Key challenges to environmental management plan implementation at construction sites

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ABSTRACT: This study identifies the key challenges in implementing erosion and sedimentation control plan (ESCP) at construction sites. This study analyzes survey data from 97 industry practitioners using mean ranking analysis, normalization, agreement analysis, and overlap analysis techniques. The major findings include the key challenges for implementing ESCP are: 'progress between ESCP and construction works is not parallel,' 'lack of publicity on ESCP,' 'failure to maintain ESCP facilities periodically,' 'cost-reduction process in ESCP implementation,' 'contractors perceived that ESCP is overcharged,' and 'completed the ESCP just for the report.' Also, the fragmentation between project stakeholders in the construction industry results in other key challenges that partially affect some project members. These findings contribute a better knowledge in developing strategies for effective ESCP implementation to protect the environment.

Keywords: *Sustainable development; Environmental management plan; Construction Industry.*

1. INTRODUCTION

Researchers and practitioners are investigating challenges in implementing environmental protection plans at construction sites because there are numerous challenges or problems in implementing environmental protection. For example, certain constraints limit project members in implementing environmental protection plans at construction sites [1]. Also, various difficulties emerged during the implementation due to economic and institutional challenges [1]. Besides, these difficulties can arise when issues emerge from design flaws and missing information [2]. Also, the complications can be associated with technical challenges consisting of limited knowledge and resources appear to be one of the main barriers to environmental performance requirements in construction [3]. Conversely, challenges due to social and political complications are also affecting the environmental sustainability of construction projects [4]. In other words, the level of stringency and the intensity of the control activities are powerful stimulus to improve the environmental and competitive performance in our construction industries [5].

ESCP is a plan that details temporary measures to be implemented during the construction phase. It may include permanent means to remain in place once the erosion and sedimentation development control measures are completed. Setting up ESCP devices requires tools that are usually prescribed based on readily available technical solutions rather than assessing environmental performance [3]. A study has also identified the challenges and barriers of ESCP implementation through case studies, including the urbanization and infrastructural development of the soil erosion associated with a building project. While these studies provide insights into the challenges in implementing ESCP, the results also illustrate that those different challenges affect the local construction sector. Therefore, this study's objective is to investigate the key challenges in implementing ESCP at construction sites.

2. METHODOLOGY

The survey development involves identifying potential challenges from individual interviews and a systematic literature review (SLR). The interview involves twenty individuals that met the predetermined criteria and were then analyzed using thematic analysis [ex., 6, 7]. Next, the SLR was executed to identify challenges that other scholars have identified. Finally, all identified challenges were combined. The drafted survey was pilot tested to ensure reliability.

Then, this study proceeds with disseminating the survey to the target population. This study's target population is industry professionals involved in ESCP implementation. As a result, 97 responses were collected for the analysis.

Next, the study proceeds with testing the data's reliability by calculating the Cronbach's alpha (α). This study's α value is at 0.967. the mean score ranking technique ranks the importance of the challenges in implementing ESCP. Then, the normalization technique was adopted to approximately proportionate the mean within the data. Challenges with normalized values ≥ of 0.50 were considered as critical. Finally, the overlap analysis technique identified overlapping and unique key challenges between interrelated groups.

3. RESULTS

Table 1 shows the ranking analysis results for the challenges in implementing ESCP. The results illustrate the challenges with normalization values ≥ 0.50 (i.e., key

challenges). However, each project member has different key challenges. Specifically, consultants, contractors, and clients have fourteen, twelve, and thirteen key challenges. From those key challenges, six challenges overlap between the project team members: C29, C11, C24, C03, C23, and C25. Lastly, consultants, contractors, and clients have five, three, and three key challenges that are not overlapping, respectively. In other words, while the overall ranking analysis shows that there are eleven key challenges, the results also indicate that only six of those challenges are the key challenges as suggested by all consultants, contractors, and clients.

Table 1 Ranking of challenges to ESCP implementation

Code	All (n=97)		Consultant (n =25)		Contractor (n = 53)		Client (n=19)	
	Mean	NV[a]	Mean	NV[a]	Mean	NV[a]	Mean	NV[a]
C29	3.887	1.000[b]	4.400	**1.000**[b]	3.792	**1.000**[b]	3.474	**0.750**[b]
C11	3.753	0.827[b]	4.120	**0.741**[b]	3.623	**0.780**[b]	3.632	**1.000**[b]
C24	3.742	0.813[b]	4.200	**0.815**[b]	3.604	**0.756**[b]	3.526	**0.833**[b]
C03	3.711	0.773[b]	4.080	**0.704**[b]	3.642	**0.805**[b]	3.421	**0.667**[b]
C23	3.711	0.773[b]	4.240	**0.852**[b]	3.566	**0.707**[b]	3.421	**0.667**[b]
C25	3.649	0.693[b]	4.320	**0.926**[b]	3.415	**0.512**[b]	3.421	**0.667**[b]
C21	3.619	0.653[b]	3.920	**0.556**[b]	3.604	**0.756**[b]	3.263	0.417
C28	3.619	0.653[b]	3.720	0.370	3.698	**0.878**[b]	3.263	0.417
C26	3.577	0.600[b]	3.760	0.407	3.566	**0.707**[b]	3.368	**0.583**[b]
C30	3.505	0.507[b]	3.600	0.259	3.604	**0.756**[b]	3.105	0.167
C17	3.464	0.453	3.600	0.259	3.434	**0.537**[b]	3.368	**0.583**[b]
C10	3.464	0.453	3.960	**0.593**[b]	3.245	0.293	3.421	**0.667**[b]
C04	3.448	0.433	4.000	**0.630**[b]	3.226	0.268	3.368	**0.583**[b]
C01	3.443	0.427	4.120	**0.741**[b]	3.189	0.220	3.263	0.417
C16	3.433	0.413	4.080	**0.704**[b]	3.208	0.244	3.211	0.333
C02	3.423	0.4	4.000	**0.630**[b]	3.264	0.317	3.105	0.167
C14	3.392	0.36	3.800	0.444	3.151	0.171	3.526	**0.833**[b]
C09	3.392	0.36	3.840	0.481	3.094	0.098	3.632	**1.000**[b]
C12	3.381	0.347	3.480	0.148	3.434	**0.537**[b]	3.105	0.167
C05	3.371	0.333	3.880	**0.519**[b]	3.189	0.220	3.211	0.333
C27	3.371	0.333	3.960	**0.593**[b]	3.151	0.171	3.211	0.333
C07	3.34	0.293	3.840	0.481	3.094	0.098	3.368	**0.583**[b]
C13	3.299	0.24	3.560	0.222	3.226	0.268	3.158	0.250
C20	3.237	0.16	3.520	0.185	3.094	0.098	3.263	0.417
C19	3.227	0.147	3.480	0.148	3.094	0.098	3.263	0.417
C06	3.196	0.107	3.320	0.000	3.132	0.146	3.211	0.333
C15	3.113	0	3.400	0.074	3.019	0.000	3.000	0.000

Note: NV = normalized values. C01 Lack of commitment on ESCP; C02 Lack of understanding of the roles and responsibilities between parties; C03 Cost-reduction process in ESCP implementation; C04 Lack of understanding of the processes and workflows required for ESCP implementation; C05 Fragmented nature of organizations in the construction industry; C06 Absence of industry standards for ESCP; C07 Disbelief in the impact of neglecting ESCP; C09 Negative attitude towards ESCP; C10 Lack of awareness on ESCP; C11 Lack of publicity on ESCP; C12 Lack of a comprehensive strategy for ESCP implementation; C13 Lack of comprehensive rules and regulations; C14 Insufficient staffing to inspect ESCP implementation; C15 Inefficiency in ESCP inspection procedures; C16 Lack of knowledge on ESCP; C17 High cost of implementing ESCP; C19 Lack of competitive advantage from ESCP implementation; C20 Shortage of qualified personnel for ESCP; C21 Inadequate incentive for ESCP implementation; C23 Contractors perceived that ESCP is overcharged; C24 Failure to maintain ESCP facilities periodically; C25 Completed the ESCP just for the report; C26 Proposed ESCP design is inappropriate for the site; C27 Incorrect installation of ESCP components; C28 Unexpected changes in site conditions; C29 Progress between ESCP and construction works is not parallel; C30 Shortage of resources to implement ESCP

4. CONCLUDING REMARKS

While ESCP implementation is vital in protecting the environment from construction works, its implementation is still low due to many challenges. This study explores the key challenges in implementing the proposed ESCP at construction sites. The major findings include the overall results suggesting eleven key challenges in implementing ESCP at construction sites from thirty potential challenges. Also, other key challenges affect one or two of the three project members, resulting from the fragmentation between project stakeholders. Thus, this study contributes to the sustainable construction body of knowledge by listing key challenges in implementing environmental protection at construction sites.

ACKNOWLEDGEMENT

This work is supported by Universiti Malaysia Pahang Fundamental Research Grant [RDU190382].

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