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DEFINING GREEN ROAD PROJECT MANAGEMENT SCOPE BY PDRI

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Abstract:
This study is about the project early operation content of the green road development, takes full account of the operation items of various stages of the life cycle, by the use of special case define the Project Definition Rating Index (PDRI). PDRI assessment framework, defining the need and scope of green road project development operations in the metropolitan area, and inquire set various assessment indicators of the work to complete building the overall indicator assessment system. From research in a policy aspect, as well as data collection out of instances of project case, research program obtains evaluation index operation item, and by semi-structured interviews supplements insufficient evaluation index items and particularity needs. Research results will be beneficial to the application in the metropolitan regional overall development project. Building green road index evaluation system helps to avoid the environmental impact brought about by land development, reduce damage to people's life safety as a consequence from needs for road maintenance, alleviate future maintenance and management expenses, and is in line with the expected benefit of green road project sustainable development.

Keywords: Green Road; Life Cycle; Project Definition Rating Index; Index Evaluation System; Sustainable Development.

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1. Introduction

The term "green" is widely used in various industries and areas of expertise. A lot of research literature for the scope of green roads such as the meaning, operations and performance evaluation has different definitions and final performance requirements. Taoyuan Zhonglu planning area is located in the center of the three urban planning areas of Nankan, Taoyuan City and Neili, with a total development area of about 143 hectares. Major operations include the roads, five big pipeline projects, regional drainage and water conservancy projects, landscape engineering, flood detention and disaster prevention in Zhonglu Park. The whole project takes full advantage of the local environment and regional development needs, provides disaster prevention, disaster mitigation, emergency rescue and temporary shelter space, and brings into play the concept of sustainable environment.

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In response to future regional development trends, regarding the operation scope of metropolitan green road development, including traffic control engineering, pavement and road engineering, common conduit, pedestrian environment and other projects, this study defines operating scopes at different stages of planning, design, construction, maintenance and management. The research results will be used by authority as future reference for performance assessment about segment expropriation project.

2. Methodology

This study primarily makes a thorough inquiry into the scope of the ground and underground development task for road engineering of existing land development environment at the time of regional sector expropriation engineering by authorities. From the practical cases, take into account relevant literature and identify assessment indicators and the needs of the practical work items. Research methods apply project definition rating index(PDRI), analyze and evaluate the need index and the job element under operation category of various stages, on the basis of which build assessment framework.

Many studies in the literature divide green roads into three constructed forms of bridges, tunnels and embankments, but the metropolitan road development carries more specific needs. This three infrastructure cannot meet the needs of the metropolitan road system [1]. Complete green road works must focus on the perfection of the operating range in various stages of the life cycle. According to "public construction work cost estimate provision manual", the life cycle of road is detailed as shown in Figure 1 below [2].

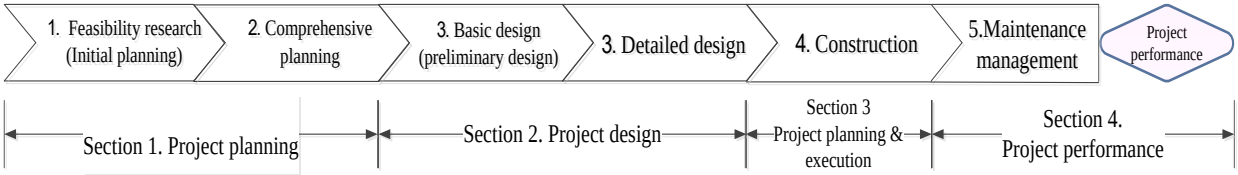

Figure 1: The name of road project life cycle

Full life cycle of public works, from the initial feasibility assessment, planning, design, construction to finally the maintenance management, at different stages has different management mechanisms [3], and the quality management is mostly established in the construction phase. On the ground that quality management in the feasible research phase involves broader areas of expertise, with respect to each other stage, it is more difficult to set clear objectives of quality management and detailed job control content, and likewise the complexity is higher [4].

Currently Taoyuan County has consecutively completed Jingguo and Zhonglu two regional developments. Connotation species included in green road are numerous. This study is based on metropolitan regional green road system as the main scope of the study, which also includes phases of work like building road management information systems and public utility pipelines investigation and measurement [5], the initial project planning and design, quality management control and test in construction process, as well as road maintenance and management [6].

At first project definition rating index, PDRI, was research achievement out of efforts of the construction project research team comprised by US Construction Industry Institute (CII) in 1994

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[7]. PDRI is a checklist defined by a wide range of project work element scopes, to meet the needs of the project forward planning. is a simple and easy tool to provide project teams with a means to measure the objective assessment of the project during early project planning [8]. PDRI was first used in 1999 in the construction industry project. After two revisions it has considered appropriate relationship between owners and contractors, and questioned the sustainable development of project, so that the scoring of project forward planning assessment is to be automated. PDRI, in the project early planning process and development of strategy information, enables owners to obtain adequate assurance on risk and decision-making, especially the understanding and acceptance of the owners. Therefore, the objectives and guidelines for the project must be clearly defined in order to promote the greatest success of project [9].

Project pre-planning process job elements are how good pre-planning of projects occurs. It will have a significant impact on cost, schedule and performance of equipment operation execution. So the better the project is planned initially, the more able it will be to achieve the overall project financial success [10]. Inadequate or a lack in definition of the scope of the project work will affect the performance of the project, and likewise is the biggest problem in construction [11]. The success in the initial stages of construction project's detail design is totally dependent on efforts made to define the management operation scope of the project during the period to define the scope of the project. In addition to collecting the project forward planning information by using PDRI, it is also necessary to collect project performance information (cost, schedule) through data and process [12].

PDRI enables project teams to measure a full definition of project scoring. Ceiling of project scoring is 1000 points. The lower the score, the better the outcome it represents. Seminar can help project teams to rectify the specific needs of the organization. By the use of detailed project needs survey and user questionnaire, send to the project's operator and the end user. While the final results of the assessment are less than 200 ($\leqq$200 Points) points, it denotes that the implementation and the effectiveness of the project is relatively good. If it exceeds 200 (> 200 Points) points, it means that there is still room for improvement, also explaining the content and scope of the project work definitions are lacking or insufficient [13].

To be consistent with tactics, vision and objectives of sustainable development, adoption of "green" philosophy to plan metropolitan green road is in line with the policy promotion and practice needs. This study employs the following three ways to set green road assessment indicators, which are explicated as follows:

2.1. Taoyuan Zhonglu Zone Expropriation Projects

In the early research stages, according to the Taoyuan County Government's "Report on Taoyuan Zhonglu Area Zone Expropriation Project Overall Planning Cum Basic Design" and the "Design and Supervision Service Proposal", collect the work items within work scope and set the index job. With work breakdown structure, from the primary key job items, select the appropriate job evaluation index. The index and job items screened will act as part of the green road indicator assessment system.

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2.2. Mindjet Mind Manager

Mindjet Mind Manager, developed by Tony Buzan from the UK, is a set of thinking organization and note method, which can be utilized in data compilation, creative thinking, group discussions, etc. The effectiveness is significant. In 1980, the scholar combined this software and TQM (total quality management) with each other, and used it in SQuBOK knowledge system [14]. To respond to development and construction needs of the future aerotropolis, take into overall considerations, and perfect sustainable development indicator assessment items and scope. Mindjet Mind Manager Mode is shown in Figure 2.

2.3. Focus Interview

Focus interview mode in this study uses both modes of structured and non-structured interviews simultaneously. Combination of the two modes can also be called semi-structured interview. The purpose is to obtain hidden information in order to facilitate the respondents providing valuable experience and feasible substantive opinions from more professional, objective and neutral points of views, to enhance the credibility of the interview.

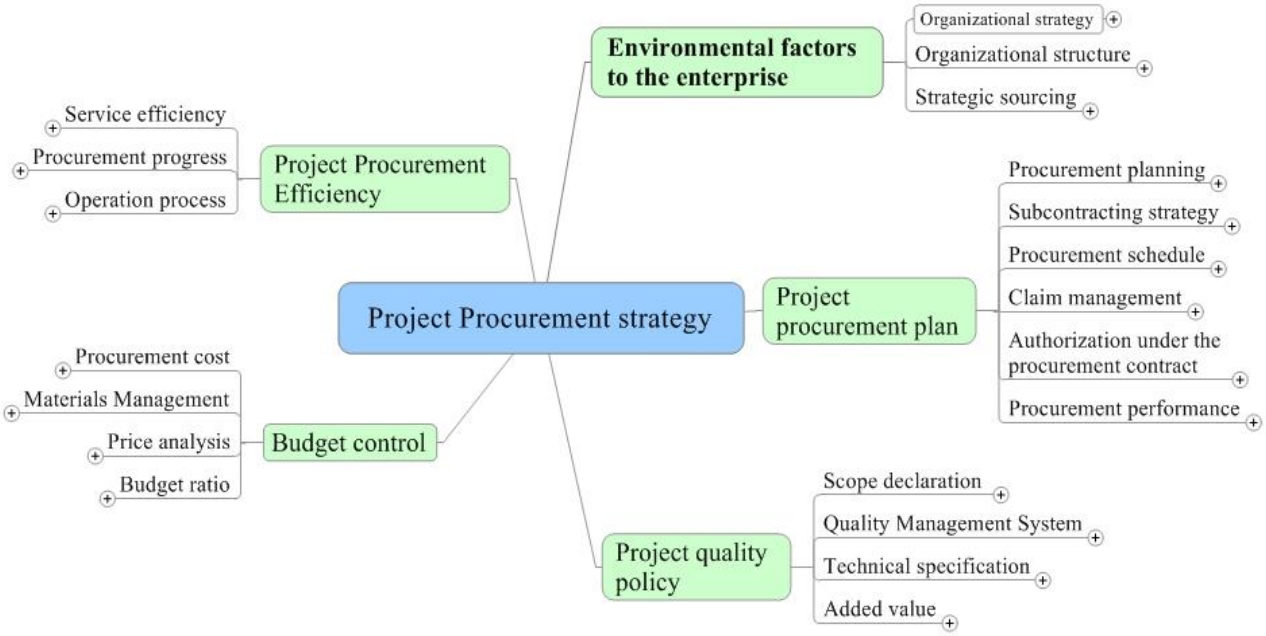

Figure 2: Mindjet Mind Manager Mode [7]

3. Build Green Road Project Management Assessment Model

Application of project definition rating index (PDRI) assessment model mainly divides metropolitan green road project management assessment model into four sections, of which job scope covers job items in various stages of all the life cycle. To build this evaluation mode will be conducive to the assessment basis when urban planning carries out projects related to sector expropriation. This article is limited to the length of the article, various related milestone items and scopes of index work circumstantially set out in Table 1.

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3.1. PDRI Assessment Model Design

PDRI assessment model structure hierarchy, its WBS job hierarchy grading layers take three levels in principle, and more detailed job decomposition items are included in the description for element. As in Figure 3, the first level is section, under which the second level is category. The third layer is element. Its operational item details are included in each element for description, in order to complete the construction of the whole project's PDRI assessment framework.

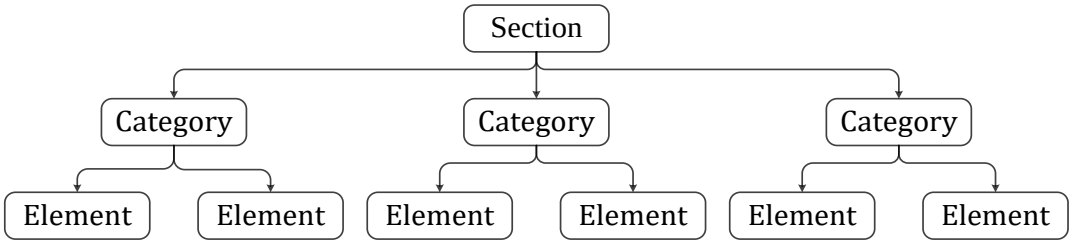

Figure 3: PDRI work breakdown structure schematic map

3.2. Set PDRI Job Weights

After the establishment of PDRI evaluation mode is complete, sections, categories and elements will be placed in PDRI definition rating scoring table as the basis for follow-up formulation of weight. This study adopts the "column" vector analysis method of the eigenvector weight. With an eye of setting mutual importance on weights between sections, categories and elements of PDRI, as shown in Figure 4 below is a pairwise comparison computing paradigm for the relative importance of category's element. Objectively define weights associated with sections, categories and elements and the importance priority among the projects of the job items.

A relative important pairwise comparison was done to measure the relative importance analysis between sections, categories, and elements, and the logic of the analysis results is required to pass consistency inspection (C.I. value). By calculating the maximum eigenvalue λ max and consistency test C.I. value, increase efficiency of assessment model and decision-making. Based on the empirical rule, the integrated scale is proposed. C. I. value of less than 0.1 is regarded as the matrix having validity, which denotes the matrix is feasible and has consistency [15].

It is evident from Table 2 that when the mutual relative importance weights of each section and category are completed, the mutual importance order of the entire evaluation mode can be understood clearly. That is, from initiation to completion of the entire project, it is easy to identify the work items of which we especially have to take much account in the various stages of entire life cycle. It also represents the proper proportion of effectiveness and performance in order that desired objectives of overall project performance are to be achieved.

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Pairwise comparison for the relative importance of category's element				
CATEGORY G.	G 1. List of equipment	G 2. Equipment location map	G 3. Equipment utility demand	e-vectors
G 1. List of equipment	1	1	2	0.411
G 2. Equipment location map	1	1	1	0.328
G 3. Equipment utility demand	1/2	1	1	0.261
	2.500	3.000	4.000	1.000
		λ max = 3.054 C. I. = 0.027 <0.1		

Figure 4: Eigenvector weight analysis paradigm

Table 1: Metropolitan green road PDRI operating range

SECTION I Feasibility Study	
A	**Project pre-planning and integrated planning**
A 1	Master plan analysis
A 2	Correlation plan content analysis
A 3	Overall planning and basic design in resource area
A 4	Detailed design guideline and construction outline specification
A 5	Status survey and analysis for project area
A 7	Overall planning and basic design for rainwater drainage
A 8	Overall planning for running water and sewage project
A 9	Initially estimated project cost and time course planning
SECTION II Project Design	
B	**Planning and design concepts**
B 1	Socio-economic environment
B 2	Natural environment
B 3	Landscape ecological environment
C	**Issues Faced and countermeasures**
C 1	Discussion topic formulation
C 2	Deliberation of discussion topics
C 3	Solution scheme
D	**Design strategy and concept.**
D 1	Overall space framework deliberation
D 2	Zoning design ideas
D 3	Road perimeter planting design ideas
D 4	Disaster prevention system planning and design
D 5	Water conservancy project design ideas
D 6	Ecological design ideas
D 7	Road gallery landscape lighting design
D 8	Information, marking system design
D 9	Running water and sewage design

SECTION III Project Planning and Execution	
F	**Project program**
F 1	Project supervision plan
F 2	Engineering overseeing program
F 3	The overall construction plan
F 4	Human resources plan
F 5	Project administration management
F 7	Safety and health program
F 8	Project progress plan
F 9	Project quality control plan
F 10	Project procurement management
F 11	Project environmental management plan
F 12	Risk management program
F 13	Project finance plan
F 14	Project cost management
G	**Project control**
G 1	Safety assurance and control
G 2	Quality assurance and control
G 3	Risk control
G 4	Project purchasing control
G 5	Construction machinery
G 6	Construction workers
G 7	Project cost control
G 8	Project progress control
G 9	Environmental control
SECTION IV Project Performance	
H	**Project Maintenance Management**
H 1	Maintenance management program
H 2	Operation maintenance execution cycle planning

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D 10 Spray irrigation system design	H 3 Maintenance update plans
D 11 Common piping and conduit design	H 4 Operational maintenance expense plans
E Project fund and financial plan	**I Project performance**
E 1 Project fund and budget details	I 1 Project planning accomplishment performance
E 2 Reasonable analysis on project budget	I 2 Project design and process performance
E 3 Analysis on difference of procurement contracting strategy composition	I 3 Project efficiency and effectiveness
E 4 Bid price composition content research and analysis	I 4 Project management executive performance
E 5 The reasonableness of the bid price component	

Table 2: PDRI Section and Category Weights

Section Weights		Category Weights	
Section	Weights	Category	Weights
II Project Design	560	D. Design strategy and concept	205
III Project planning and execution	229	B. Plan design concept	157
I Project procurement risk	136	F. Project program	132
IV Feasibility study	75	E. Project funds and financial planning	117
Total	**1000**	G. Project control	97
		H. Project maintenance management	83
		C. Issues faced and countermeasures	81
		A. Project pre-planning and integrated planning	75
		J. Project performance	53
		Total	1000

4. Conclusions

This research, targeting the development of metropolitan green road projects, can precisely meet project requirements and expected development purposes. The main conclusions and benefits are as the following several explications.

4.1. Diminish pipeline manhole covers (hand hole covers), to shape a new urban appearance

1) Build underground common conduits with a total length of about 23.72 km.
2) For the sake of the usage demand, create the optimal benefits. Through the integration, set the "Resource Area" to replace the traditional laying of various types of pipeline manhole covers (hand hole covers).
3) Reach target that planned roadway pavement of more than 15 m does away with manhole cover, and planned roadway pavement of 12 m or less diminishes manhole cover.

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4) Through the integration, plan that only plan road of more than 15 m may set up a separate main of electricity, telecommunications. The manhole cover is provided within range of facility belts, sidewalks or bike lanes in order to meetplanning principle of no manhole cover on planned roadway surface above 15 m.
5) Project benefits: meet pipeline maintenance management needs to reach benefits of smooth, beautiful roads thus shaping a new cityscape.

4.2. Pre-Plan to Set Lead-In Pipes For Various Utility Pipelines on Clients End

1) In accordance with the preliminary results of land distribution (allocation lines of land) by the Land Office, the orientation of the site has been confirmed.
2) In accordance with provisions relating to "minimum development scale of building site" in urban planning and the related "Guidelines for Land Usage Zoning Regulation", on the basis of the minimum development area, it is estimated that the subsequent development architecture model, and preliminarily categorize into the "building area" and "townhouse area." In accordance with the provisions of the minimum width of each site's provisional plan roads, carry out site assignment.
3) According to the results of the site allocation, plan and lay out resource area and have lead-in pipes for various utility pipelines on clients end embedded in each site.
4) Project benefits: Avoid repetitively digging and filling roads in later regional development, and maintain high quality road usage.

4.3. Perfect Bicycle Road Network System

Take into holistic consideration of planning in project area. We shall expropriate the existing pedestrian or bike lanes on the range side, amalgamate and include them in the bike path system of this development case, and extend and build the bike path near the road, to form a complete bicycle lane network for the whole region with a total length of about 16.6 km.

Geographic position of the Taoyuan Zhonglu zone expropriation engineering links east-west access road of Taoyuan International Airport. The zone expropriation project is seen as a gateway to enter Taoyuan. Overall project plans and designs a total of 3 parks (amounting to about 7.54 hectares), ranging from earthquake, flood, fire prevention to other functions in the neighborhood Art Park. There are a total of 17 green lands (about 1.88 hectares) which cover the earthquake, flood, fire prevention and other designs in central metropolitan landscape park. Six parent-child playgrounds are set (about 2.03 hectares). It is exemplary for integrated development of metropolitan zone expropriation projects.

Regional zone expropriation project is one of the ways to thoroughly reinvent the old city, is also the process to evolve from the old thinking to new thinking, and is also the power to make the whole society improve the living environment and then become sophisticate and innovative. Promoting "green" and "smart" urban visions must be the future trend of urban development construction, and to achieve this goal, it is necessary to have a sound overall public facility planning. Sustainable development of an advanced city affects dimensions even more extending to the social, economic, environmental and systematic aspects and so on. We expect this study

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provides agencies with the assessment and reference for future public works of segment expropriation.

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