

INTRODUCTION OF TIME MANAGEMENT CONCEPT FOR PUBLIC WORK PROJECTS

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Abstract: Reduction of the cost of public works is now one of the important policy issues in Japan. Though various policy initiatives have been taken to address the issue, the possibility of achieving significant cost reduction through the shortening of project term has not been explored yet. This paper utilizes the information included in ex-post evaluation reports for an objective assessment of possible cost saving and other economic and financial benefits due to better time management in public work. The paper finally makes policy recommendations for applying the time management concepts in public work projects in Japan. The result of this study could serve as valuable inputs for the ongoing reform process to improve efficiency of public work projects in Japan. The study findings can also be relevant especially for developing countries as the longer time period or time over-run is the common problem in these countries too.

Key Words: Public works, Project management, time management, project delay,

1. BACKGROUND

From late 1990s, cost reduction for public work has become an important political issue in Japan. Because of the worsening condition of public finance, lower efficiency of public work projects has been severely criticized by Japanese people. The government is making efforts to reduce the cost of construction by taking various measures such as introduction of innovative technology and reform of the bidding procedure. However, the longer time period taken by public work projects, which is one of the major responsible factors for lower efficiency is not given due importance in the ongoing reform process. It appears that the public agencies and general people are not much aware of the potential financial and socio-economic benefits that can be obtained through better time management in public work projects. Also, there is not much research work on this particular issue.

With this background, the purposes of this paper are; firstly to clearly identify possible causes of delays in the implementation of public work projects, secondly to review policy efforts introduced in Japan to address this problem, thirdly to analyze the underlying reasons of

delays and estimate the actual losses resulting from delays, and finally to make policy recommendations.

2. CAUSES AND EXTENT OF DELAYS

2.1 Causes of delays

In case of private sector projects, project delay means direct financial loss because of accumulated interest payment and lost revenue due to delayed opening of the facility. That means decreased profitability and longer payback period for the capital investment. Therefore, private sectors always make their best efforts to shorten the term of project implementation. In the case of public work projects, especially projects financed from general tax revenue, decision makers take lower interest in shortening or avoiding delay. This phenomenon is well understood but policy initiatives to address the issue is so limited worldwide. The generic reasons for the delays in public work projects are summarized in Table-1.

Table 1: Reasons for delays in public work projects

<p>(1) Technological factors:</p> <ul style="list-style-type: none"> • Lack of management skills • Constraints of construction technology to shorten project term <p>(2) Unexpected factors</p> <ul style="list-style-type: none"> • Unexpected geological conditions • Discovery of under ground artifacts of cultural importance • Natural disasters <p>(3) Budgetary factors</p> <ul style="list-style-type: none"> • Inadequate budgetary resource for optimal project financing • Lack of financial provision for unexpected factors <p>(4) Administrative procedures</p> <ul style="list-style-type: none"> • Complexities of negotiation with and consensus building among related public institutions • Lack of standardize procedure regarding time-span for individuals decisions in the process of project planning and implementation <p>(5) Other legal and regulatory factors:</p> <ul style="list-style-type: none"> • Disincentive against shortening the project term • Subsidized public bodies (such as local government) have to pay back the saved cost as a result of completing project before schedule term. • Private contractors have to pay penalty for the delay but also have to return the saved cost if term is shortened. <p>(6) Factors related to stakeholders</p> <ul style="list-style-type: none"> • Land acquisition • Consensus building among concerned citizens • Activism to oppose project implementation

2.2 Extent of delays

For the public work projects in transport sector, the term of project implementation is carefully decided taking all relevant factors into account. But majority of public work projects fail to be completed within the scheduled term. Figure-1 shows the time delays experienced by samples of projects from different transportation sectors. Each panel shows time delays (in year) on the x-axis and number of project on the y-axis.

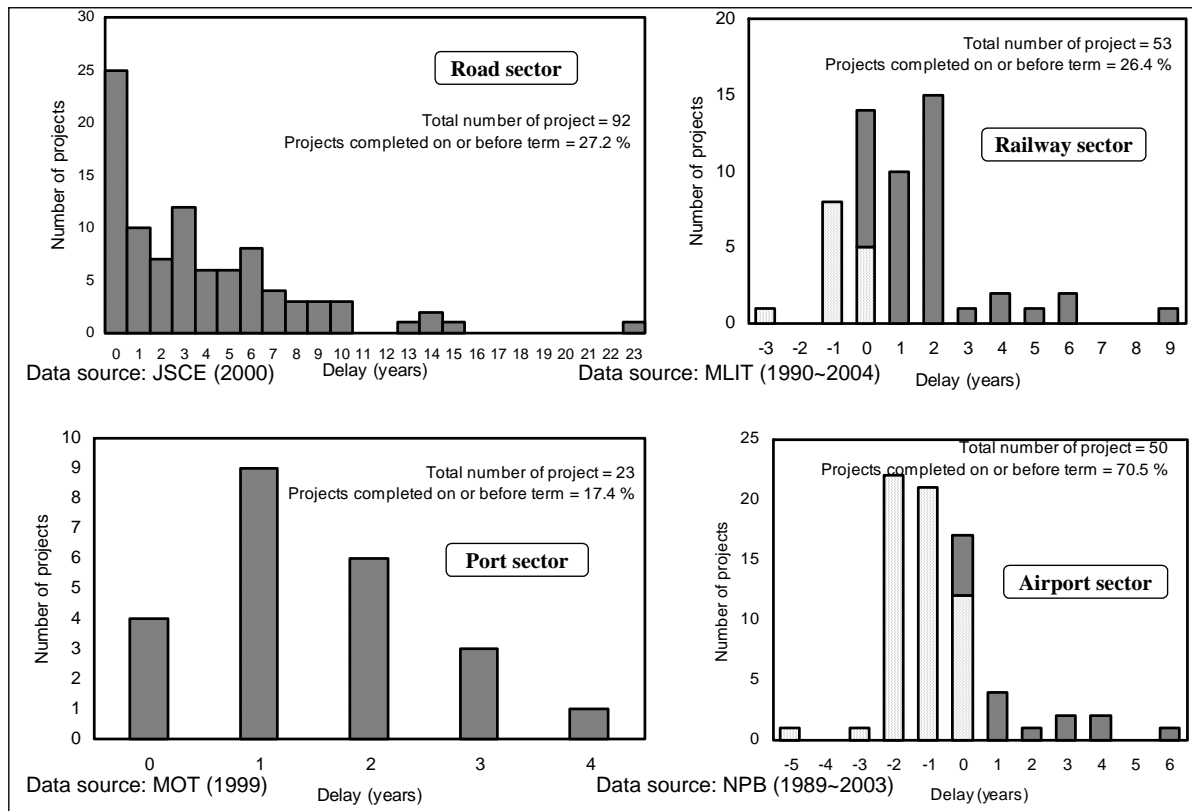


Figure 1: Extent of delays for projects in different sectors

As shown in the upper-left panel of Figure-1, delay term in road projects is substantial and the longest as compared to projects in other transport sectors. Only 25 road projects out of a total of 92 (27.2 percentage) were completed within the scheduled term. The main causes for delays includes complexities of land acquisition process and problems in consensus building among concerned citizens. In addition, due to demand for numerous road projects but limited budgetary resources, the available financial resources have to be thinly spread over so many projects leading to the extension of the project term due to lack of adequate project financing.

Likewise, as shown in lower-left panel of Figure-1, only 4 port projects out of a total of 23 (17.4 percentage) were completed within the scheduled term. The maximum length of delay was 4 years. The main reason of delay is difficulty in building consensus among and reaching agreement with local fishermen.

In case of railway projects, 14 projects out of a total of 53 (26.4 percentage) were completed on or before schedule term as shown in upper-right panel of Figure-1. Though the percentage of projects that were completed within the scheduled term is almost same as that for road projects, the length of delay for the remaining projects in railway sector is much shorter. Most

railway projects were completed only with 2 years of delay. The relatively shorter delay for the railway projects might be because of the profitability concerns since railway projects involve revenue earning infrastructure and delay in project completion means potential loss of revenue. In addition, most railway projects are subway projects in which land acquisition is not much difficult and gaining consensus among citizens is also not difficult as the environmental impact of subway projects is not significant.

Airport sector performs relatively better in terms of completing projects within or even before the schedule term. As shown in the lower-right panel of Figure-1, 35 airport projects out of a total of 50 were completed on or before the schedule term. The maximum length of delay in airport sector was 6 years. The difficulty in implementation of airport projects comes mainly due to environmental (noise) concerns. However, most of project work (included in the sample) involved extension of runway or other associated facilities (such as parking, extension of terminal building etc) rather than the construction of new airport. That is possibly why the project implementations could be better controlled to follow the scheduled terms.

3. REVIEW OF POLICY EFFORTS

In Japan, introduction of Time Management Concept in public work projects was first proposed by the first author (Shigeru Morichi) of this paper in 1999. The importance and benefits of time management in public work projects is obvious. Yet, the author used the phrase “Time Management Concept” with a notion of broadening the meaning of time management beyond the conventionally understood meaning with a narrowly defined scope. This concept specifically calls for reassessing every rule and procedures related to planning and implementation of public work projects for their effects on time schedule of the projects and possible losses incurred due to delays. Introduction of this concept is expected to bring about a drastic change in the mindset of decision makers and related people including citizens and may induce new thinking to make them realize the scale of socio-economic loss due to delays.

The main reason for proposing the Time Management Concept lies in the fact that despite the widespread cases of delays in public work projects in Japan, the issue has not attracted due attentions from policy makers, project administrators and citizen groups alike, apparently due to lack of information about the financial and other socio-economic losses resulting from such delays. For example, at the end of 1990s, Mr. Hashimoto, the then prime minister of Japan, called on all the government departments to reduce the cost of public work because of financial hardship caused by prolonged recession. As a response, public work related government department made several efforts to reduce the cost burden of public work on the government finance. However, there are no policy efforts directed towards reducing cost by shortening scheduled term of projects and/or avoiding delays in implementation.

Regional Economy Committee (Shigeru Morichi as the chairman) of Economic Policy Council issued a report that included a recommendation to introduce the Time Management Concept, which was approved by the Cabinet in 1999. Thereafter all ministries related to public work started examining the institutional provisions relevant to public work for making necessary improvements. As a special initiative in response to this issue, Ministry of Transport formed a committee named “Introduction of Time Management Concept and Ex-post Evaluation Procedure” under the chairmanship of Shigeru Morichi.

In 2000, a scheme for comprehensive evaluation of bidding was introduced that, among others, emphasized the importance of time management to improve the efficiency of bidding evaluation. In this scheme, the time management idea was borrowed and adopted from experience of Lane Rental Bidding Scheme¹ as practiced in United Kingdom. Under this scheme bids are evaluated considering not only bidding amount but also the construction term proposed in the bid. The contractor has thus inbuilt incentive to shorten the construction term of the project.

Likewise, in 2001, eminent domain law for land acquisition (which allows government to acquire private land for public use if the land owner is not offering the land voluntarily) was improved to reduce time required for land acquisition process.

Detail descriptions of the policy efforts including those mentioned above are given in research papers and reports published by the research group of Shigeru Morichi and the Research Institute of Construction and Economics. Key publications in this regard include Morichi et al (2004), Tada (2001), Nakayama (2000), Research Institute of Construction and Economics (2000), Transport Policy Bureau of Ministry of Transport (2000) and Hasegawa (2004).

4. ANALYSIS OF REASONS FOR AND ESTIMATION OF LOSSES FROM DELAYS

4.1 Ex-post evaluation

The committee on ex-post evaluation (under the chairmanship of Shigeru Morichi) formed by Kanto Regional Bureau of the Ministry of Land, Infrastructure and Transport (MLIT) started ex-post evaluation of completed projects in 2000. As ex-post evaluation is important not only for securing accountability but also for learning lessons from past experiences, the evaluation process examined all relevant facts including those related to project delays. Contents of the ex-post evaluation are as follows:

- ① Change in factors relative to assumptions made in cost-benefit analysis (CBA): for example, traffic volume, construction cost, project term and reasons for delay.
- ② Effectiveness of project: for example, congestion improvement, travel cost reduction etc
- ③ Environmental impacts: for example, pollution and noise
- ④ Socio-economic impacts: for example land-use change
- ⑤ Necessity of additional ex-post evaluation
- ⑥ Improvement needed in the project
- ⑦ Lesson learning for project planning process and feedbacks to evaluation methodology

¹ This scheme was originally devised for road repair projects which required closing of road lanes to carry out the construction works. As there is obvious social cost due to the lane closure, both bid amount and time span of construction as proposed in the bid are taken into account while evaluating different bids.

4.2 Analysis of delays in selected road projects

Table 2: Reasons for delay in implementation of selected road projects

Project	Reasons for delay
R17: Numata By-pass (NBP)	<ul style="list-style-type: none"> • Difficulties in consensus building among local residents for the location of anti-noise barrier • Difficulties in land acquisition for the anti-noise barrier • Surveying work for underground cultural heritage
R16:Kobuchi Intersection improvement (KIC)	<ul style="list-style-type: none"> • Relocation of private factory • Construction of temporary structure and ground improvement work • Design change due to unexpected underground condition
R16: Chiba By-pass	<ul style="list-style-type: none"> • Relocation of access road to private residence
R50: Uchihara By-pass (UBP)	<ul style="list-style-type: none"> • Problems of land acquisition • Complexities in deciding provisions for and location of connected access (underground pass-way or overhead bridge) for divided farm lands
R16: Kawagoe widening (KW)	<p>Problems of land acquisition</p> <ul style="list-style-type: none"> • Decision to invoke eminent domain law due to disagreement over land price • New offer by the landowner for voluntary agreement for land acquisition • Need to reevaluate the land price again
R140: Karisaka Road (KR)	No delay
R298: Tokyo Outer Ring Road (TORR)	<ul style="list-style-type: none"> • Land acquisition • Citizen's opposition

During 2000-2003, ex-post evaluation of seven fully completed national road projects were carried out. All except one of these projects suffered from implementation delay. The ex-post evaluation reports have listed the reasons for the delays as shown in Table-2.

Table 3: Selected project indicators

Projects	Scheduled term, (years)	Delay (years)	Total cost (ex-post ¹) (bil yen)	Benefits (ex-post) (bil yen)	Benefit-cost Ratio (appraisal ²)	Benefit-cost Ratio (ex-post)	Loss due to delay (bil yen)
R17:NBP	16	5	22.6	41.5	2.8	1.8	12.0
R16:KIC	13	2	8.0	28.4	3.88	3.55	2.7
R16:CBP	32	1	26.8	106.9	4.13	3.99	3.8
R50:UBP	15	4	14.2	33.7	2.47	2.37	3.3
R16:KW	26	6	12.1	25.7	2.19	2.12	3.3
R140:KR	14	0	58.0	61.2	1.1	1.1	0
R298:TORR	30	3	68.2	116.0	1.7	1.7	4.8
Average		3	29.98	59.05	2.61	2.38	4.27

Notes: 1. Revised figure as computed by ex-post evaluation.

2. Benefit cost ratio at the time of project appraisal (i.e. before implementation)

Table-3 further shows key project parameters including expected project terms, delay time, estimated loss due to delay. The estimated loss includes increased construction cost and the reduced socio-economic benefits. The table also includes the benefit cost ratios at the time of project appraisal and ex-post evaluation. As shown in the table, due to the project delay, the benefit cost ratio computed by ex-post evaluation for most projects is lower than that at project appraisal stage. The money-term loss due to delay is a substantial amount. In the worst case (R17: Numata BP), the loss from delay is almost 30 % of project total benefits- a significant amount from any measure. On average, the loss is over 7 % of total benefits.

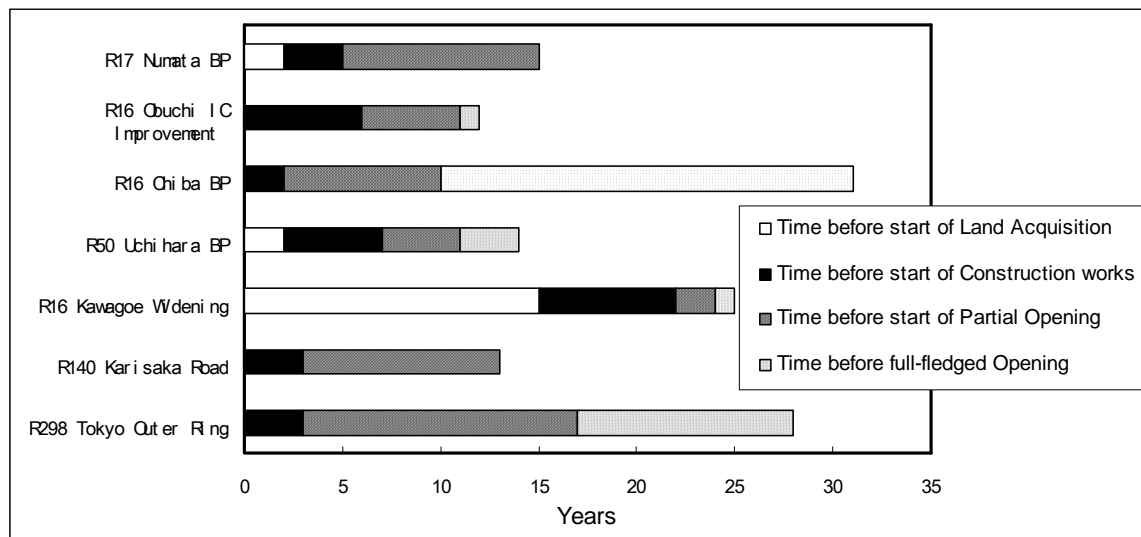


Figure 2: Time taken before starting of different stages of project implementation

Figure 2 shows the years lapsed before a particular stage of project implementation is started. The time taken before starting of a particular stage should be read as the accumulated time up to the right end of corresponding bar in the chart. For example, the length of un-shaded segment (white) of bars represents time spent before land acquisition starts (indicating processing and negotiation time). Likewise, the combined length of white segment and black segment represents time spent before construction starts. However, the start of construction does not necessarily indicate the completion of land acquisition since construction work can be started as soon as minimum stretch of land that is required to start construction is acquired. So, there is possibility of land acquisition and construction works progressing side-by-side.

Though, in normal case, only the full-fledge opening of the project indicates project completion and partial opening is basically due to some unexpected complications for particular sections of the project. However, in some cases implementation of project is designed and scheduled for a phase wise completion leading to an intentional partial opening. In such cases, the completed parts or the sections in the first phase is opened for service and the remaining parts or sections (to be completed under subsequent phases) are implemented according to the increase in traffic volume or pressure from land-use changes. For example, in case of multilane highway, in the beginning only few lanes just enough to serve existing traffic may be built and remaining lanes may be built later when traffic volume is high enough to justify more lanes. The partial opening for some projects shown in Figure-2 appears to be intentional one. So, indicated time period between starting point for partial opening and full-fledged opening is not of much relevance while analyzing project delay.

However the scheduled term for each project shown in Table-3 looks too long. In fact, the scheduled term for each project might have been decided taking several factors into consideration, such as difficulty in land acquisition, and other physical and technological constraints. However, as the delays are relatively not so long, it is likely that the scheduled terms were basically decided by the availability of budgetary financial resources. We can see from Figure-2 that the project implementation has taken substantial time even after the starting of the construction work. It indicates a possible case where the budgetary financial resource has been thinly spread over a large number of projects forcing all projects to wait longer than otherwise required. In contrary, if the allocation of budgetary resource is concentrated to a small number of projects, some of the projects, at the least, can be completed much earlier, and remaining projects can get concentrated financing in the later years. Under such scheme of budgetary allocation, we can see that the scheduled term of most projects can be significantly shortened without changing the completion date of remaining projects (projects started later). This implies significant reduction of schedule terms and possible delays and as a result substantial additional social benefits from public works.

In fact, the planners show a tendency of setting up the schedule term of a public work project with upward bias in order to factor in so many uncertainties associated with implementation of the project. Even after such conservative estimate of time schedule, delays in project implementation are significant both in scale and frequency. So, the policy efforts to address this issue should be targeted at two levels; to shorten the schedule term of projects and to avoid the delay. There have been concerted policy efforts and also practical achievements in improving other aspects of the project management system. For example, to rationalize the project cost estimation, there is a system of conducting annual survey of unit costs. But there is not any standardized and systematic procedure for setting up the scheduled term of public work projects. As a result, decision makers had to rely on the planner's ad-hoc estimation with upward bias setting up a much longer term than actually required.

In the project cycle, the project implementation phase, which starts after the project approval by concerned authority, involves two distinct phases, firstly non-investment phase such as processing and negotiation for land acquisition and other preparatory arrangements and secondly investment phase such as payment to land owners and construction expenses. While discussing project terms, both of these phases are treated in the same way. However, these two phases have distinct characteristics from the viewpoint of financial efficiency. Shortening of overall terms can be achieved by shortening the terms of either phase. However, shortening of the term of investment phase may result in more financial benefits particularly in two ways. Firstly, shorter investment means shorter construction term resulting in significant reduction in construction cost. Secondly, if the starting time of investment phase is delayed until the finalization of land acquisition but not beyond the point that delays the opening of the project, the accumulated interest on committed capital resource would be less. In other words, delaying actual investment point by some time (but keeping the project completion date same) would reduce the net present value of project cost yielding higher benefit cost ratio. In practice, if minimum land is available to start construction (due to easy agreement with some land owners or other reasons), there is a temptation on the part of project managers to start construction. This approach is intuitively appealing as people might think that the parallel processing and negotiation for land acquisition and progressing of construction work contribute to early completion of the project. However, actually it makes little difference in shortening the project term as, in essence, the net effect is forward extension of investment phase rather than forward shift of investment phase. While forward shift of investment phase

may bring net benefits due to early completion of the project, forward extension of the investment phase just makes the project term longer without changing completion date.

Likewise, shortening the term of non-investment phase that mainly includes processing and negotiation for land acquisition can shift the starting time of investment phase and contribute to early completion of the project. What is important is to put effort to carry out two distinct activities of this phase separately but simultaneously; they are administrative processing and negotiation with landowners and local citizens. In this way, the terms of this phase can be shortened resulting in a net shortening of overall project term. Most effective way to achieve this is through public involvement from the early stage so that negotiation can be settled and consensus can be build among concerned citizen before investment is made.

5. RECOMMENDATIONS

As mentioned in above chapters, there is only limited effort made for policy initiatives and institutional provisions to shorten the term of project implementation. It appears that decision makers in related government offices, citizen groups including landowners are not fully aware of the extent of financial and other socio-economic losses caused by project delay. Of course, the obvious solution of project delays lies in the efficient project management. However, the generic pattern and extent of delay in public work projects suggest that the policy efforts targeted for project delay should go much beyond project level management and should include reform at system level covering components like related laws, institutions, administrative procedure, budgetary process, and planning process including public involvement (PI). What follows is policy recommendations targeting key issues related to project delay.

5.1 Incentive mechanisms

The behavior of key players in the project planning and implementation system is shaped by the incentive mechanism that is inherent in the given institutional structure including regulation and procedures. In the present system, there is a good scope of introducing effective incentive mechanisms that might influence behavior of key players to avoid the delay and shorten the project term. In addition, there is also some disincentive mechanism inherent in the present system that leads to project delay. That means penalizing the players trying to shorten the project terms. Therefore, it is imperative to remove disincentive mechanism, which exist in the current system and introduce incentive mechanism that gives rewards for shortening the project terms. Following paragraphs suggests some specific incentive measures targeted to key players.

- (1) Subsidized local government: Under the present system, if local government achieved cost saving through shortening project term, the saved amount need to be return to the central government, an obvious case of disincentive. Such provision should be removed. Instead, the local government body should be allowed to retain some portion of saved cost. It is also important to widely publicize the successful cost saving initiatives taken by some leading local government bodies. Such publicity may give incentive to the local government bodies to continue the efforts and at the same time may encourage other local government bodies to replicate the good examples.
- (2) Construction firms: The current system requires the construction firms to pay penalties for delay but does not give any reward for shortening the construction term. Rather if the

construction firm shortens the term and completes the project before schedule term resulting a saving in construction cost (along with social benefits due to early opening of the project), the saved amount has to be paid back to the government (the client). To make the incentive stronger, a portion of the saved cost should be given to the construction firm as a reward. The comprehensive bidding evaluation system as mentioned before is, in fact, making an attempt to give incentive to contractors to shorten the term of construction. However, there are no clear rules and procedure to decide on what type of projects should be subjected to this new approach. So, there is a need to formulate clear guidelines to identify types of projects for which the newly devised incentive mechanisms should be applied.

- (3) Citizen groups including landowners: It seems that there is lack of awareness among concerned citizen groups and landowners about the extent of losses due to project delays. One possible way to raise public awareness on this matter is to open data of money-term losses due to project delays. It is also important to build some kind of incentive mechanism that gives rewards to landowners who cooperate voluntarily to finalize the negotiation for land acquisition earlier.

5.2 Improving budget allocation system

(1) Need of concentrated budget allocation: As mentioned before, the current practice of budgetary allocation spread the public financial resources thinly over large number of projects causing a much longer project term than otherwise would be the case. Such inefficient approach should be changed in favor of an approach that concentrates budgetary resources into a small number of projects in order to ensure adequate financing to complete the projects within the optimal minimum time span. As compared to the present approach, this approach helps most projects to complete earlier without delaying completion date of other projects. Instead, projects chosen for later investment (not necessarily later completion) could yield higher benefit cost ratio (as compared with under current approach) due to later investment (means lower discounted amount) and short investment period (means lower construction cost).

(2) Harmonization of budgetary system and project management system: Government budgetary system operates year-by-year basis but the project implementation term span multiple years. However, some of the provisions in current system require that project implementation activities be dictated by the government annual budget decisions. This does not make it possible to shift the construction work (scheduled originally for later years) to earlier fiscal year as a result of better time management. So, shortening work schedule of an individual year does not contribute to completing project earlier. Likewise, the project needs to wait until next fiscal year to get budget for some unexpected factor even if it is hampering the progress of the construction seriously. Another important hurdle the annual budgetary system creates is due to the time lag between budget allocation decision and actual distribution of budget. Due to such time lag, the project management needs to wait several months to use the allocated budget for project activities- a clear case of inefficiency. Therefore reform process should give due consideration to harmonize the budget allocation system with the need of project management for public work.

(3) Improving land registration system: One of the underlying reasons for difficulty in smooth land acquisition lies in the problems with land registration system. This can easily be understood since the current land registration law, regulation and procedure are not originally

optimized for smooth land acquisition for public work. So, current land registration system creates several complications in the process of land acquisition. Some of the problems in the current land registration system include lack of up-to-date cadastral survey and maps, disputes related to inheritance and outstanding inheritance taxes and so on. Measures should be taken to undertake cadastral survey and produce up-to-date cadastral maps so that disputes related to ownership can be avoided. Likewise, relevant changes should be made in the procedure of transferring inherited land property so that land acquisition process can be progressed even if there are inheritance disputes or outstanding inheritance taxes. Appropriate legal arrangement can be made to safely deposit the amount paid for land compensation so that it can be settled accordingly once the disputes are resolved.

5.3 Need to devise a method for the estimation of optimal project term

In fact, there is no standardized procedure in Japan to decide the time period for project implementation. As a result, even though there has been a significant advancement in construction technology making it possible to shorten the construction period, it is not happening in practice. As mentioned before the project term is decided conservatively with upward bias. Therefore, it is important to devise an objective method to estimate the optimal terms of project implementation. Without such method, the incentive mechanisms proposed above may involve risks of manipulations on the part of key players (such as local government bodies and contractors) by setting artificially longer terms and then claiming rewards for apparent (but not real) shortening of the term (strategic behavior due to moral hazards). In addition, the objective estimation of project term allows introducing incentive mechanisms even within the provisions of conventional bidding system. The information and data from ex-post evaluation reports may serve as important reference to estimate the optimal project term.

In Japan, the policy initiatives to save cost of public work projects by shortening project terms are just starting to take shape in last few years. As the implementation of concrete policy measures to address this issue is still very limited, the recommendations discussed above are intended to identify key areas where improvements are urgently needed. In addition, we have to continue the efforts to establish new institutional provisions and procedures for efficient implementation of public work projects. Unfortunately, for this particular issue, even in other developed regions or countries such as EU and US, there is no standard or well-tested system. So we do not have a luxury of borrowing basic idea from a well-tested system and adapt it to the Japanese system. Rather we are facing a challenge of developing new system by learning from past experiences. The recently introduced system of ex-post evaluation could be an important vehicle to gain insights from the past experiences to develop a comprehensive system for implementing public work projects giving due importance to the Time Management Concept. Such a system would be useful not only for Japan but also for countries of East Asian region, which are expecting a huge demand of public works in near future.

6. CONCLUSION

Presenting the patterns and scale of delays in public work projects in Japan, this paper analyzed the generic reasons for delays. It also estimated the money-term losses caused by project delay and discussed underlying issues responsible for project delay and made policy recommendation to address these issues. Most importantly, discussing the case of Japan, the

paper emphasized the importance of understanding the time management concept for public works with a much broader scope, which should influence decision-making procedures in all related institutions including the attitude of general public towards public works. The recommendations made in this paper identify some critical areas that needs urgent reform in order to realize the potential benefit though reduction in project terms or avoiding project delay in Japan. It is expected that the analysis and recommendations of this paper will serve as useful reference for policy makers in process of policy reform in Japan to improve the efficiency of public works. Countries of East Asian regions, which are expecting a huge increase in public works in near future, can also utilize the concept put forward in this paper to improve the time schedule of public works and thereby avoid significant financial and social losses.

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