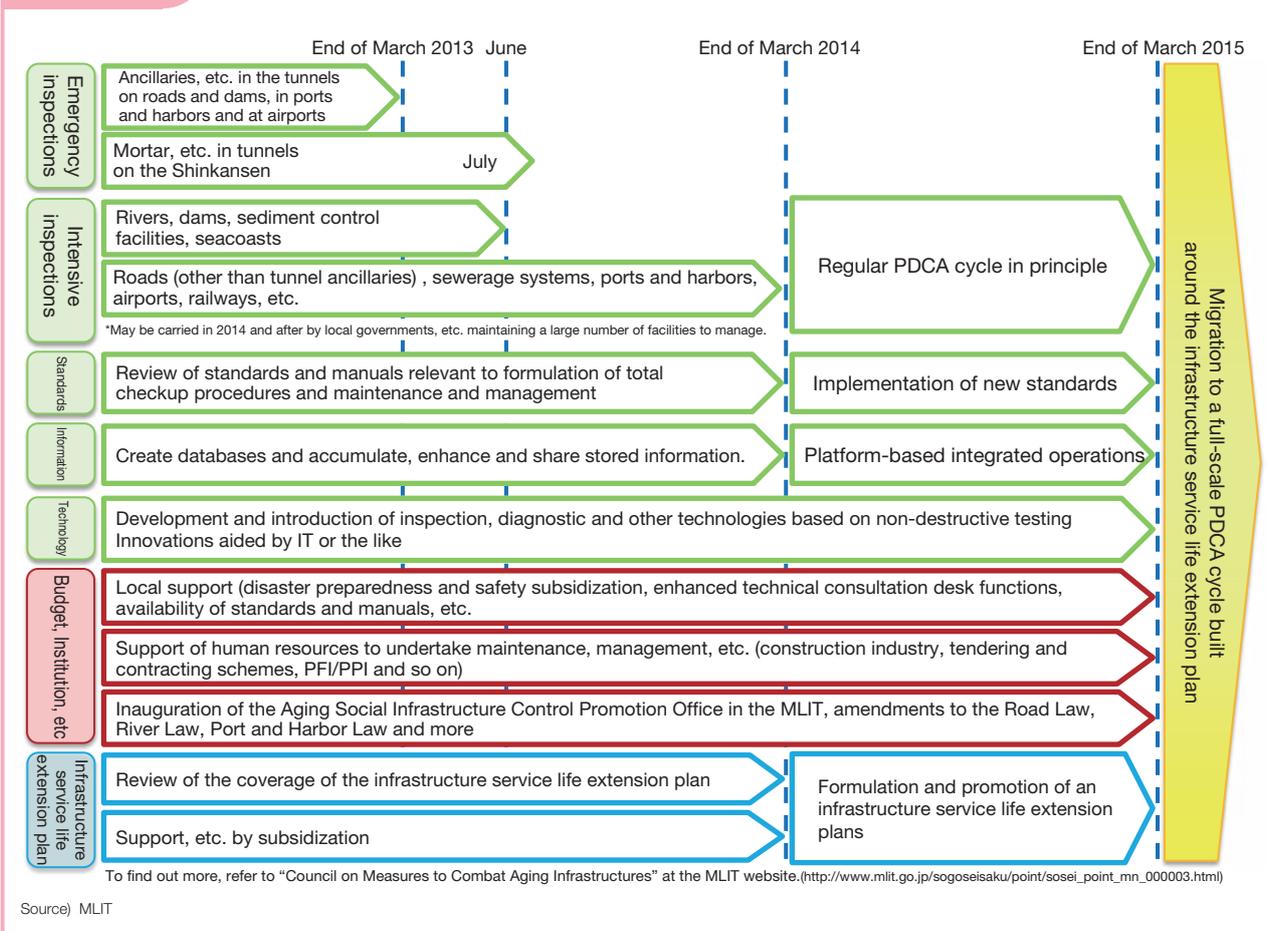
1 Efforts Made during the First Year of Social Capital Maintenance Activity and Carrying Them Forward through the Future

In its bid to allow existing social infrastructures to continue demonstrating their utilities over extended periods of time to come, the MLIT carries out their maintenance on a strategic and planned basis in an effort to take a far-sighted vision of infrastructures.

(1) Progress of comprehensive, cross-sectional efforts made pursuant to “Near-Term Actions to be Taken,” etc.

Since the social capital that has been developed since the nation’s period of rapid economic growth is on the brink of rapid aging from now, the MLIT has positioned the year 2013 as the “First Year of Social Capital Maintenance Activity” in its all-out effort to combat aging infrastructures and inaugurated the Council on Measures to Combat Aging Infrastructures chaired by the Minister of Land, Infrastructure, Transport and Tourism January of the same year. In March of the same year, the Council presented a three-year vision of the actions to be taken to combat aging social capital in a document titled “Near-Term Actions to be Taken to Maintain, Manage and Upgrade of Social Capital” to drive integrated, cross-sectional efforts (Figure 3-6).

Figure 3-6 Roadmap (Summary) for Near-Term Actions to be Taken to Maintain, Manage and Upgrade Social Capital (decided on March 21, 2013)



The basic idea is to determine the current status of existing infrastructures through appropriate inspections and fix them properly on the basis of the results of such inspections and also to promote the formulation and enhancement of infrastructure service life extension plans, etc., which form an integral part of the PDCA cycle for driving these efforts on a strategic and planned basis. More specifically, the following kinds of efforts have been driven:

(1) Total inspections and repairs

Since emergency inspections prompted by the Sasago Tunnel ceiling board fall accident, etc. and intensive inspections that give top priority to eliminating damages to users and third parties virtually completed as scheduled for fiscal 2013, repairs have been promptly initiated on the basis of the results of these inspections.

(2) Reviewing standards and manuals

Since the formulation and review of various standards and manuals relevant to checkups, their frequencies and so on based on knowledge available to date, inspection results, etc. have virtually completed as scheduled for fiscal 2013, new standards have been put into service since fiscal 2014.

(3) Developing maintenance, management and upgrade information

The development of a database is underway with regard to the present status of each individual facility, as well as a facility ledger, to impel the implementation of a PDCA cycle relevant to facility maintenance, management and upgrade based on precise information. In fiscal 2013, a prototype of the platform of such information was developed to help share and utilize cross-sectional facility information. Functions of the database are now being configured to launch the database on a limited scale during fiscal 2014.

(4) Development, introduction, etc. of new technologies

Regarding the development and introduction of the inspection and diagnostic technologies that help speedily locate deteriorated and damaged points, those relating to nondestructive testing, etc. have been field-tested and assessed through public participation by taking advantage of New Technology Information System (NETIS) since 2013. At the same time, a maintenance and management support website focusing on maintenance and management technologies has been opened to elucidate technological characteristics. During fiscal 2013, the Next-Generation Social Infrastructure Robot Development and Introduction Review Panel meeting was also inaugurated to grope for ways to boost robots, etc. to the state of practical usefulness, as by defining needs and applications for them in such fields of social infrastructure maintenance, management, etc. Starting from fiscal 2014, useful technologies have been invited in public from private businesses, colleges and so on and subjected to on-site verifications and assessments by the Next-Generation Social Infrastructure Robot On-Site Verification Committee to further their utilization and development.

In fiscal 2013, the Committee for Reviewing and Promoting Usage of Social Infrastructure Monitoring Technologies met to propel the development, etc. of technologies, as through matching between field needs and seeds in an industry-academia-government collaboration, and to assess and analyze the usefulness of the technologies developed through field verifications. The Committee expects to perform field verifications and assessments on monitoring technologies by public invitation starting from fiscal 2014.

(5) Aids extended to local governments

While local governments have a large number of infrastructural facilities to manage, they still must work to combat their aging with severe constraints on their financial, technical, human and other resources. Financial aids are granted to these local governments by the disaster preparedness and safety subsidization program inaugurated in the fiscal 2012 supplementary budget to support their facility inspections and repairs and infrastructure service life extension planning. Further, a support desk providing consultation on efforts to combat aging infrastructures was set up at each Regional Development Bureau and elsewhere in July 2013 as a one-stop solution to receiving requests for consultation from the local governments and others. The Ministry's other ongoing efforts include releasing standards and manuals relevant to infrastructure maintenance and management and promoting then enhancement or refinement of technical workshop and training plans.

(6) Supporting human resources to undertake maintenance, management, etc.

To ensure the proper practice of the work of maintaining, managing and upgrading social infrastructures, securing the right human resources to undertake inspection, repair and other on-site jobs and enhancing their technical capabilities would be essential. From a viewpoint of sustaining and inheriting the technical capabilities of local contractors, the Ministry has started studying and implementing measures aimed at restructuring the existing scheme of tendering and contracting, such as placing blanket orders covering multiple projects in a single deal each and encouraging the use of multi-year contracting.

The Ministry also encourages the development of an environment in which social infrastructures can be maintained, managed and upgraded in a more precise fashion through the use of local partnerships and PPP/PFI concepts, in its effort to drive public-private collaborations in their maintenance, management, upgrade and so on.

(7) Developing an integrated scheme of state management, and legislation, etc.

In March 2013, the Office for Promoting Measures Against Aging Social Capital was set up in the MLIT to move ahead with cross-sectional efforts to measures to combat aging infrastructures and propel their appropriate maintenance, management, upgrade, etc. on-site in its effort to build up an integrated scheme of management.

In addition, relevant amendments were made to the Road Law, River Law, Port and Harbor Law and more in the same year to address certain issues, such as expressly defining their criteria on maintenance and management, such as inspections.

(8) Promoting infrastructure service life extension planning

Prioritized support is being extended to local governments, etc. lagging in their formulation of infrastructure service life extension plans by newly including seacoast maintenance, dam, sedimentation control and other facilities in the scope of disaster preparedness and safety subsidization, etc. and stretching the period to qualify for such subsidization, etc. for river and park facilities.

The MLIT formed the Social Capital Maintenance Strategy Subcommittee under the Infrastructure Development Council and the Transport Policy Council in July 2012 to proceed with inquiries and discussions, which came up with a recommendation titled “Future Concepts of Maintenance, Management and Upgrade Social Capital” in December 2013. The recommendation suggests prioritized measures to be taken by the MLIT, local governments, etc. Pursuant to this recommendation, the Subcommittee will proceed to probe steps to put these measures into action, such as launching qualification systems on inspections and diagnostics, forming associations of specialists and building a new framework of maintenance activity surpassing the administrative boundaries of smaller municipalities.

(2) Developing efforts targeting infrastructures of every kind and carrying them forward through the future

The Infrastructure Service Life Extension Master Plan (hereinafter the “Master Plan”) was compiled at a meeting of the Liaison Conference among Ministers and Agencies Concerned with the Promotion of Measures Aimed at Combating Aging Infrastructures in November 2013 to disseminate such efforts across the government and further to local governments, private business operators and more working on infrastructures of any kind.

The concept of the Master Plan is to keep the PDCA cycle for maintenance activity running consistently, or taking the right action positively at the right timing to suit the results of inspections and diagnostics carried out at one instance and keeping a record of the facility conditions, logs of the actions taken and so on to aid in the implementation of inspections and diagnostics at the next. Pursuing this effort would help make the infrastructures longer-lived and avoid large-scale repairs and renewals to the extent possible, which could not only trim the total costs that may be incurred for the implementation of mid- and long-term maintenance, management, upgrade and other activities and level the budgets, but open up new markets relevant to the efforts made in the meantime, such as inspections, diagnostics, repairs and upgrades, in an evolving segment of growth technology.

While the Master Plan identifies the measures relevant to these concepts, it encourages the managers, etc. of infrastructures located in every part of the nation to prepare infrastructure service life extension plans (action plans) to pursue positive implementation of these measures.

After following up “Near-Term Actions to be Taken to Maintain, Manage and Upgrade Social Capital” at the May 21, 2014 meeting of the Council on Measures to Combat Aging Infrastructures, the MLIT has just come up with its action

plan to reflect recommendations by the Council (Figure 3-7).

Figure 3-7 Summary of the MLIT's Infrastructure Service Life Extension Plan (Action Plan) (decided on May 21, 2014)

Compiles an action plan based on the Infrastructure Service Life Extension Master Plan to reflect accomplishments and tasks emerging during the First Year of Social Capital Maintenance Activity. Make efforts intended to allow social infrastructures to demonstrate their intended utilities over extended periods of time so that a maintenance cycle will be built and developed continually. Ensure public security and safety, cut and level total costs and realize competitiveness for the maintenance industry.			
1. MLIT's Roles		Roles of the "competent authority" to build schemes, systems, etc. relevant to infrastructures	
		Roles of Infrastructure Managers	
2. Scope of Planning		3. Mid- and Long-Term Cost Prospects	
Target: All the facilities whose programs or the like are supervised by the MLIT. Period: Fiscal 2014 to fiscal 2020		Need to have more precise estimates of the mid- and long-term prospects of the costs of facility maintenance, management, upgrade and so on by probing into the actual status of the facilities and by individual facility planning.	
4. Present Status and Tasks, and Directions for Efforts			
	Present status and tasks	Directions for Efforts relevant to required measures	Examples of specific efforts
Checkups, diagnostics/repairs, renewals, etc.	Responses for facilities other than those subjected to total checkups Responses to changes in the social structure, such as diminishing population Shortage of technically competent staff members Secure the budget needed to put efforts into action/ Secure human resources to undertake inspections, diagnostics, etc.	Build maintenance cycles for all facilities. Review the need to have facilities, measures to be taken and so on. Enhance consultation desk functions, and training and education. Carry on and enhance support as by subsidization. Review tendering and contracting schemes.	Timely, appropriate checkups and diagnostics based on standards Repairs, renewals, concentration, etc. based on individual facility planning Enhancement and continuation Support efforts by disaster preparedness and safety subsidization. Fair pricing, etc., optimization of ordering lots
Development of Standards	Unclear position of standards Standards yet to be updated with new technologies and knowledge	Maintain standards in order. Update standards with new technologies and knowledge.	Visualize all standards with their positions clearly defined. Revise standards as appropriate at the right timing.
Development and Utilization of Information Infrastructures	Deficiency or lack of ledgers, etc. Inadequate uniform management aimed at information usage	Gather information through checkups, repairs, etc. Accumulate information and consolidate information in a unified manner, including that available from local governments.	Create and upgrade databases, and accumulate and update stored information. Share information among stakeholders.
Formulate individual facility plans	Presence of facilities for which plans are yet to be formulated Variations in coverage	Promote planning and enhance contents.	Expand the scope of planning. Develop and release guides, etc. and support by subsidization, etc.
Development and introduction of new technologies	Inadequate matching between field needs and technical seeds Unclear characteristics of new technologies (such as applicable conditions)	Industry-academia-government collaboration, and matching between needs and seeds Clarification of field conditions, etc. tailored to new technology usage	Field demonstrations and assessments, as by seeking public subscriptions with needs expressly defined Support of on-site introduction of new technologies via maintenance and management websites targeting specific characteristics of checkup and diagnostic technology
Budget management	Non-planned investment Revenue sources to cover action spending yet to be allocated	Reduction and leveling of total costs Review of benefits and burdens	Planned actions taken on the basis of individual facility planning Review towards allocation of revenue sources to cover investment on renewal
Constructing of systems	Inadequate assessment of technicians' technical capabilities Difficulty for local governments to respond alone Inadequate participation of users, such as the general public	Enhance qualification systems, and utilize technicians versed in advanced technical capabilities. Build a scheme of partnership between managers. Gain understanding from users, such as the general public, and promote collaboration.	Assess private qualifications and dispatch national governmental personnel, etc. Support municipalities by way of associations of stakeholders. PR activities conducted as by field inspection tours
Development of legislation, etc.	Unclear position of laws and regulations governing checkups, etc.	Clarify obligations and respond to changes in the social structure.	Define shares of responsibility for maintenance and repairs.
5. Others	Follow up plans to enhance and deepen efforts.		Release information positively through websites or else.

To find out more, visit the following address at the MLIT website: http://www.mlit.go.jp/sogoseisaku/point/sosei_point_mn_000003.html

Source) MLIT

The MLIT's action plan is a "maintenance guide," or a roadmap to maintenance engineering, that finalizes and visualizes the specific efforts it makes to help formulate facility-specific service life extension plans on those infrastructures that are managed by local governments, etc., as well as the central government, and thrust actions based on such plans.

The Ministry commits itself to a continuing policy of taking prioritized, planned actions to combat aging social infrastructures so as to get the concept of the management cycle come to firm stay nationwide and to carry forward the serious meaningfulness of the First Year of Social Capital Maintenance Activity and the relevant actions through the futures.

2 Getting Construction Works Executed Right, and Securing Manpower to Undertake Them

Contractors working to maintain, manage and upgrade social infrastructures require human resources to undertake these jobs. The MLIT works is at work to secure such human resources.

In May 2014, the Law Making Partial Amendments to the Construction Contractors Law, etc. took effect to update the Construction Contractors Law, the Law for Promoting Proper Tendering and Contracting for Public Works and other legislation with a view to ensuring correct execution of works, including maintenance, management and upgrade, securing human resources to undertake these jobs, prevent dumped order-taking and so on, pursuant to the Summary of Near-Term Actions to be Taken worked out in January 2014 at the Subcommittee on Basic Problems, Construction Workgroup, Industry Work Shop, Central Council on Construction Contracting Business and Infrastructure Development Council. This law has introduced anti-dumping as an additional concept of normalizing the practice of tendering and contracting for public works, dictating the submission of breakdowns of the bid amounts upon tendering and imposing obligations, such as requiring contractors' associations to secure and foster human resources and the Minister of Land, Infrastructure, Transport and Tourism to support them. The Law for Making Partial Amendments to the Law for Promoting Quality Assurance for Public Works effective in May 2014 also sets forth the mid- and long-term availability of human resources

as its key philosophy and recommends purchasers to set predetermined prices properly and take effective anti-dumping measures.

While demands for a certain amount of demotion work have loomed into sight as an era of full-scale maintenance and upgrade work sets in, it has become an imminent task to build an appropriate framework of construction in position to respond to a large bulk of problems, including fears of serious accidents involving the public and environmental issues. To preclude accidents during the execution of demotion work and ensure the quality of the work, demolition work has been added as a new sector of the construction industry relevant to its licensing to ensure the quality of the work, so that technicians equipped with relevant technical experience or qualifications will be deployed.

The Construction Industry Revitalization Council (chaired by Senior Vice-Minister Takagi) of the MLIT met in January 2014 to commit itself further to securing and fostering human resources to drive the construction industry in its continuing pursuit of short- and long-term solutions.

Conclusions

Thus discussed, various efforts are presently underway from the three perspectives of “Use it Wisely,” “Supported by Everyone” and “Taking a Far-Sighted Vision.” Working to ensure that these efforts will demonstrate their effects is necessary. What is also important is to drive further discussions to probe into the futures of the social infrastructures.

Efforts made from the perspective of using social infrastructures wisely can be exemplified by amendments made to the Road Law. As explained in Chapter 2, it is important to proceed with discussions of the scheme and concept of using social infrastructures wisely relevant to national land and transportation. Particularly, ways how to use the schemes of efficiently selecting users of social infrastructures and providers of services using social infrastructures should be explored in various aspects.

Efforts that have been made from the perspective of “Supported by Everyone” include the introduction of a concession scheme at an airport or else, an expanding scope of comprehensive work consignment to private sector and so on. To keep up with further progress, for example, it might be necessary to explore comprehensive work consignment to private sector deals that cover diverse or multiple fields of industry by themselves or promote a way of encouraging greater resident participation, as in Chiba Repo demonstration test.

From a perspective of “Take a Far-Sighted Vision” of social infrastructures, we need not only to support the implementation of efforts conscious of their longevity and life-cycle costs as they are used by local governments but also work to develop an environment that permits securing such human resources capable of maintaining, managing and upgrading them. Meeting these goals should dictate partnership between the central and local governments, and a mechanism to commit the construction industry to a long-term program to secure and foster human resources. In the meantime, it would be necessary for the administrators to keep local residents positively informed of the present status and future prospects of social infrastructures to enable the local residents to select and decide which social infrastructures to eliminate and consolidate and how to maintain, manage and upgrade them, with burdens on their future generations taken into consideration.

We need to always aware of what we can leave for our future generations as we strive to maintain, manage and upgrade social infrastructures.

Annotation 1 Estimating the Productivity Effect of Social Capital

1 Estimated Equation

The following Cobb–Douglas production function that allows for social capital stocks explicitly is presumed (one term earlier variables are used for private capital and social capital to deal with the endogeneity problem:

$$Y_t = A (H_t \cdot L_t)^\alpha (CU_t \cdot K_{t-1})^\beta G_{t-1}^\gamma$$

$\left[\begin{array}{l} Y = \text{total production, } A = \text{technical level of economy, } H = \text{number of hours worked, } L = \text{number of employees,} \\ CU = \text{operating rate, } K = \text{private capital stock, } G = \text{social capital stock} \\ \text{Subscript } t \text{ denotes the term.} \end{array} \right.$

At estimation, a linear homogeneity of production function ($\alpha + \beta = 1$) relating to the labor and private capital was postulated to estimate the following logarithmically converted estimated equation in the least square method:

$$\ln Y_t = c + (1 - \beta) \ln H_t \cdot L_t + \beta \ln CU_t \cdot K_{t-1} + \gamma \ln G_{t-1} + \varepsilon_t (\varepsilon: \text{error term})$$

The results of such estimation are summarized in the table below. Case 2 presents the results of estimation for social capital broken down into seven fields under the jurisdiction of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) (roads, ports and harbors, airports, sewage systems, urban parks, flood control and seacoasts). Case 3 presents the results of estimation for social capital limited to the three fields of traffic (roads, ports and harbors and airports).

Social Capital Stocks	Case 1	Case 2	Case 3
Constant term (c)	-8.916 (-7.872) **	-8.917 (-8.310) **	-9.329 (-8.781) **
β	0.315 (2.822) **	0.309 (2.855) **	0.267 (2.481) *
γ	0.226 (2.700) *	0.229 (2.851) **	0.266 (3.263) **
Number of samples	35	35	35

(Notes) 1 The parentheses under the coefficient estimate enclose a t-value, which has been subjected to a robust Newey-West correction for the serial correlation.
 2 * is significant with a significance level of 5%. ** is significant with a significance level of 1%.

2 Data

(1) Total production

For 1975 to 1979, the rate of change in the total production from a year earlier was determined from the values of subtotals “Gross Domestic Product (Real) by Economic Activity” in the Cabinet Office’s Fiscal 1988 Annual Report on National Accounts (1990 Basis, 68SNA),” so that the total production was retrospectively estimated from the values of subtotals in 1980 in “Gross Products by Economic Activity (Real)” in the Cabinet Office’s Fiscal 2009 Annual Report on National Accounts (2000 Basis, 93SNA). For 1980 to 2009, the values of subtotals in “Gross Products by Economic Activity (Real)” in the Cabinet Office’s Fiscal 2009 National Accounts (2000 Basis, 93SNA) are used.

(2) Number of hours worked

For 1975 to 1979, yearly ratios were calculated from five-year data for 1980 to 1984 on surveyed industry totals (30 persons or more) and from the number of hours worked for the same period out of the data on “Number of Employees, Number of Employers and Number of Hours Worked by Economic Activity” in the Cabinet Office’s Fiscal 2009 Annual Report on National Accounts (2000 Basis, 93SNA). Then, data on surveyed industry totals (30 persons or more) for 1975 to 1979 out of the Ministry of Health, Labour and Welfare’s Monthly Labor Statistics Survey was multiplied by the five-year average of these yearly ratios as a conversion rate. Data for 1980 to 2009 was cited from “Number of Employees, Number of Employers and Number of Hours Worked by Economic Activity” in the Cabinet Office’s Fiscal 2009 Annual Report on National Accounts (2000 Basis, 93SNA).

(3) Number of employees

Data for 1975 to 1979 was cited from “Number of Employees and Number of Employers by Economic Activity” in the Cabinet Office’s Fiscal 1998 Annual Report on National Accounts (1990 Basis, 68SNA). Data for 1980 to 2009 was cited from “Number of Employees, Number of Employers and Number of Hours Worked by Economic Activity” in the Cabinet Office’s Fiscal 2009 Annual Report on National Accounts (2000 Basis, 93SNA).

(4) Operating rate

For the manufacturing industries, operating rate index data out of “Indices of Industrial Production”, the Ministry of Economy, Trade and Industry (METI), was used. However, since only data in 1978 and after was available, the operating rate data for 1978 to 2009 was subjected to regression with business sentiment diffusion index data on the manufacturing industries in the Bank of Japan’s “Explanation of the Short-Term Economic Survey of Enterprises in Japan” to estimate the operating rates for 1975 to 1977 on the basis of the business sentiment diffusion index data.

For the nonmanufacturing industries, data from the METI’s “Indices of Tertiary Activity” was used. Since only data in 1988 and after was available, data for 1979 to 1987 was estimated using the same method as for the manufacturing industries.

(5) Private capital stocks

Data on the real capital stocks of the manufacturing and nonmanufacturing industries in “Japan Industrial Productivity (JIP) Database 2013” by the Research Institute of Economy, Trade and Industry (RIETI), an incorporated administrative agency, has been used. Housing has been removed from data on the nonmanufacturing industries.

(6) Social capital stocks

Data was cited from the Cabinet Office’s Japan’s Social Capital 2012. To keep the scope of data consistent with the data on the private capital stocks, data from all the 17 fields of social capital listed there has been converted to 2000 basis and further to calendar year values, excluding railways, public rental housing, water services, forestry and fisheries, school facilities, postal services and industrial water, according to Miyagawa, Kawasaki and Edamura (2013). Further, patterns of diminishing social capital efficiency (physical depletion, obsolescence and so on) have been set and the value of capital services derived from the future social capital estimated from these patterns has been converted to a present worth using a discount rate.

[References]

Cabinet Office (2010): “Fiscal 2010 Annual Report on Japanese Economy and Public Finance”

Tsutomu Miyagawa, Kazuyasu Kawasaki, Kazuma Edamura (2013): “Review of the Productivity Effect of Social Capital,” RIETI Discussion Paper Series 13-J-071

Annotation 2 Verifying the Welfare Effect of Social Capital

1 Estimated Equation

Following Karaki et al. (2006), the following equation has been estimated (for the process in which the estimated equation has been derived, refer to Karaki et al. (2006):

$$\ln R_i = a_0 + a_1 \ln I_i + a_2 \ln t_i + a_3 \ln g_i + a_4 \ln N_i + \varepsilon_i$$

R = residential land price per unit area, I = disposable income, t = commuting expense, g = social capital,
 N = urban size (number of employees)
 Subscript i denotes the area.

The marginal utility (R_g) measured in terms of the land price of the of the social capital stock can be stated in an equation as:

$$R_g = a_3 \frac{R_i}{g_i}$$

Estimation results are summarized in the following table:

Range of social capital stocks	Social capital	Under the jurisdiction of MLIT	Living and disaster preparedness under the jurisdiction of MLIT
Estimation method	Instrumental variables method	Instrumental variables method	OLS
Constant term	-1.906 (-1.726)	2.394 (1.660)	-6.221 (-8.134) **
a_1	1.822 (14.047) **	0.302 (1.168)	2.065 (17.906) **
a_2	-1.317 (-4.760) **	-0.780 (-5.822) **	-0.122 (-2.112) *
a_3	0.0330 (0.989)	0.142 (5.666) **	0.123 (7.012) **
a_4	0.317 (7.904) **	0.557 (9.036) **	0.109 (5.764) **
adj.- \bar{R}^2	0.505	0.459	0.639
Number of samples	919	919	919
Instrumental variable ^{Note 3}	Ratio of commuting to the central city	Ratio of commuting to a local municipality, central city dummy	-

(Notes) 1 The parentheses under the coefficient estimate enclose a t-value, which has been calculated using a robust White standard error against a non-uniform dispersion of the error term.

2 ** is significant with a significance level of 1%. * is significant with a significance level of 5%.

3 The variables listed on the "Instrumental variable" line are used as instrumental variables of the commuting expense.

Table Estimation Results (Micropolitan Employment Area)

Range of social capital stocks	Social capital	Under the jurisdiction of MLIT	Living and disaster preparedness under the jurisdiction of MLIT
Estimation method	Instrumental variables method	Instrumental variables method	OLS
Constant term	-1.767 (-1.418)	-0.608 (-0.640)	-0.703 (-0.719)
a_1	1.029 (4.210) **	1.384 (9.305) **	1.492 (10.283) **
a_2	-0.444 (-1.910)	-0.152 (-2.456) *	-0.174 (-3.424) **
a_3	0.0215 (0.218)	0.125 (3.260) **	0.0762 (2.137) *
a_4	0.546 (2.046) *	0.0158 (0.244)	0.0192 (0.308)
adj.- \bar{R}^2	0.290	0.426	0.408
Number of samples	328	328	328
Instrumental variable ^{Note 3}	Ratio of commuting to the central city	Ratio of commuting to a local municipality, central city dummy	-

(Notes) 1 The parentheses under the coefficient estimate enclose a t-value, which has been calculated using a robust White standard error against a non-uniform dispersion of the error term.

2 ** is significant with a significance level of 1% and * is significant with a significance level of 5%.

3 The variables listed on the "Instrumental variable" line are used as instrumental variables of the commuting expense.

2 Data

The municipalities that have been analyzed are those included in Metropolitan Employment Areas (MEA) and Micropolitan Employment Areas (McEA) (one government-designated city and one special district in each area) based on the 2005 Metropolitan Employment Area Standard available from Center for Spatial Information Science, the University of Tokyo.

The residential land price is the municipal average of residential land prices from "Prefectural Land Price Survey." The income is the municipal taxable income from the Ministry of Internal Affairs and Communications "Survey of the Status of Municipal Tax Imposition, etc." divided by the permanent population. The prefectural social capital is the prefectural social capital stock from the Cabinet Office's Japan's Social Capital 2012 that is prorated among the municipalities according to a certain standard. Further, the urban size is the number of employees in a Metropolitan Employment Area calculated from the MIC's "Population Census." The amount of the commuting expense is based on the average commuting time calculated from the MIC's "Housing and Land Survey" and the "Population Census."

[References]

- Yoshitsugu Kanemoto, Kazuyuki Tokuoka (2002): "Japan's Urban Area Setting Criteria," *Journal of Applied Regional Science*, No.7, 1-15
- Yoshihiro Karaki, Takashi Okuhara, Satoshi Tomari, Chisato Asahi, Tomoaki Nishihata (2006): "The Economic Effects of Public Capital Stock: Measuring Productivity Effects and Welfare Effects Through Urban Area Classification," Report No. 68, Policy Research Institute for Land, Infrastructure, Transport and Tourism

Annotation 3 Estimating the Effects of the Compactness of a City May Have Upon Administrative Spending

(1) Estimation method

Regarding a municipality having a DID district, the following equation has been estimated using the number of residents (N), the population density of the DID district (Density), the area of the municipality (Square) and the time dummy (Dummy) as explaining variables and the amount of annual spending per resident (EXP/N) as an explained variable, in which a fixed effects model is used for estimation to allow for the municipality-specific severity:

$$EXP/N = c + \alpha \ln(N) + \beta \ln(\text{Density}) + \gamma_1 \text{Square} + \gamma_2 \text{Dummy} + \varepsilon$$

The estimation has been carried out using data derived from the two periods of fiscal 2005 and fiscal 2010 available in the MIC's "Regional Statistical Databases."

(2) Estimation results

Estimation results are summarized in the following table:

	Constant term	Population (logarithm)	DID district population density (logarithm)	Area	Adj R ²
Amount of annual spending per capita	2670.084*	-191.833*	-25.137*	0.003*	0.927

(Notes) 1 The time dummy is not shown here.

2 * is significant with a significance level of 1%.