An Approach to Risk Management for Land Readjustment Projects Implemented by a Cooperative Association

Takanori SATA*, Chikashi DEGUCHI**, Tetsunobu YOSHITAKE*** and Makoto ASANO*

Abstract

A Land Readjustment (LR) project implemented by a cooperative association is a popular tool used for urban development and improvement in Japan. It necessarily is accompanied by many risks caused by the different views of landowners who organize a cooperative association, and other organizations concerned with the LR project. Although reduction of these risks is very important for the cooperative association, it is impossible to take countermeasures for all risks because of financial restrictions. So, a cooperative association must find ways to reduce any high risks and select proper countermeasures to them. This study produced a flowchart for supporting a cooperative association in finding the risks and selecting effective countermeasures based on the analyses of questionnaires conducted with experts on LR projects and then checking the validity and applicability of the proposed flowchart.

The risks are classified into four areas (Zone-A: First priority for risk reduction; Zone-B: Second priority; Zone-C: Third priority; and Zone-D: risk acceptance) using risk impact and risk potential. Any impacts whereby the risks negatively affect the LR project were evaluated using the questionnaire results from the LR experts. Further, the likelihood that the risk is eventually actualized was evaluated by twelve experts in a construction consultancy who work nationwide.

In the proposed flowchart, the risk finding and the selection countermeasures are processed according to the LR project stage, population density, and the state of implementation of the countermeasures. To check the validity of the flowchart, the risks and countermeasures selected by the flowchart were applied to four practical LR projects and then compared with the countermeasures actually selected by the LR experts. The comparison shows good agreements and applicability to risk management in LR projects that are implemented by a cooperative association.

Keywords: *land readjustment project, risk management, questionnaire survey, countermeasures, flowchart*

* Tamano Consultants Co., Ltd., ** University of Miyazaki, *** Kyushu Institute of Technology
E-Mail: sata_takanori@tamano.co.jp

* This is an abstract peer-reviewed by the International Affairs Committee of the City Planning Institute of Japan for ISCP2014.

1. Introduction

An LR project is the typical method used for Japanese urban development and improvement. In recent years, this method has also been applied to the earthquake disaster reconstruction in the Tohoku region in Japan.

The implementation organizations for LR projects are the cooperative association, the public sector, the individual, and the Urban Renaissance Agency. The typical organizations are the public sector (51%[1)] of all LR projects in operation) and the cooperative association (40%[1)] of same in content). In the case of LR projects implemented by a cooperative association, the cooperative association has to be organized by more than seven land owners. Indeed, 504 LR projects in Japan have been implemented by the cooperative association. Among these, 39 projects have had problems related to financial failure (exploration in 2011)[2)] due to falling land prices, unsalable reserve land, and other issues. To complete such projects, it is very important for the cooperative associations to reduce these risks. However, the cooperative associations usually do not have enough business funds for the reduction of all risks; they have to make a judgmental decision on reducing or accepting specific risks. So, it becomes necessary for these associations to select the high risks and select properly corresponding countermeasures to address them successfully.

Basically, risks are recognized by two features, the likelihood that the risk will be actualized, and its severity for the implementation of the LR project once the risk is actualized. Hereinafter these features are described as 'risk likelihood', and 'risk impact', respectively. Risk likelihood is evaluated by 'Exist' or 'Not Exist'. Risk impact is evaluated by 'small' or 'large'. **Figure 1** shows a conceptual diagram for classifying these risks[3)]. The horizontal axis is the risk impact, and the vertical axis is the risk likelihood. The risks are classified as having four zones[3)].

- Zone-A : A risk that has a large impact on the project, and the risk likelihood is 'Exist'. So, the countermeasures have to be undertaken as a first priority for risk reduction.
- Zone-B : A risk that has a large impact on the project, but the risk likelihood is 'Not exist'. This risk holds a second priority for risk reduction.
- Zone-C : A risk that has a small impact on the project, but the risk likelihood is 'Exist'. This risk holds a third priority.
- Zone-D : A risk that has a small impact on the project and the risk likelihood is 'Not exist'. This risk will be accepted, and no countermeasures will be taken.

Here, the risk impact was already evaluated by a previous research[4)] on risk in LR projects based on questionnaire results gained from LR experts. Risk impact was rated on a nine Likert Scale of 4 ~ -4, where 4 is the largest impact to project failure, 0 is medium impact, and -4 is the smallest impact. This research[4)] added up the risk impact by separating four project stages ('(i)Preparation', '(ii) Approval', '(iii)Construction', and '(iv)Completion') and 'Inside Densely Inhabited District (DID)', or 'Outside DID'. Because risks and their influences do differ from the four stages of a LR project and inside or outside DID. This research did not consider the risk likelihood and did not intend to handle the risks. On the other hand, previous research on risk management in LR projects proposed risk allocation tables using the Private Finance Initiative (PFI) method as its viewpoint[5)]. One more research also developed the risk allocation table for a cooperative association[6)]. However, these researches did not mention the alternative countermeasures used to reduce risks and find proper countermeasures.

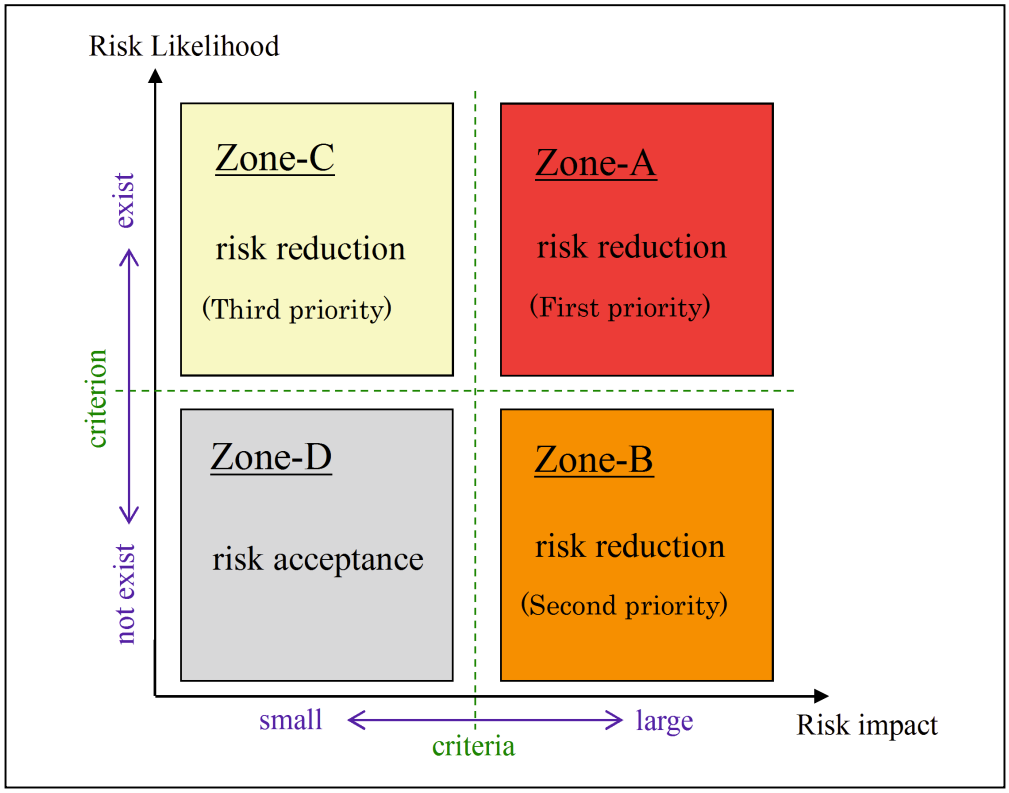

Figure 1. Conceptual diagram for Risk classification

Meanwhile, an anecdotal report introduced the risk countermeasures for a LR project[7], and another research[8] evaluated risk countermeasures to use to reduce risks. These researches, however, did not develop specific methods for selecting the effecting countermeasures.

This paper is an approach to use for risk management in LR projects. The paper seeks to

1) Evaluate the risk likelihood based on questionnaires given to LR expert,
2) Develop a flowchart to identify important risks to be taken into account and select their countermeasures, and
3) Check the validity and applicability of the flowchart for practical LR projects by comparing the countermeasures selected based on the flowchart and those the LR experts selected.

2. The framework of this study

Figure 2 shows the framework of this paper (3 steps; 'Risk classification', 'Develop the flowchart', and 'Applicability check'). Then each step is described below.

[Risk classification]

As discussed in Chapter 1, the risk impact is already evaluated by a conventional study[4]. The content of the risks and their influences differ within the various LR project stages. In the study[4], the mean values of all risk influences in each project stage were calculated from the ranked values of their risk impact. These mean values are used as the criteria in each stage. Namely, when a risk impact is greater than the criterion, then risk will be classified as Zone-A

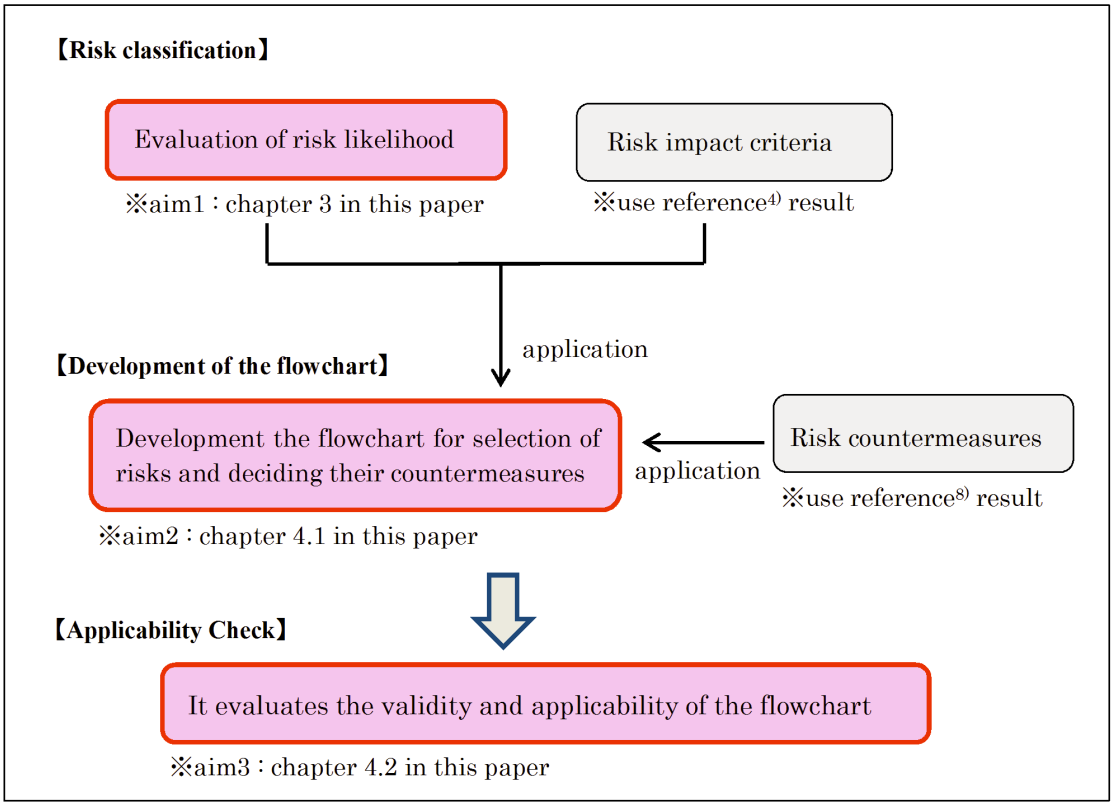

Figure 2. The framework of this paper

or Zone-B. **Table 1** shows the risks classified as 'small impact' or 'large impact' in the four LR project stages, and by separating them into two project areas, namely, inside DID, or outside DID. Risks that have small impacts are in the second or fourth column, while risks that have large impacts are in the third or fifth column. The content of the risks and their influences differ based on the project stages.

Meanwhile, the criterion for the risk likelihood for separating Zone-A and Zone-C from Zone-B and Zone-D, is explained in Chapter 3.

[Development of the flowchart for selecting risks and their countermeasures]

In Chapter 4.1 the flowchart for finding important risks and selecting their countermeasures is developed based on the above risk classification.

[Applicability Check]

In Chapter 4.2, the flowchart is applied four LR projects that have different situations for 'Consensus Building' and 'Financing' so as to select the countermeasures. Further, the validity and applicability of the flowchart by comparing the countermeasures is derived from the flowchart with those countermeasures selected by the expert who is concerned with the four LR projects.

3. Evaluation of risk likelihood

(1) Risk identification procedure

The risks must be evaluated to identify the risk likelihood. To define the risk likelihood, it

Table 1. Risk impact for LR projects implemented by a cooperative association[2)]

	Inside Densely Inhabitant District (DID)		Outside Densely Inhabitant District (DID)	
	Small impact risk	Large impact risk	Small impact risk	Large impact risk
(ⅰ)Preparation stage	2.Cordination (among authorities concerned)	1.Consensus building (inside cooperative association)	2.Adjustment (among authorities concerned)	1.Consensus building (inside cooperative association)
	3.Cordination (with land owners and people near project area)	5.Financing	3.Cordination (with land owners and people near project area)	5.Financing
	4.Insufficient know-how		4.Insufficient know-how	7.Buried cultural property, soil pollution, insufficient bearing capacity of fundation ground
	6. Environment impact assessment		6.Environment impact assessment	
	7.Buried cultural property, soil pollution, insufficient bearing capacity of fundation ground		8.Exploration, surveying, designing	
	8.Exploration, surveying, designing			
(ⅱ)Approval stage	2.Exploration, surveying, designing	1.Consensus building	2.Exploration, surveying, designing	1.Consensus building
	3.Delay in the construction	4.Financing	3.Delay in the construction	4.Financing
(ⅲ)Construction stage	3.Consensus building (decision of final re-plotting plan)	1.Consensus building (decision of provisional re-plotting plan)	4.Ground risk (buried cultural property)	1.Consensus building (decision of notice provisional re-plotting plan)
	4.Ground risk (buried cultural property)	2.Consensus building (indemnification)	6.Exploration, surveying, designing	2.Consensus building (indemnification)
	6.Exploration, surveying, designing	5.Ground risk (industrial waste)	7.Delay in the construction	3.Consensus building (decision of final re-plotting plan)
	7.Delay in the construction	8.Increasing of construction cost	8.Increasing of construction cost	5.Ground risk (industrial waste)
	10.Process planning	9.Financing	10.Process planning	9.Financing
	11.Transfer timing of infrastructure to local government		11.Transfer timing of infrastructure to local government	
	12.Effects on neighborhood		12.Effects on neighborhood	
(ⅳ)Completion stage	2.Completion of project	1.Reserve land sales	2.Completion of project	1.Reserve land sales

is important to understand all risks for the LR project, and evaluating each for its risk likelihood. All risks in LR projects were already evaluated by previous research[8)]. So this paper used those risks[8)].

- **Table 4** shows these 29 risks[8)] in the second column and their issues or content in the third column.
- In October 2010, a questionnaire was conducted with experts who have LR experience of more than 15 years to have them list candidates and their risk likelihood criteria.

(2) Survey-A and its respondents

The survey question was “Will you list the description of the risk likelihood criteria” for

Table 2. Years of experience (Survey-A)

Years of experience	Number of respondents
15-20 (year)	2 (16.7%)
21-25 (year)	2 (16.7%)
25-30 (year)	5 (41.7%)
31-35 (year)	0 (0.0%)
35-40 (year)	3 (25.0%)
Total	12 (100.0%)

Table 3. Competency (Survey-A)

Competency		Number of respondents*
Pro-fessional Engineer	Comprehensive Technical	2
	Civil Engineering	5
	(Urban and Rural Planning)	4
	(Construction Management)	1
RCCM(Urban and Rural Planning)		4
Land Readjustment Engineer		11
Land Surveyor		5
Civil Engineering & Construction Management		1
Total		28

* Multiple answer

several candidate risks. For this purpose, the questionnaire was conducted on 12 experts who belong to a construction consultancy and work as department managers and chiefs in LR divisions. Hereinafter, this questionnaire is called Survey-A. **Table 2** summarizes the experience years of the 12 respondents, and **Table 3** shows their competencies. These tables indicate that most of the respondents have been involved in LR experiments for more than 20 years, and mostly they have competency as a LR engineer (91.7%).

(3) Definition of the risk likelihood criteria

Table 4 and **Table 5** in the fourth column show the risk likelihood criteria obtained from Survey-A. The value in the parentheses is the number of corresponding respondents. For example, for ‘‘1. Consensus building’’, there are four criteria; agreements is greater than 95%, 90%, 85% or 80%. Therefore, only one has to be defined as the risk likelihood criterion for ‘‘1. Consensus building’’ is in (i)Preparation stage. A certain prefecture permits a LR project when its agreement is more than 85%. In this paper, that 85% of agreement is defined as the identified risk criterion. Namely, more than 85% of landowners and leaseholders agree with the LR project, and thus, the risk likelihood is evaluated as ‘Not exist’. For ‘‘1. Consensus building’’ in (ii)Approval stage, there are two candidates for the risk likelihood criteria; agreement of 95% and 85%. In this case, agreement of 95% is selected, because there is no administrative standard like in (i)Preparation stage, and the number of the answer is four and more than one at 85%. Other criteria are defined in the fifth columns. The ‘‘-’’ in **Table 4** in the construction stage denotes that no respondent listed the risk likelihood criteria, except for ‘‘6. Exploration, surveying, designing’’ and ‘‘7. Delay in the construction’’ in the construction stage.

4. Flowchart for finding important risks to examine and selecting their countermeasures

4.1. Development of the flowchart

It can be assumed that the following flowchart is based on finding high risks and selecting properly corresponding countermeasures. **Figure 3** shows the flowchart for finding important risks to take into account and selecting their countermeasures. The flowchart has four parts.

(1)Confirming LR project stages and the risks to be taken in account for risk management

Risks and their influences differ for the four stages of a LR project and inside or outside DID. By considering these differences, the first process (P_1) confirms the stages in a LR project, and P_2 makes sure that the project is in or out DID. In P_3, it selects the risk to be taken into account.

Table 4. Risks and the risk likelihood criteria judged as 'exist' (1/2)

	Item of risk[8)]	Description of risk[8)]	Survey-A result	Risk likelihood criteria
(i) Preparation stage	1.Consensus building	[a] Land owers fail in consensus building for LR project. [b] Cordination is in disarray due to discrepancy or bad relationship among land owners. [c] Changes of land re-plotting become dificultt when land contribution rate or location of re-plotting is presented too early. [d] Land owners become to be demotivated when the approver shows disapproval to budget shortfall or change of demarcation.	・The project has the percentage more than 95 percent of agreement ratio.[1] ・The percentage more than 90 percent of agreement ratio.[2] ・The percentage more than 85 percent of agreement ratio.[2] ・The percentage more than 80 percent of agreement ratio.[3]	The project has the percentage more than 85 percent of agreement ratio.
	2.Cordination (among authorities concerned)	[a] A project become delay due to cordinations of subsidy withe organaization concerned and relevant projects with local goverments. [b] A project become delay due to insufficient cordinations inside local goverment and delay of decision-making to support a cooperative association.	・There is Campaign pledge of local chief executive about the project. [5] ・The project is addressed under upper level plan.[1]	There is Campaign pledge of local chief executive about the project. Or, the project is addressed under upper level plan.
	3.Cordination（with land owners and people near project area）	Cooperative association cannot commmunicate well with project's opponent in the eripheral area, or coordinate well about road and project area.	・The project has a direct effect on peripheral people of project area.[1]	The project has a direct effect on peripheral people of project area.
	4.Insufficient know-how	[a] Project time is extended du to the turn back works caused by the lack of know-how of cooperative association.	・A business agent is supportive of the project.[2] ・Consultant company is supportive of the project.[9]	A business agent or Consultant company is supportive of the project.
		[b] Project time is extended du to the turn back works caused by insufficient cordination and information sharing inside the company contracted.	・Consultant company is supportive of the project.[9]	Consultant company is supportive of the project.
		[c] Project time is extended du to the delay of corrdination with government caused by the lack of know-how of local government officers.	・The municipality has an experience with Land Readjustment Project.[6]	The municipality has an experience with Land Readjustment Project.
		[d] Project time is extended du to the lack of information on law and regulation change.		
	5. Financing	Smashup of financing (Guaranty of subsidy, etc) due to an certainity of the project plan	・A contract is signed with a business agent.[6] ・A conditional contract is signed with a reserve land's buyer.[12]	A contract is signed with a business agent. Or, A conditional contract is signed with a reserve land's buyer.
	6. Environment impact assessment	[a] Project is stopped or plan is changed based of environment impact assessment. [b] Cooperative association responds to the complaints from environmental groups.	・The project area smaller than criteria area of environment impact assessment.[4]	The project area smaller than criteria area of environment impact assessment.
	7.Buried cultural property, soil pollution, insufficient bearing capacity of fundation ground	[a] Project is stopped or plan is changed due to buried cultural property, etc. [b] Survey cost increases due to the exploration of buried cultural property.	・The Project doesn't have candidate area about buried cultural property, etc.[5]	The Project doesn't have candidate area about buried cultural property, etc.
	8. Exploration, surveying, designing	[a] Project cost increase due to the consultant company's mistakes in surveying, or designing. [b] Project period and cost increase due insufficient survey and design.	・A contract is signed with a business agent.[5] ・The contractual provisions with Consultant company is provided for defect.[1]	A contract is signed with a business agent. Or, the contractual provisions with Consultant company is provided for defect.
(ii) Approval stage	1.Consensus building	[a] Adjustment of adversary of land readjustment project [b] Cooperative association fails for consensus building among land owners on the re-plotting plan.	・The percentage exceeds 95 percent of agreement ratio.[4] ・The percentage exceeds 85 percent of agreement ratio.[1]	The project has the percentage exceeds 95 percent of agreement ratio.
	2. Exploration, surveying, designing	[a] Project cost increase due to the consultant company's mistakes in surveying, or designing. [b] Project period and cost increase due insufficient survey and design.	・A contract is signed with a business agent.[5]	A contract is signed with a business agent.
	3. Delay in the construction	The delay of related project affects the project period.	・There isn't related project.[6]	There isn't related project.
	4. Financing	Smashup of financing (Write-down of subsidy from falling land prices, etc)	・A contract is signed with a business agent.[5] ・A contract is signed with a reserve land's buyer.[2]	A contract is signed with a business agent. Or, A contract is signed with a reserve land's buyer.
	5. Budget use	Cooperative association cannot use budget according to plan, because of the gap between plan and project's progress.	・The project has circumstantial execution scheme.[7]	The project has circumstantial execution scheme.

Table 5. Risks and the risk likelihood criteria judged as 'exist' (2/2)

	Item of risk[8)]	Description of risk[8)]	Survey-A result	Risk likelihood criteria
(iii) Construction stage	1.Consensus building (decision of provisional re-plotting plan)	Cooperative association fails for consensus building among land owners on the notice provisional re-plotting plan.	-	-
	2.Consensus building (indemnification)	[a] Heavy going of compensation negotiation with land owner increases the compensation cost. [b] Cooperative association pays construction compensation cost for peripheral people of project area.	-	-
	3.Consensus building (decision of final re-plotting plan)	[a] Land owner re-argue in writing on final re-plotting plan. [b] Cooperative association fails of consensus building among land owners on the subject of adjusting payment. [c] It takes a long time, when cooperative association collects of a great amount of adjusting payment.	-	-
	4.Ground (buried cultural property)	Construction and engineering company unearth new buried cultural property in project area.	-	-
	5.Ground risk (industrial waste)	[a] The disposal of industrial waste rises construction cost. Or, it becomes tangled adjustment over the expense of disposal of industrial waste between cooperative association and land owners. [b] Industrial waste damages the image of this project area . (Adverse consequence of reserve land sales)	-	-
	6. Exploration, surveying, designing	[a] Project cost increase due to the consultant company's mistakes in surveying, or designing. [b] Project period and cost increase due insufficient survey and design.	・A contract is signed with a business agent.[2] ・A contract is signed with consultant company.[1]	A contract is signed with a business agent or consultant company.
	7. Delay in the construction	[a] Delay of consensus building between land owners gives occasion to delay of the construction. [b] Lack of build unity with authority concerned gives the delay of the construction. [c] Delay of other project's gives the delay of the construction.	・A contract is signed with a business agent.[1]	A contract is signed with a business agent.
	8. Increasing of construction cost	The unanticipated countermeasure causes a rise in construction cost.	-	-
	9. Financing	Smashup of financing (Doldrums of reserve land sales, etc)	-	-
	10. Process planning	Cooperative association has impractical process planning gives the extension of project period and increase compensation for business cost.	-	-
	11. Effects on neighborhood	The unanticipated countermeasure for vibration or noise rises construction cost.	-	-
	12. Transfer timing of infrastructure to local government	Cooperative association pays expenses of pavement repair until transfer of the infrastructure to local government.	-	-
	13. New land owners	New land owners do not know the location of their land in the project area. (They don't understand adjusting payment.)	-	-
	14. Budget use risk	Cooperative association can not use budget as plan, because there is a diremption of plan with project's progress.	-	-
(iv) Completion stage	1. Reserve land sales	[a] Cooperative association faces a funding shortfall due to unsellable reserve lands. [b] Cooperative association responds to a complaint from reserve land's buyer.	-	-
	2. Completion of project	[a] Cooperative association can not apply the dissolution to governor, because the organization does not collect and pay for adjustment of re-plotting land area from/to land owners. [b] Land owner launches legal action against adjusting payment, etc. So, the project period extends and the cost of action increases. [c] Delay in processing completion of the project	-	-

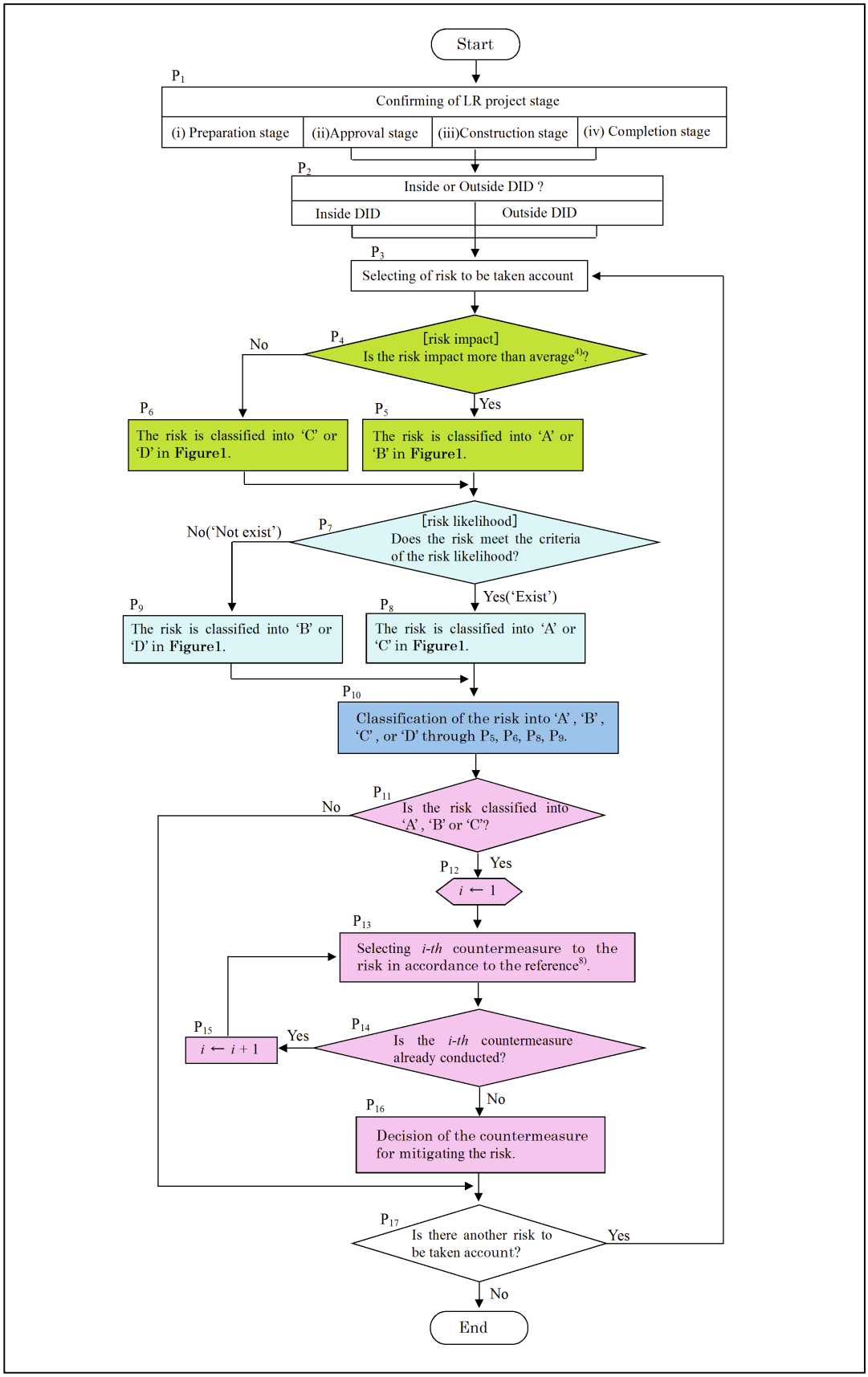

Figure 3. Flowchart for selecting risks and their countermeasures

Table 6. Risk countermeasures for Consensus building[8)]

	Item of risk	Matter of risk countermeasures		inside DID				outside DID			
				effecti-veness	feasib-ility	summ-ated ratings	rank-ing	effecti-veness	feasib-ility	summ-ated ratings	rank-ing
(i) Preparation stage	1.Consensus building	Arrangement of information on land owners	Preparation of file about information on land owners	1.75	1.85	3.60	10	1.50	2.33	3.83	7
			Prehension of people involved in land	1.15	1.35	2.50	18	1.25	1.33	2.58	14
			Additional collecting of agreement in land owners	1.85	1.45	3.30	14	1.00	0.33	1.33	18
		Transmission of information to land owners	Briefings to all land owners	2.35	2.35	4.70	2	2.25	1.67	3.92	3
			Transmission of information about project (news)	1.70	2.10	3.80	7	2.00	1.00	3.00	12
			Presentation of approximate land contribution rate	1.95	1.40	3.35	13	2.00	2.00	4.00	2
			Presentation of case example about indemnification	1.95	1.75	3.70	8	2.25	1.67	3.92	3
		Decrease a feeling of anxiety	Holding of group talkfest	2.20	2.00	4.20	4	1.75	0.67	2.42	15
			Holding of individually-briefing session	2.55	1.95	4.50	3	1.75	1.67	3.42	11
			Conviction by individually-visit	2.20	1.85	4.05	5	2.00	1.67	3.67	8
			Set of inquiry counter within project area	1.45	1.25	2.70	17	1.75	0.33	2.08	16
			Holding of briefing session about tax or land utilization	1.65	1.25	2.90	15	2.50	1.00	3.50	10
		change of mind	Holding of visit or workshop	1.95	1.50	3.45	12	2.00	1.00	3.00	12
		relationship of land owners	Set of an organized group of land owners	1.85	1.65	3.50	11	2.25	1.67	3.92	3
			Cohesiveness of founder (instruction course, visit, etc)	2.60	2.25	4.85	1	2.25	1.33	3.58	9
		Use of key person	Support for the activities of coordinator	1.85	1.85	3.70	8	2.25	1.67	3.92	3
			Use of big figure	1.65	1.25	2.90	15	1.75	0.33	2.08	16
		switch of project plan	Swift review of project area line (scale-down)	2.10	1.80	3.90	6	3.00	1.33	4.33	1

(2)Risk classification

In P_4-P_{10}, the selected risk is classified into the four areas shown in **Figure 1**. P_4-P_6 makes a judgment on whether the risk has a small or large effect on project failure, based on the risk impact criteria found in **Table 1**. If the risk has a large effect on the project, it proceeds to P_5. It means that the risk is classified as 'A' or 'B'. If the risk has a small effect, it proceeds to P_6, which means that the risk is classified as 'C' or 'D'.

P_7-P_{10} addresses the judgment wherein the risk meets the risk criteria definition in the fifth column of **Table 4** and **Table 5**. If the risk does not meet that criteria, it proceeds to P_8, which means that the risk is classified as 'A' or 'C'. On the other hand, if the risk meets the criteria, it proceeds to P_9, which means that the risk is classified as 'B' or 'D'.

Consequently, through using P_5, P_6, P_8, P_9, the risk is classified as 'A' , 'B' , 'C' , or 'D'.

(3)Selecting risk countermeasures

P_{11}-P_{16} are the procedures used to select the countermeasures for the risks that are already classified as 'A', 'B', or 'C'. If a risk is classified as 'D' in P_{10}, then that risk will be accepted, which means that no countermeasure will be taken. The risk countermeasures were already identified and evaluated by the research[8)], as shown as Table 6.

Table 6 shows these risk countermeasures against ''1. Consensus building'' in the (i)Preparation stage. The third and fourth columns detail the risk countermeasures. The fifth to eight columns correspond to the inside of DID, and the nine to twelve columns correspond to the outside of DID. In the fifth and nine columns, the effectiveness of the risk countermeasures are shown, and in the sixth and tenth columns, their feasibilities are shown by the research[8)]. These effectiveness and feasibility aspects were estimated to range from the minimum value of 0.33 to the maximum value of 3.00 in the previous research[8)]. The eighth and twelfth columns are ranked by the sum total of their effectiveness and their feasibility.

P_{11} refers to for separating the risk into 'A', 'B', 'C'. When the risk is 'D', it proceeds to P_{17}.

P_{12} and P_{13} refer selecting a high-ranked countermeasure in the eight or twelve columns in **Table 6**. If the countermeasure was already conducted, the next high-ranked countermeasure will becomes the next candidate for a countermeasure through P_{14} and P_{15} to P_{13}.

In P_{17}, if there is any remaining risk to be taken account, it goes back to P_3.

4.2. Applicability of the flowchart

Checking the validity and applicability of the flowchart requires a confirmation point of view by LR engineers' know-how that the flowchart has good alternative selection function for the risk countermeasure. Thus, the validity and applicability of the proposed flowchart into practical LR projects is accomplished by comparing the countermeasures derived from the flowchart with those answered in questionnaires by the LR engineers. These countermeasures were already evaluated by the LR engineers [8]. This paper used that result. Four LR projects were used for this verification. The four projects have different great risk situation seen in LR projects, namely 'Consensus Building' and 'Financing'. The characteristics of the four projects are the following:

- Project 'a' in the Kantou region, Japan
  : This project is conducted inside DID, and has a problem for 'Consensus Building'. (It has a low-percentage of agreement ratio for land owners and leaseholders.)
- Project 'b' in the Kyusyu region, Japan
  : This project is conducted inside DID. There is no problem for 'Financing (Reserve land sales)' in the (i)Preparation stage. Also, the project has a high-percentage of agreement ratio for the land owners and leaseholders.
- Project 'c' in the Cyuubu region, Japan
  : This project is conducted outside DID and has a popular situation in 'Consensus Building' and 'Financing'.
- Project 'd' in the Cyuugoku region, Japan
  : This project is conducted outside DID and has a problem in 'Financing'.

Table 7 shows the age, working years for the project, and competencies of respondents concerned with the four projects. Most of the respondents have been working in the projects for more than 2 years and hold several professional qualifications.

Table 8 shows the comparison of risk countermeasures based on the flowchart with those selected by the respondents (professional engineers) in Project 'a' and Project 'b'. The first column shows the four project stages. The second column shows the risk items to be selected and classified into four zones; A, B, C and D. The third column shows the zones (A, B, C, D) in which the risk was classified for a Project 'a'. Here, 'C, D' means that the risk cannot be classified into 'C' or 'D', because there was less-information for the judgment based on risk likelihood. The fifth column shows the ranking as evaluated by the LR engineers. For example, for "1. Consensus building" in (i)Preparation stage, "Strengthening founders' cohesiveness" was selected as the countermeasure based on the flowchart, but the LR engineers evaluated it in the third rank. Namely, there were two countermeasures with higher rankings. In this case, the flowchart could not select an adequate countermeasure, while in the case of "5. Financing" the class was 'A' and the rank is '1', which means that the flowchart selected the adequate countermeasure because both selections agreed. Here, the concordance rate (CR) is defined as follows.

Table 7. Personal attributes of those respondents involved with four LR projects

	Respond-ent's age	Working year in the project	Competency
Project 'a'	47	25	Land Readjustment Engineer
	39	1	Professional Engineer (civil Engineering), Land Readjustment Engineer
Project 'b'	41	2	Compensation management specialists
	48	2	Land Readjustment Engineer
	30	4	Land Readjustment Engineer, Land Surveyor
	43	4	Professional Engineer (civil Engineering), RCCM (Urban and Rural Planning)
	48	4	Land Readjustment Engineer
	45	2	Land Readjustment Engineer, Land Surveyor
	39	1	Land Readjustment Engineer
Project 'c'	47	19	Land Readjustment Engineer, Land Surveyor, Civil Engineering and Construction Management
	48	6	RCCM (Urban and Rural Planning) , Land Readjustment Engineer
	43	5	-
Project 'd'	39	11	Land Surveyor
	40	3	Land Readjustment Engineer, Land Surveyor
	39	10	Land Surveyor, Compensation management specialists
	50	2	Land Readjustment Engineer

CR (%) = NA/ NR

NA : the number of risks with agreement between the classification result derived from the flowchart and the ranking selected by LR engineers, namely the number of '1'.

NR : the number of risks classified as 'A', 'B' or 'C'.

In Project 'a', NA is 19 and NR is 26, and CR = 19/26 = 73%. The right sides of **Table 8**, and **Table 9** show the comparisons for Project 'b', Project 'c' and Project 'd'. As shown in these tables, CR = 70%, CR = 74 %, and CR = 73% as obtained, respectively. These rates mean that the flowchart has good alternative selection function for the risk countermeasure based on LR engineers' know-how.

5. Conclusion

The results of this study offered in this paper can be summarized as follows.

(1) A questionnaire (Survey-A) was administered to the land readjustment (LR) engineers with significant experience in LR projects to evaluate the risk likelihood that certain risks will become apparent. Based on the questionnaire and its answers, the criteria for risk likelihood were defined, so that each risk can be classified into "large/exist" and "small/not exist".

(2) A classification diagram, with the risk likelihood on the vertical axis and the risk impact[4)] on horizontal axis, was created to classify each risk into four zones; A, B, C, D.

(3) This study developed a flowchart to use for finding the important risks that need to be taken into account and for selecting their countermeasures at the Preparation stage, Approval stage, Construction stage, and Completion stage.

(4) To evaluate the validity and applicability of the flowchart that was applied to four LR projects, and 26, 23, 27 and 15 risk countermeasures were obtained, respectively. Comparisons of these countermeasures with the priority which were answered by the LR

Table 8. Comparison of risk countermeasures selected by the flowchart and those proposed by LR engineers in Project 'a' and Project 'b'

	Item of risk	Project 'a' (inside DID)			Project 'b' (inside DID)		
		Classified risk	Risk countermeasure selected by the flowchart	Ranking by LR engineers	Classified risk	Risk countermeasure selected by the flowchart	Ranking by LR engineers
(i) Preparation stage	5. Financing	A	Changing project plan (slash of project cost)	1	B	Offer to sell about buyer of Reserve land (superordinate countermeasure already conducted)	1
	1.Consensus building	A	Strengthening founders' cohesiveness (instruction course, visit, etc)	3	B	Briefings to all land owners (superordinate countermeasure already conducted)	1
	7.Buried cultural property, soil pollution, insufficient bearing capacity of fundation ground	C	Implementation risk assessment about land	1	D	-	-
	3.Cordination (with land owners and people near project area)	C	Explanation by individually-visit	2	C	Explanation by individually-visit	3
	8. Exploration, surveying, designing	C	Collective occupation of content of specifications or process of works by relationship organizations	3	C	Detached check from a third person (superordinate countermeasure already conducted)	1
	2.Cordination (among authorities concerned)	C,D	ascertainment of time schedule with relationship organizations	5	C	ascertainment of time schedule with relationship organizations	3
	6. Environment impact assessment	D	-	-	D	-	-
	4-1.Insufficient know-how (cooperative association)	D	-	-	D	-	-
	4-2.Insufficient know-how (Contract Company)	D	-	-	D	-	-
	4-3.Insufficient know-how (local government)	D	-	-	D	-	-
	4-4. Insufficient know-how (information of changing the low)	D	-	-	D	-	-
(ii) Approval stage	4. Financing	A	Sale by bulk of aggregatory Reserve land	1	B	Sale by bulk of aggregatory Reserve land	2
	1.Consensus building	A	Transmission of information about project (news)	3	B	Conviction by individually-visit (superordinate countermeasure already conducted)	1
	2. Exploration, surveying, designing	C	Collective occupation of content of specifications or process of works by relationship organizations	1	C	Collective occupation of content of specifications or process of works by relationship organizations	1
	3. Delay in the relevant construction	C	Append the schedule of relevant construction to project schedule	1	D	-	-
	5. Budget use	A,C	Preparation highly-detailed financial arrangements	1	B,D	Readjustment of Budget plan (superordinate countermeasure already conducted)	1
(iii) Construction stage	2.Consensus building (indemnification)	A	Reservoir of record about compensatory negotiation	7	A	Preparation of file about information on land owners (superordinate countermeasure already conducted)	1
	1.Consensus building(decision of provisional re-plotting plan)	A	Reservoir of record about cooperative consultation with land owners	1	A	Preparation of file about information on land owners (superordinate countermeasure already conducted)	1
	9. Financing	A	Prehension of a balance of income and outgo	1	A	Prehension of a balance of income and outgo	3
	5.Ground risk (industrial waste)	A	Research of forepassed land information	1	A	Research to community resident (superordinate countermeasure already conducted)	1
	8. Increasing of construction cost	A	Explanation to land owner about flexible soil	1	A	Explanation to land owner about flexible soil	1
	3.Consensus building (decision of final re-plotting plan)	C	Holding of individually-briefing session	1	C	Holding of individually-briefing session	4
	10. Process planning	C	Gestation of execution scheme	1	C	Prehension of availability of delay, cause for delay (superordinate countermeasure already conducted)	1
	7. Delay in the construction	C	Implementation of periodic conference with relationship organizations about process of works	1	C	Establish liaison council about process of works (superordinate countermeasure already conducted)	1
	4.Ground (buried cultural property)	C	Implementation of prior consultation with education board	1	C	Implementation of prior consultation with education board	1
	11. Effects on neighborhood	C	Holding of briefing session to neighborhood about building construction work	1	C	Holding of briefing session to neighborhood about building construction work	4
	12. Transfer timing of infrastructure to local government	C	Furthering of only a part of transfer of control	1	C	Append maintenance and operation cost to financial arrangements (superordinate countermeasure already conducted)	1
	13. New land owners	A,C	Explanation to new land owners about land contribution, adjusting payment, etc	1	A,C	Explanation to new land owners about land contribution, adjusting payment, etc	2
	14. Budget use risk	A,C	Early commencement of baraza about relocation	1	A,C	Arrangement of auxiliary construction area (superordinate countermeasure already conducted)	1
	6. Exploration, surveying, designing	D	-	-	D	-	-
(iv) Completion stage	1. Reserve land sales	A	Reserve land coupled with residence sales (superordinate countermeasure already conducted)	2	A	(sold out to reserve land until construction stage)	-
	2. Completion of project	C	Prior arrangement about conversion of town name and town line	1	C	Prior arrangement about conversion of town name and town line	1
Concordance rate (CR)		**CR =19/26 = 73%**			**CR =16/23 = 70%**		

Table 9. Comparison of risk countermeasures selected by the flowchart and those proposed by LR engineers in Project 'c' and Project 'd'

	Item of risk	Project 'c' (outside DID)			Project 'd' (outside DID)		
		Classifi-ed risk	Risk countermeasure selected by the flowchart	Ranking by LR engineers	Classifi-ed risk	Risk countermeasure selected by the flowchart	Ranking by LR engineers
(i) Preparation stage	5. Financing	A	Designing reserve land with buyer	1			
	1.Consensus building	B	Swift review of project area line (scale-down)	1			
	7.Buried cultural property, soil pollution, insufficient bearing capacity of fundation ground	B	Swift review of project area line for abatement of impact	1			
	6. Environment impact assessment	C	Pass orders to Contract Company during the early years	1			
	8. Exploration, surveying, designing	C	Request of technical assistance by local government	1			
	4-1.Insufficient know-how (cooperative association)	C	Working management by main Contract Company	1			
	4-2.Insufficient know-how (Contract Company)	C	Implementation of technical probation for Contract Company	1			
	2.Cordination (among authorities concerned)	C,D	Implementation of prior conference	1			
	4-3.Insufficient know-how (local government)	D	-	-			
	4-4. Insufficient know-how (information of changing the low)	D	-	-			
	3.Cordination (with land owners and people near project area)	D	-	-			
(ii) Approval stage	4. Financing	A	Sale by bulk of aggregatory Reserve land	1			
	1.Consensus building	A	Holding of individually-briefing session	1			
	2. Exploration, surveying, designing	C	Collective occupation of content of specifications or process of works by relationship organizations	1			
	5. Budget use	A,C	Readjustment of Budget plan (superordinate countermeasure already conducted)	1			
	3. Delay in the relevant construction	D	-	-			
(iii) Construction stage	1.Consensus building (decision of provisional re-plotting plan)	A	Reservoir of record about cooperative consultation with land owners	3	A	Holding of individually-briefing session (superordinate countermeasure already conducted)	1
	5.Ground risk (industrial waste)	A	Research to community resident	1	A	Research to community resident	1
	9. Financing	A	Switch of reserve land location	1	A	Switch of reserve land location	1
	2.Consensus building (indemnification)	A	Reservoir of record about cooperative consultation with land owners	3	A	Intensification of bargainer (superordinate countermeasure already conducted)	1
	3.Consensus building (decision of final re-plotting plan)	A	Explanation about adjusting payment	4	A	Explanation about adjusting payment	1
	8. Increasing of construction cost	C	Early action of highly-detailed research	2	C	Early action of highly-detailed research	3
	4.Ground (buried cultural property)	C	Implementation of prior consultation with education board	1	C	Implementation of prior consultation with education board	1
	10. Process planning	C	Prehension of availability of delay, cause for delay	1	C	Updating of execution scheme (superordinate countermeasure already conducted)	1
	7. Delay in the construction	C	Append the schedule of relevant construction to execution scheme	1	C	Append the schedule of relevant construction to execution scheme	1
	12. Transfer timing of infrastructure to local government	C	Append maintenance and operation cost to financial arrangements	2	C	Append maintenance and operation cost to financial arrangements	2
	11. Effects on neighborhood	C	Holding of briefing session to neighborhood about building construction work	1	C	Holding of briefing session to neighborhood about building construction work	2
	13. New land owners	A,C	Explanation from seller to new land owners about project information	1	A,C	Explanation from seller to new land owners about project information	1
	14. Budget use risk	A,C	Preparation highly-detailed financial arrangements	2	A,C	Explanation to board member about budget use risk (superordinate countermeasure already conducted)	1
	6. Exploration, surveying, designing	D	-	-	D	-	-
(iv) Completion stage	1. Reserve land sales	A	Exploitation of reserve land s	1	A	Reserve land coupled with residence sales (superordinate countermeasure already conducted)	1
	2. Completion of project	C	Prior arrangement about conversion of town name and town line	2	C	Prior arrangement about conversion of town name and town line	3
Concordance rate (CR)		**CR =20/27 = 74%**			**CR =11/15 = 73%**		

engineers reveal that 73%, 70%, 74% and 73% have the same first priority given by the engineers.

(5) These good agreements suggest that the flowchart can be used to support the risk management in LR projects implemented by a cooperative association. However, the flowchart should be improved for getting higher applicability.

References:

1) Ministry of Land, Infrastructure, Transport and Tourism, City and Regional Development Bureau, Urban Development and Improvement Division (2011): Companion to Land Readjustment Project (2010, in Japanese) , p. 8, Urban Regeneration and Land Readjustment Association.

2) Motoyuki Emura (2012) : Approach in MLIT (Ministry of Land, Infrastructure, Transport and Tourism) to Administrative Improvement for Land Readjustment Projects by a Cooperative Association (in Japanese), Land Readjustment Projects Forum 2012, pp.118-121, Urban Regeneration and Land Readjustment Association.

3) Project Management Association of Japan (2007) : Project & Program Management for Enterprise Innovation Standardized Guidebook (in Japanese), p.441, JMA Management Center lnc.

4) Chikashi Deguchi, Tetsunobu Yoshitake, Takanori Sata, Makoto Asano (2009): Identification and Evaluation of Risks for Land Readjustment Projects—Case of Land Readjustment by Private Association (in Japanese), Journal of the City Planning Institute of Japan No44-3, pp. 271-276, The City Planning Institute of Japan.

5) Kanagawa Prefectural Government Fujita Corporation SAGAMI RAILWAY Co., Ltd. Shimizu Corporation Tokyu Corporation Hideaki Ozawa Landmark Co. Ltd. (2003): A Study on Land Readjustment by the Partnership of Public and Private Sectors Summary of the Report (in Japanese), p. 15.

6) Takanori Sata, Chikashi Deguchi, Tetsunobu Yoshitake, Makoto Asano (2012) : Risk-Management in Land Readjustment Project Executed by Cooperative Association, pp.73-84, Journal of International City Planning.

7) Kohei Takakuwa (2011) : Land Readjustment Project and Risk-Management (in Japanese), pp.17-21, Bulletin of Land Readjustment Engineers No.148.

8) Takanori Sata, Chikashi Deguchi, Tetsunobu Yoshitake, Makoto Asano (2012) : Characteristics and its Evaluation of Risk-Management in Land Readjustment Project Executed by Cooperative Association (in Japanese), Journal of the City Planning Institute of Japan Vol.47 No.1, pp. 17-22, The City Planning Institute of Japan.