

Linking Institutional Pressures and Environmental Management Practices in Mega Construction Project: The Mediating Role of Project Managers' Organizational Citizenship Behaviors for the Environment

Ge Wang¹; Qinghua He²; Xianhai Meng³; Tao Yu⁴; and Xue Yan⁵

¹Ph.D. Candidate, School of Economics and Management, Tongji Univ., Shanghai 200092, China; School of Natural and Built Environment, Queen's Univ. Belfast, Belfast BT9 5AG, U.K. E-mail: 2014_wangge@tongji.edu.cn

²Professor, School of Economics and Management, Tongji Univ., Shanghai 200092, China. E-mail: heqinghua@263.net

³Lecture, School of Natural and Built Environment, Queen's Univ. Belfast, Belfast BT9 5AG, U.K. E-mail: x.meng@qub.ac.uk

⁴Ph.D. Candidate, School of Economics and Management, Tongji Univ., Shanghai 200092, China. E-mail: yutao2012tjdx@163.com

⁵Ph.D. Candidate, School of Management and Engineering, Nanjing Univ., Nanjing 210093, China. E-mail: xueyan9103@163.com

Abstract

This paper extends previous literature of mega construction projects (MCPs) by empirically exploring the relationships between institutional pressures and MCPs' environmental management practices (EMPs) with considering the mediating effect of project managers' organizational citizenship behaviors for the environment (OCBEs; a form of voluntary pro-environmental behaviors). A questionnaire survey was employed to collect data from 128 MCPs' project managers in China. The results obtained from partial least squares analysis show that both mimetic and normative pressures have significant influences on EMPs. Conversely, there is no significant relationship between coercive pressure and EMPs. In addition, the results further indicate that project managers' OCBEs play a critical but varied mediating role in the relationships between three types of institutional pressures and EMPs. This paper reinforces the need to regard project managers' OCBEs as exemplary behaviors that demonstrate their personal and genuine commitment to the environment. The findings of this paper also provide new insights into the use of institutional forces to facilitate the improvement of EMPs in MCPs.

INTRODUCTION

Mega Construction Projects (MCPs) are large-scale infrastructure projects, characterized as complex, politically-sensitive (Van Marrewijk et al. 2008) and having a huge impact on local economic developments, social progresses, and environmental changes (Wang et al. 2017; Zeng et al. 2015). The construction processes of MCPs have

caused a wide range of environmental problems, particularly in developing countries such as China that is experiencing an infrastructure investment boom over the decades (Ansar et al. 2014). Qiu (2007) reported in *Nature* that nearly 1500 antelopes' migration and breeding activities are severely affected by the construction of Qinghai-Tibet railway. Stone (2010) described Three Gorges Dam (the world's largest hydropower project) as an "environmental bane" in *Science*. Given the increasing concern regarding environmental issues, MCPs are challenged with growing pressures by stakeholders and regulatory agencies to be environmentally friendly in managing construction processes (Zeng et al. 2015).

Through the lens of institutional theory, external pressures that motivate MCPs to adopt Environmental Management Practices (EMPs) include three different categories, namely, *coercive*, *mimetic*, and *normative pressures* (DiMaggio and Powell 1983). Nevertheless, it remains largely unknown to which extent MCPs' EMPs are affected by different types of institutional pressures. There seems to be a "*black-box*" between institutional pressures and EMPs.

Prior studies on MCPs' environmental management focus on formal and project-level practices, such as the implementation of environmental management system, as well as the auditing and certification procedures (Flyvbjerg et al. 2003). However, these studies largely neglect the important role of informal and voluntary environmental initiatives taken by project managers, such as personal involvement in environmental programs, or informal support for green initiatives. In fact, Organizational Citizenship Behaviors for the Environment (OCBEs), which are based on individual, voluntary and informal initiatives, are increasingly considered to be one of the critical success factors in environmental management (Boiral et al. 2015; Wang et al. 2017). Boiral and Paillé (2012) defined OCBEs as "*individual and discretionary behaviors that are not explicitly recognized by the formal work requirements and that contribute to the efficiency of environmental practices.*" Noteworthy, managers' OCBEs can facilitate the implementation of environmental management practices by demonstrating the degree of their personal commitment in this area and their willingness to be a source of support in the organization's effort to become greener (Boiral et al. 2016). Meanwhile, institutional pressures can indeed reinforce environmental values and awareness, which, in turn, foster OCBEs (Boiral et al. 2015). From this perspective, project manager's OCBEs could be one of the key factors bridging the link between institutional pressures and EMPs in MCPs. Nevertheless, few empirical evidences exist to verify this link.

Additionally, previous literature has highlighted the key role of project managers' commitment, leadership, and knowledge in ensuring the success of EMPs (Hwang and Ng 2013; Tabassi et al. 2016). However, the literature on this issue has essentially focused on general pro-environment values and skills. As a consequence, the behavioral aspects of environmental leadership have been largely neglected (Boiral et al. 2015). To fill these gaps, this paper aims to explore the relationships between institutional pressures and environmental management practices with considering the mediating effect of project managers' OCBEs.

The remainder of this paper is organized as follows. The next section provides a description of a set of research hypotheses and a theoretical model. Thereafter, the

research methods and analysis results are reported. Last, conclusions and managerial implications are discussed.

RESEARCH HYPOTHESES AND THEORETICAL MODEL

“Leading by example” is critical, as prior studies have consistently shown that managers’ commitment to the environment is one of the key determinants for the adoption of EMPs (Boiral et al. 2015). Managerial environmental commitment is often analyzed based on managers’ attitude and beliefs in environmental protection issues (Zhang et al. 2015). However, a striking gap sometimes exists between managers’ environmental awareness and their actual environmental behaviors. This may result in the inconsistency between professed values and displayed behaviors. To address this concern, this paper focuses on managers’ OCBEs to reflect their actual level of environmental commitment. More specifically, managers’ OCBEs can be perceived as exemplary behaviors demonstrating their personal and genuine commitment to the environment. As a result, it is reasonable to assume that project managers’ OCBEs are important drivers for inclusion of pro-environmental elements into their daily management activities and tend to be emulated by other project members in MCPs. From the above analysis, the following hypothesis is suggested:

H1. There is a positive relationship between project managers’ OCBEs and EMPs.

Coercive pressure is related to the compulsory pressure exerted by powerful agencies such as regulators and supervisors (DiMaggio and Powell 1983). The construction of MCPs contributes greatly to air, water, noise, and land pollutions. MCPs’ project managers often have to take concrete actions in response to energy and environmental regulations, such as the adoption of ISO 14000 management systems, or launch of sustainability reports. In this process, environmental regulations tend to enhance the environmental concern of project managers and to induce them to adopt more environmentally conscious behaviors in daily work activities (Zhang et al. 2015). Thus, the following set of hypotheses is proposed.

H2a. Coercive pressure is positively related to project managers’ OCBEs.

H2b. Coercive pressure is positively related to EMPs.

Mimetic pressure reflects the pressure on organizations to imitate others’ successful practices (DiMaggio and Powell 1983). As MCPs are characterized by high uncertainties and complexities in nature, project managers are likely to be influenced by the practices of peer-projects and to replicate a proven successful route (He et al. 2016). Project managers’ OCBEs are motivated during the process of learning from other MCPs’ successful experiences in environmental practices. To maintain the competitiveness, MCPs are more likely to demonstrate an interest in EMPs when peer-projects set an example for environmental protection. On this basis, the following set of hypotheses is proposed.

- H3a.** Mimetic pressure is positively related to project managers’ OCBEs.
- H3b.** Mimetic pressure is positively related to EMPs.

Normative pressure primarily derives from professionalization, which is viewed as a form of rules, standards, and norms (Phan and Baird 2015). Professional bodies in the environmental protection field often form shared norms and collective expectations of what desirable behaviors would be. MCPs are notorious for destroying local environment. In the global context of sustainable development, MIPs are faced with increasingly strict industrial norms in terms of environmental protection (Zeng et al. 2015). Project managers are inclined to exhibit pro-environment preferences and engage in OCBEs when they are in an industrial community that places a high value on environmental protection (Zhang et al. 2015). Furthermore, under enormous normative pressures, MCPs tend to invest more in EMPs so as to meet stricter industrial norms. These discussions lead to the following set of hypotheses.

- H4a.** Normative pressure is positively related to project managers’ OCBEs.
- H4b.** Normative pressure is positively related to EMPs.

To sum up, this paper develops the theoretical model based on the abovementioned research hypotheses (see Figure 1).

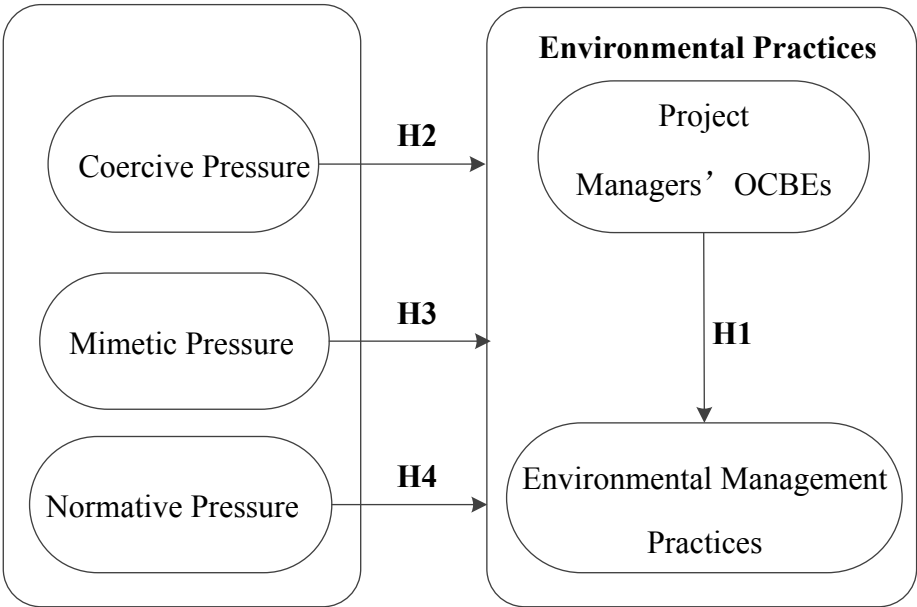


Figure 1.Theoretical model.

RESEARCH METHODS

In order to empirically validate the research hypotheses, a questionnaire survey was employed to collect data. The questionnaire was designed and developed based on literature reviews, project observations, and semi-structured interviews with scholars and professionals who have engaged in MCPs research and implementation. (Four interviewed senior project managers have involved in a number of MCPs in China, such

as Shanghai Expo, Suzhou–Nantong Bridge, Nanning High Speed Railway Station, and Shanghai Disney Park. Two interviewed professors have carried out MCPs management research for over 15 years).

As for institutional pressures, the measurement items were adopted from He et al. (2016). *Firstly*, Coercive Pressure (CP) items capture the three authoritative dimensions of regulatory agencies, industry associations, and third-party environmental supervisions in the context of MCPs implementation. *Secondly*, Mimetic Pressure (MP) items were presented in terms of the perceived effectiveness of EMPs by peer-projects. *Thirdly*, Normative Pressure (NP) was operationalized to reflect how professional bodies shape the norms of environmental protection in MCPs. A total of three items were used to measure the normative influences of industry experts, consultant firms, and academic communities.

According to Boiral and Paillé (2012), the measurement items of OCBEs were adopted from five aspects including helping, sportsmanship, organizational loyalty, individual initiative, and self-development, and were further modified to fit the context of environmental protection in MCPs. With respect to EMPs, the measurement items were adopted from Tung et al. (2014) to reflect the level of EMPs in MCPs. All selected measures were rated using five-point scales from 1 (strongly disagree) to 5 (strongly agree). All items were translated into Chinese to facilitate the respondents' understanding. This study applied the back-translation technique to establish linguistic equivalence between the two versions prior to the formal investigation.

A pre-test involving 23 MCPs' professionals was conducted to assess the appropriateness of the questionnaire's scope, to identify ambiguous expressions of the measurement items, and to verify the rationality of the related constructs. This survey was conducted between November 2015 and March 2016 in China. After the omission of invalid responses and the deletion of outliers, 128 responses were ultimately included in the subsequent analysis. Fifty-eight (45.31%) respondents of the 128 respondents were senior management (e.g., general managers), and 70 (54.69%) were middle management (e.g., site managers and department managers).

Factor Analysis (FA) was performed to analyze the collected primary data. FA has been extensively adopted as an effective statistical technique in identifying individual factor that represent sets of interrelated variables (He et al. 2016). To test the research hypotheses, Partial Least Squares (PLS) technique was employed to form the estimation method for analyzing the path model.

ANALYSIS RESULTS

The 10 items of institutional pressures were subject to FA. The Kaiser-Meyer-Olkin (KMO) value is $0.776 > 0.6$, indicating satisfactory sample adequacy (Field 2009). As shown in Table 1, the rotated loadings of the manifest items on their intended constructs are all above the recommended threshold of 0.4 (Cao et al. 2016). As a result, no institutional item was removed from the measurement model.

Similarly, FA procedures were also applied to extract the measurement items of OCBEs and EMPs. And no OCBEs or EMPs item was removed from the measurement model.

Table 1. Component List of Institutional Pressures.

Measurement items	Factor loadings		
	Factor 1	Factor 2	Factor 3
MP1	0.801	0.064	0.153
MP3	0.780	0.323	-0.018
MP2	0.762	0.183	0.116
MP4	0.480	0.209	0.248
NP1	0.191	0.842	0.090
NP2	0.173	0.828	0.119
NP3	0.235	0.816	0.002
CP2	-0.004	0.091	0.852
CP1	0.136	0.151	0.815
CP3	0.282	-0.059	0.779
Variance explained (%)	22.819	22.816	21.176
Variance cumulatively explained (%)	22.819	45.635	66.811

The validity of all measurements was further assessed in terms of the internal consistency, convergent validity, and discriminant validity. Internal consistency was assessed through the estimate of composite reliability. Table 2 shows that the composite reliability values are all greater than 0.7, indicating a satisfactory level of reliability of internal indicators with each construct (Hair et al. 2011). Convergent validity measures the extent to which the items underlying a particular construct actually represent the same conceptual variable. The first evidence of convergent validity is reflected by the values of Average Variance Extracted (AVE). Table 2 shows that the AVE values are all greater than 0.5, suggesting a satisfactory level of convergent validity of the constructs (Hair et al. 2011). Further evidence of convergent validity is provided by the factor loadings of each measurement item. The standardized factor loadings of all the items on their respective constructs are above the threshold of 0.7, and no cross-loading problem exists (see Table 2). Additionally, the square roots of AVE (values on the diagonal of the correlation matrix) are all greater than the absolute value of the inter-construct correlations (off-diagonal values), which suggests that the constructs have satisfactory discriminant validity.

Table 2. Measurement Validity and Construct Correlations.

Constructs	CR	AVE	Correlation matrix				
			CP	MP	NP	OCBEs	EMPs
CP	0.869	0.688	0.829				
MP	0.835	0.565	0.305	0.752			
NP	0.894	0.738	0.207	0.471	0.859		
OCBEs	0.931	0.659	0.259	0.567	0.564	0.812	
EMPs	0.852	0.658	0.244	0.524	0.480	0.611	0.811

A bootstrapping procedure with 5,000 resamples was conducted to compute standard errors and to test the statistical significance of the path coefficients. The results of the bootstrap-based PLS analysis are presented in Figure 2. The R^2 value of the

dependent variable (i.e., EMPs) is 0.436, indicating that most of the variances in the construct are explained by the research model. And the influence of OCBEs on EMPs is significant ($\beta=0.392$, $p<0.001$), thus Hypothesis 1 is supported. It is also shown that the MP–OCBEs link ($\beta=0.368$, $p<0.001$) and NP–OCBEs link ($\beta=0.376$, $p<0.001$) are all significant, thereby providing evidence for Hypotheses 3a and 4a, respectively. However, the CP–OCBEs link is not found to be significant ($\beta=0.070$, $p>0.05$), hence Hypothesis 2a is not supported.

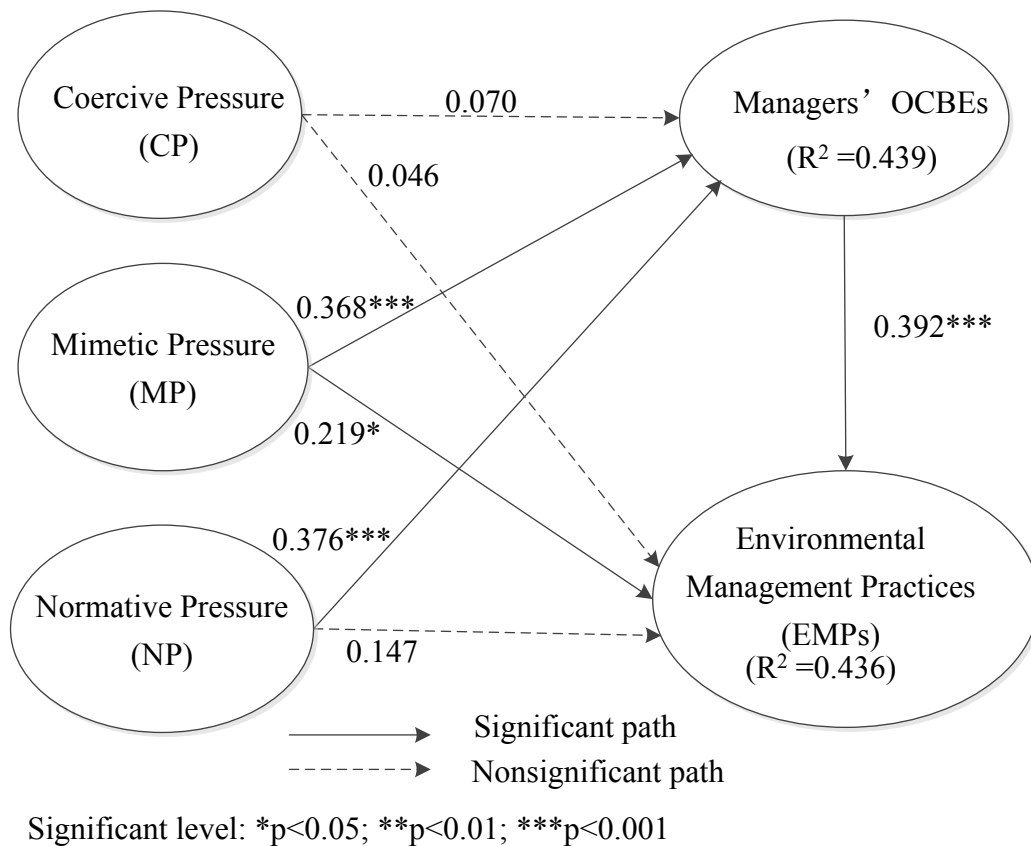


Figure 2. Results of PLS analysis for the research model.

Regarding the relationships between institutional pressures and EMPs, only the influence of MP is found to be significant when the effect of OCBEs is included ($\beta=0.219$, $p<0.05$), hence Hypothesis 3b is supported. Together with the significant links between MP and OCBEs and between OCBEs and EMPs, this finding further indicates that the influence of MP on EMPs is partially mediated by OCBEs.

To further investigate the effects of CP, MP, and NP on EMPs, an alternative model without the mediator was tested using the collected data. The results of the PLS analysis for the alternative research model are presented in Figure 3. While the intermediating effect of OCBEs is excluded, the direct influences of MP ($\beta=0.361$, $p<0.001$) and NP ($\beta=0.302$, $p<0.001$) on EMPs are significant. Combined with the results shown in Figure 2, these findings suggest that the effect of NP on EMPs is fully mediated by OCBEs, thus Hypothesis 4b is also supported. Although the intermediating effect of OCBEs is

excluded, the direct influence of CP on EMPs is still insignificant ($\beta=0.072$, $p>0.05$). Thus, Hypothesis 2b is not supported by the data.

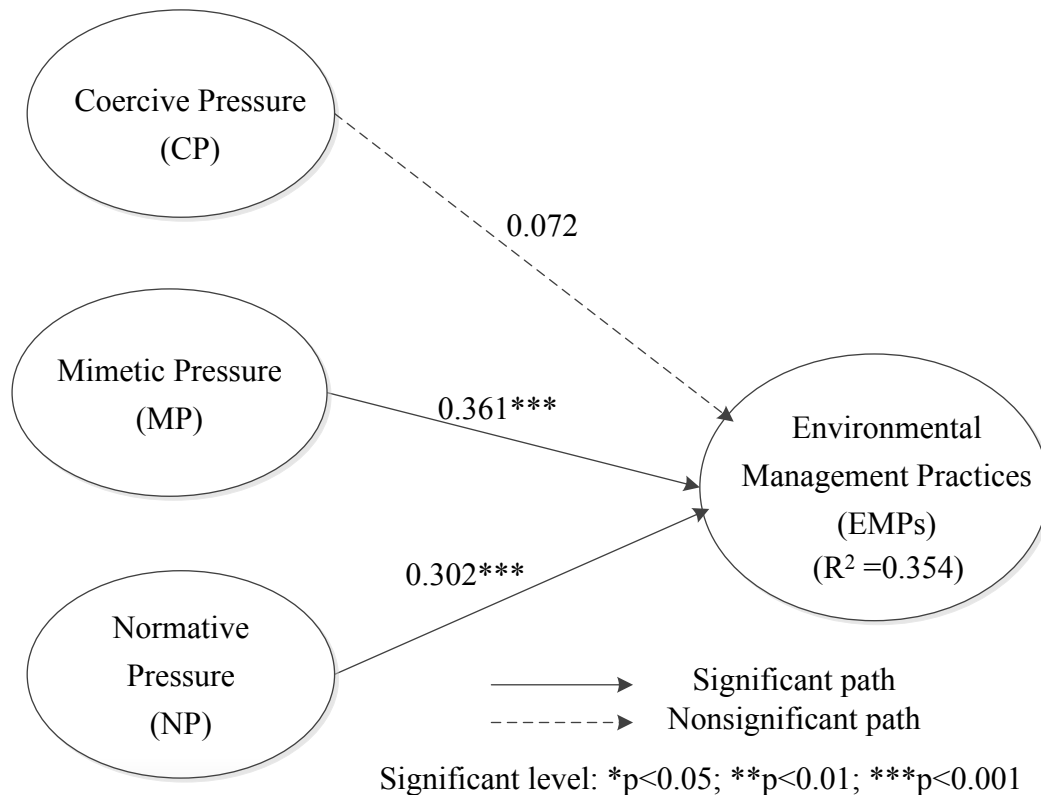


Figure 3. Results of PLS analysis for the alternative research model.

CONCLUSIONS

This study examines how institutional pressures exert influences on EMPs and what roles project managers' OCBs play in this institutionalization process. Firstly, with respect to coercive pressure, this paper fails to provide evidence for its significant influences on EMPs and project managers' OCBs in MCPs. This result is somewhat surprising because prior research indicates that environmental regulations are important drivers for the implementation of EMPs (Testa et al. 2015) and can indeed reinforce the environmental values and awareness of managers (Boiral et al. 2015). Such a result is probably due to the "*strong government and weak regulations*" in MCPs in China (Zeng et al. 2015). As China's MCPs are usually initiated by the central or local government, regulatory agencies often turn a blind eye to MCPs' environmental problems. In this case, coercive pressure does not necessarily contribute to EMPs and influence the behaviors of project managers in MCPs. Therefore, it is important to facilitate the development of third-party environmental supervisions to make up for the inefficient environmental regulations.

Secondly, according to Figure 3, mimetic pressure has the most influential impact on EMPs. MCPs are characterized by a culture that is ambiguous. In other words, MCPs

have fuzzy limits and embodies a duality between objects and actors who are willing the projects into being (Van Marrewijk et al. 2008). Flyvbjerg et al. (2003) claimed that most of MCPs overrun on costs, fall behind schedules, and fail in environmental responsibilities. Accordingly, there is a pressing need for MCPs to learn from peer-projects' experiences to achieve success. As such, EMPs are easily to be affected by peer-projects. This paper further shows that project managers' OCBs partially mediate the relationship between mimetic pressure and EMPs. This finding suggests that mimetic pressure not only shows the way forward to project managers by stimulating them to take responsible environmental behaviors (i.e., OCBs), but also give a direct stimulus to MCPs towards environmental-friendly practices.

Thirdly, normative pressure also has significant influences on EMPs. And the relationship between normative pressure and EMPs is fully mediated by project managers' OCBs. While normative pressure can motivate EMPs, this link will not work if project managers fail to set an example in terms of environmental values and behaviors. To sum up, the day to day environmental behaviors (i.e., OCBs) of project managers tend to speak louder than words (i.e., professional standards) alone, especially in the eyes of project workers

ACKNOWLEDGMENTS

This work was supported by the National Natural Science Foundation of China (Project No.: 71571137, 71471136 and 71390523) and the International Exchange Program for Graduate Students of Tongji University.

REFERENCES

- Ansar, A., Flyvbjerg, B., Budzier, A. and Lunn, D. (2014). "Should we build more large dams? The actual costs of hydropower megaproject development." *Energy Policy*, 69(4), 43-56.
- Boiral, O. and Paillé, P. (2012). "Organizational citizenship behaviour for the environment: measurement and validation." *Journal of business ethics*, 109(4), 431-445.
- Boiral, O., Raineri, N. and Talbot, D. (2016). "Managers' citizenship behaviors for the environment: a developmental perspective." *Journal of Business Ethics*, (3), 1-15.
- Boiral, O., Talbot, D. and Paillé, P. (2015). "Leading by example: a model of organizational citizenship behavior for the environment." *Business Strategy and the Environment*, 24(6), 532-550.
- Cao, D., Li, H., Wang, G. and Huang, T. (2016). "Identifying and contextualising the motivations for BIM implementation in construction projects: an empirical study in China." *International journal of project management*, 35(4), 658-669.
- DiMaggio, P.J. and Powell, W.W. (1983). "The iron cage revisited: institutional isomorphism and collective rationality in organizational fields." *American Sociological Review*, 48(2), 147-160.
- Field, A.P. (2009). "Discovering statistics using SPSS." *Sage publications*, Brighton.

- Flyvbjerg, B., Bruzelius, N. and Rothengatter, W. (2003). *Megaprojects and risk: an anatomy of ambition*, Cambridge University Press, London.
- Hair, J.F., Ringle, C.M. and Sarstedt, M. (2011). "PLS-SEM: indeed a silver bullet." *Journal of Marketing theory and Practice*, 19(2), 139-152.
- He, Q., Dong, S., Rose, T., Li, H., Yin, Q. and Cao, D. (2016). "Systematic impact of institutional pressures on safety climate in the construction industry." *Accident Analysis & Prevention*, (93), 230-239.
- Hwang, B.G and Ng, W.J. (2013). "Project management knowledge and skills for green construction: Overcoming challenges." *International Journal of Project Management*, 41(2), 87-103.
- Phan, T.N. and Baird, K. (2015). "The comprehensiveness of environmental management systems: the influence of institutional pressures and the impact on environmental performance." *Journal of environmental management*, (160), 45-56.
- Qiu, J. (2007). "Environment: riding on the roof of the world." *Nature*, 449(7161), 398-402.
- Stone, R. (2011). "Hydropower. the legacy of the three gorges dam." *Science*, 333(6044), 817.
- Tabassi, A.A., Argyropoulou, M., Roufehaei, K.M and Argyropoulou, R. (2016). "Leadership behavior of project managers in sustainable construction projects." *Procedia Computer Science*, (100), 724-730.
- Testa, F., Olivier, B., and Iraldo, F. (2015). "Internalization of environmental practices and institutional complexity: can stakeholders pressures encourage greenwashing?" *Journal of Business Ethics*, (1), 1-21.
- Tung, A., Baird, K. and Schoch, H. (2014). "The relationship between organisational factors and the effectiveness of environmental management." *Journal of Environmental Management*, (144), 186-196.
- Van Marrewijk, A., Clegg, S. R., Pitsis, T.S. and Veenswijk, M. (2008). "Managing public-private megaprojects: paradoxes, complexity, and project design." *International Journal of Project Management*, 26(6), 591-600.
- Wang, G., He, Q., Meng, X., Locatelli, G., Yu, T. and Yan, X. (2017). "Exploring the impact of megaproject environmental responsibility on organizational citizenship behaviors for the environment: a social identity perspective." *International Journal of Project Management*, 2017(5), 1-13.
- Zeng, S.X., Ma, H.Y., Lin, H., Zeng, R.C. and Tam, V.W. (2015). "Social responsibility of major infrastructure projects in China." *International Journal of Project Management*, 33(3), 537-548.
- Zhang, B., Wang, Z. and Lai, K.H. (2015). "Mediating effect of managers' environmental concern: bridge between external pressures and firms' practices of energy conservation in China." *Journal of Environmental Psychology*, 43(1), 203-215.