



**QUEEN'S
UNIVERSITY
BELFAST**

Exploring the impact of megaproject environmental responsibility on organizational citizenship behaviors for the environment: A social identity perspective

Wang, G., He, Q., Meng, X., Locatelli, G., Yu, T., & 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*, 35(7), 1402–1414.
<https://doi.org/10.1016/j.ijproman.2017.04.008>

Published in:
International Journal of Project Management

Document Version:
Peer reviewed version

Queen's University Belfast - Research Portal:
[Link to publication record in Queen's University Belfast Research Portal](#)

Publisher rights

Copyright 2017 Elsevier.
This manuscript is distributed under a Creative Commons Attribution-NonCommercial-NoDerivs License (<https://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits distribution and reproduction for non-commercial purposes, provided the author and source are cited.

General rights

Copyright for the publications made accessible via the Queen's University Belfast Research Portal is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

The Research Portal is Queen's institutional repository that provides access to Queen's research output. Every effort has been made to ensure that content in the Research Portal does not infringe any person's rights, or applicable UK laws. If you discover content in the Research Portal that you believe breaches copyright or violates any law, please contact openaccess@qub.ac.uk.

Open Access

This research has been made openly available by Queen's academics and its Open Research team. We would love to hear how access to this research benefits you. – Share your feedback with us: <http://go.qub.ac.uk/oa-feedback>

Exploring the impact of megaproject environmental responsibility on organizational citizenship behaviors for the environment: A social identity perspective

Abstract

The importance of organizational citizenship behaviors for the environment (OCBEs) has been clearly established in the environmental literature. However, the OCBEs construct has rarely been examined in the specific and increasingly important realm of megaproject environmental responsibility (MER). To fill this gap, this paper presents an individual-level analysis that explores the impact of project participants' perceptions of MER practices on their environmental commitment and OCBEs. The results show that project participants' perceptions of MER practices directed toward *internal* stakeholders (i.e., stakeholders linked by project contracts) are positively related to their OCBEs. This relationship is partially mediated by the environmental commitment of project participants. Conversely, project participants' perceptions of MER practices directed toward *external* stakeholders (i.e., the local community and general public) have only an insignificant impact on their OCBEs. These findings provide new insights for managing MER practices to stimulate the emergence of OCBEs and thereby improve environmental performance.

Keywords: Megaproject; Environmental responsibility; Organizational citizenship behaviors for the environment; Environmental commitment; Social identity theory

1. Introduction

Megaprojects are temporary endeavors with a large investment commitment, vast complexities (especially in organizational terms), and long-lasting impacts on the economy, environment, and society (Brookes and Locatelli, 2015). In the engineering sector, megaprojects refer to large-scale infrastructure projects that are usually financed by governments and are characterized by “enormous resource consumptions, significant environmental impacts, as well as a high level of risk, innovation, and complexity” (Flyvbjerg, 2014; Locatelli and Mancini, 2010; Locatelli et al., 2017a; Van Marrewijk et al., 2008).

In the global context of sustainable development, improving environmental performance is one of the most pressing and prominent objectives in megaproject management (Locatelli and Mancini, 2013; Zeng et al., 2015). As megaprojects increase their efforts in environmental management, the key challenge is to translate formal project policies into innovative and spontaneous individual initiatives (Locatelli et al., 2017b; Maier and Branzei, 2014). Where individual involvement is insufficient, the application of environmental management policies and systems tends to be disconnected from daily activities and to be implemented symbolically rather than substantively (Boiral et al., 2016).

1.1 OCBEs in megaproject

Boiral (2009) defined organizational citizenship behaviors for the environment (OCBEs) as comprising “*individual, voluntary, and discretionary social behaviors that are not explicitly recognized by the formal management system and that contribute to effective environmental management by organizations.*” Examples of OCBEs include helping to resolve environmental issues, suggesting solutions aimed at preventing pollution, and collaborating

23 with environmental departments to implement green technologies.

24 The megaproject is an exemplary case of a complex, dynamic, and temporary organization.
25 Compared to “regular projects,” megaprojects have more ambiguous roles and boundaries,
26 and more informal coordination activities between teams (Hanisch and Wald, 2014; Sainati et
27 al., 2017; Van Marrewijk et al., 2008). As a form of innovative and spontaneous initiative that
28 goes beyond the prescribed role requirements (Ekrot et al., 2016), OCBEs are essential to
29 compensate for the limitations of formal management systems in megaprojects (He et al.,
30 2015) and have far-reaching impacts on project success (Braun et al., 2013; Turner and Zolin,
31 2012).

32 The Shanghai World Expo project attached high importance to environmental protection
33 and took a variety of environmentally conscious initiatives (Zhang, 2013). For example, it
34 launched a “golden idea” activity to seek constructive suggestions from project participants
35 and the application of these suggestions played an important role in reducing energy
36 consumption and enhancing environmental protection (He et al., 2015). Astonishingly,
37 although OCBEs have been extensively valued by megaproject management (as in the
38 Shanghai World Expo), this research area remains underdeveloped. Furthermore, the
39 social–psychological mechanisms that lead project participants to engage in OCBEs are as yet
40 largely unexplored.

41 *1.2 Research purpose and question*

42 This paper contributes to megaproject management research by proposing and validating a
43 predictive model for OCBEs. The findings in this paper can serve as a guide for megaproject
44 managers to promote OCBEs and thereby facilitate the improvement of project environmental

45 performance. According to the burgeoning OCBs literature, “if individuals are aware that
46 becoming sustainable is an important objective of their organization and the organization
47 demonstrates an interest in supporting environmental responsibility practices, they may be
48 more prone to reciprocate by performing OCBs” (Paillé and Raineri, 2015; Raineri and
49 Paillé, 2016). Nevertheless, why, how, and under what circumstances organizational
50 environmental responsibility practices lead to individual OCBs remains largely unknown
51 (Paillé et al., 2014; De Roeck and Delobbe, 2012). Environmental commitment refers to a
52 sense of attachment to and identification with the environmental goals and values of an
53 organization, and it serves as a bridge between the organization’s environmental
54 responsibility practices and individual OCBs (Raineri and Paillé, 2016). Therefore, this
55 study empirically investigates the relationships between project participants’ perceptions of
56 megaproject environmental responsibility (MER) practices and their OCBs, considering the
57 mediating effect of their environmental commitment.

58 To date, scholars have explored the contextual antecedents of individual-level OCBs in
59 terms of organizational-level practices, including environmental management practices (Paillé
60 et al., 2013), organization environmental policies (Raineri and Paillé, 2016; Paillé and Raineri,
61 2015), and human resource management (Paillé et al., 2014). The authors leveraged this body
62 of knowledge, along with primary data, to provide guidelines for managing OCBs in
63 megaprojects. To analyze how project-level factors influence individual-level OCBs, this
64 study developed an empirical model in which MER practices were reflected by the
65 perceptions of individual project participants. In the questionnaire survey, only on-site project
66 participants who were directly involved in MER practices were considered as targeted

67 respondents. These respondents were senior and professional individuals (with knowledge of
68 MER practices), including project owners, contractors, and consultants.

69 This paper adopted a stakeholder-oriented conceptualization of MER practices, which
70 refers to “megaproject environmental initiatives taking into account the interests of different
71 stakeholder groups, including governments/owners, non-owner stakeholders (i.e., contractors,
72 consultants, designers, and suppliers), the local community, as well as the general public”
73 (Zeng et al., 2015). MER practices directed toward the four abovementioned stakeholder
74 groups manifest themselves in very different ways. To better explain and predict OCBEs, it is
75 necessary to distinguish how project participants perceive the four types of MER practices.
76 These considerations lead to the following research question:

77 *How do project participants’ perceptions of MER practices directed towards the four*
78 *stakeholder groups affect their environmental commitment and, in turn, their OCBEs?*

79 This paper is organized as follows. Section 2 provides the theoretical foundations and
80 presents the research hypotheses based on a literature review. Section 3 illustrates the research
81 methods and analytical procedures. Section 4 presents the data analysis results. Section 5
82 discusses the research findings and their implications for megaproject environmental
83 management. Section 6 summarizes the key ideas and suggests a research agenda.

84 **2. Theoretical foundation and hypotheses**

85 *2.1. Defining OCBEs in megaprojects*

86 Recent research findings make a convincing case to include voluntary pro-environmental
87 behaviors as part of the “organizational citizenship behaviors” (OCBs) domain—otherwise
88 known as organizational citizenship behaviors for the environment (OCBEs) (Boiral, 2009;

89 Daily et al., 2009; Raineri and Paillé, 2016). Inspired by the taxonomy of OCBs proposed by
90 Organ et al. (2006), Boiral and Paillé (2012) further classified OCBEs into five
91 categories—helping, sportsmanship, organizational loyalty, individual initiative, and
92 self-development. On this basis, the possible applications of OCBEs and their natures in
93 megaprojects are discussed as follows:

94 *Helping* includes altruism with regard to environmental protection and collaboration to
95 promote environmental initiatives. The megaproject is characterized by a high level of
96 uncertainty (Van Marrewijk et al., 2008). It has ambiguous role boundaries and must rely on
97 project participants to make a concerted effort to achieve environmental goals, e.g., helping
98 colleagues to better understand project environmental goals and encouraging them to adopt
99 more environmentally conscious behaviors or to express their ideas and opinions on
100 environmental issues. Consequently, helping behaviors can be viewed as a common
101 cooperative effort to improve the environmental performance of a megaproject (Invernizzi et
102 al., 2016).

103 *Sportsmanship* refers to the tolerance of and positive attitude toward the inconveniences
104 and additional work that can be associated with environmental practices, e.g., willingness to
105 make time to support the project environmental department when unexpected environmental
106 problems occur (e.g., extreme climate events). Megaprojects are carried out under conditions
107 of high complexities (Locatelli et al., 2014) and face huge environmental risks (Flyvbjerg et
108 al., 2003). Considering the complexity and diversity of the environmental problems in
109 megaprojects (Zeng et al., 2015), addressing these problems requires not only a rapid
110 response by the project environmental department, but also the prompt assistance of project

111 participants working in other departments (e.g., safety, quality, and labor departments).

112 *Organizational loyalty* means the day-to-day adherence to environmental policies and goals,
113 e.g., voluntary compliance with the formal and informal (i.e., both stated and unwritten)
114 project environmental policies and procedures. Megaprojects bring together differing and
115 competing stakeholders, interests, and values (Locatelli and Mancini, 2012a; Ruuska et al.,
116 2011; Van Marrewijk et al., 2008). More often than not, the success of environmental
117 management practices is based on the discretionary adherence of multi-stakeholders to the
118 overarching environmental goals (Daily et al., 2009).

119 *Individual initiative* is based on personal involvement and participation in environmental
120 activities, e.g., making suggestions to minimize construction wastes and providing early
121 warnings to prevent on-site pollution accidents. Creativity is perceived to be an essential
122 ingredient for ensuring the success of a megaproject (Maier and Branzei, 2014). The goal of
123 this dimension is to facilitate the improvement of overall environmental performance by
124 stimulating the proactive and innovative initiatives of project participants.

125 *Self-development* involves the development of personal knowledge with respect to
126 environmental protection. The roles of knowledge transfer and self-learning have been
127 recognized as crucial for improving organizational adaptabilities, especially in complex
128 megaprojects (Van Marrewijk et al., 2008). There are two approaches to
129 self-development—active participation in project training programs (e.g., environmental
130 protection lectures) and the effective acquisition of environmental information through
131 self-learning during the course of daily work activities.

132 *2.2. The relationship between environmental commitment and OCBEs*

133 According to Meyer and Herscovitch (2001), environmental commitment is a frame of
134 mind that denotes a sense of both attachment and responsibility to the environmental targets
135 of an organization. Through the lenses of reasoned action theory (Ajzen and Fishbein, 1980)
136 and value–belief–norm theory (Stern et al., 1999), specific attitudes that are either
137 context-dependent or have behavioral direction are more likely to be enacted and reified
138 (Raineri and Paillé, 2016). With the growing concern about environmental issues, the positive
139 environmental performance of a megaproject may lead project participants to feel increased
140 levels of self-esteem and to recognize the environmental values of the project in which they
141 play a part. The environmental commitment engendered by project environmental practices
142 can make participants feel that they share environmental values with other project participants.
143 As such, they are more likely to engage in discretionary extra-role behaviors (e.g., OCBEs)
144 that benefit other project participants. In addition, they may tend to devote additional efforts
145 to meeting the environmental goals of the project. Based on the above, the following
146 hypothesis is proposed:

147 **H1.** The environmental commitment of project participants is positively related to their
148 OCBEs.

149 *2.3. Impact of project participant perceptions of MER practices on their*
150 *environmental commitment and OCBEs*

151 *2.3.1 Taxonomy of MER practices*

152 Environmental responsibility, an important and distinct component of corporate social
153 responsibility (CSR), is typically seen as a set of environment-friendly practices intended to

154 positively affect stakeholders (Rahman and Post, 2012). The stakeholders of a megaproject
155 are those who affect or are affected by project practices, including both *internal* stakeholders
156 (i.e., owners/governments, contractors, consultants, designers, and suppliers) and *external*
157 stakeholders (i.e., the local community and general public) (Zeng et al., 2015).

158 Considering the differences between project roles, *internal* stakeholders can be further
159 divided into two types: 1) governments (i.e., regulators and owners) and 2) non-owner
160 stakeholders (i.e., contractors, consultants, designers, and suppliers). Governments, which
161 typically initiate megaprojects, play a dual role that incorporates supervision (in terms of laws
162 and regulations) and participation (in terms of project contracts). In contrast, contractors,
163 consultants, designers, and suppliers are linked only through project contracts. Similarly,
164 *external* stakeholders can also be classified into two categories: 1) the local community and 2)
165 the general public (Zeng et al, 2015). The local community is directly affected by the
166 implementation process of megaprojects, e.g., land expropriation, housing demolition, as well
167 as changes in property values and living environments. Apart from the local community, other
168 external stakeholders are included in the general public category.

169 Through the lens of social identity theory (SIT), membership in different social categories
170 is considered to convey social identity that defines one's attributes as a member of that group
171 (Ashforth and Mael, 1989). Specifically, one's social identity provides benchmarks by which
172 people can know what they should feel and think, as well as how they should behave. The
173 term corporate organization can be viewed as a social categorization (Turker, 2009b).
174 According to Newman et al. (2015), when employees view their organization as socially
175 responsible, organizational identification processes will promote extra-role behaviors that

176 augment the employer's CSR practices. With respect to a megaproject, the project-based
177 organization serves as a social categorization of its participants. According to SIT, and in
178 combination with insights from Newman et al. (2015), this study argues that project
179 participants' perceptions of MER practices can motivate their engagement in OCBs as a
180 function of project identification processes that promote pride in and attachment to the
181 environmental goals and values of the project. As such, this paper proposes Hypotheses 2, 3,
182 4, and 5 in the next sections.

183 *2.3.2 MER practices directed toward governments*

184 The first group of selected stakeholders is governments. The compliance of a megaproject
185 with the environmental obligations pursuant to laws, regulations, and contracts is likely to be
186 viewed in a positive light. This is due to the megaproject's high degrees of uncertainty and
187 complexity (Van Marrewijk et al., 2008). It is notable that this tendency leads megaproject
188 participants to develop high levels of self-esteem and to identify themselves with the
189 environmental values of the project. According to SIT, and based on insights from the OCBs
190 literature (Carmeli et al., 2007; Newman et al., 2015), MER practices directed toward
191 governments (MER-G) encourage project participants to exert further effort to achieve project
192 environmental goals and to transcend their job roles to assist others whom they perceive as
193 having similar environmental values. On this basis, the following hypotheses are presented:

194 **H2a.** Project participants' perceptions of MER-G are positively related to their environmental
195 commitment.

196 **H2b.** Project participants' perceptions of MER-G are positively related to their OCBs.

197 *2.3.3 MER practices directed toward non-owner stakeholders*

198 Environmental responsibility directed toward non-owner stakeholders, e.g., contractors,
199 consultants, designers, and suppliers, may manifest in a variety of ways. Such manifestations
200 include suitable on-site working and living environments, commitments to justice in dealing
201 with environmental issues, and opportunities for the development of environmental
202 knowledge and skills. When project participants perceive that a megaproject meets their
203 personal environmental needs and those of their colleagues, they are likely to perceive that the
204 megaproject shares environmental values similar to their own. Through the lenses of SIT and
205 the literature on OCBs (Newman et al., 2015; Zhang et al., 2014), MER practices directed
206 toward non-owner stakeholders (MER-N) make project participants more likely to engage in
207 discretionary extra-role behaviors (e.g., OCBEs) that benefit others involved in the project
208 and to exert additional efforts to achieve project environmental goals. Given this finding, the
209 following hypotheses are presented:

210 **H3a.** Project participants' perceptions of MER-N are positively related to their environmental
211 commitment.

212 **H3b.** Project participants' perceptions of MER-N are positively related to their OCBEs.

213 *2.3.4 MER practices directed toward the local community*

214 Megaprojects substantially alter regional ecological environments and local communities
215 are among the first to be affected. Consistent with SIT and previous OCBs research (Bartels et
216 al., 2010; Newman et al., 2015), project participants are likely to show an interest in
217 environmental activities, as well as to identify with the environmental values of the project, if
218 the megaproject receives positive feedback from the local community regarding its

219 environmental practices. Therefore, MER practices directed toward the local community
220 (MER-L) are likely to foster feelings of a shared environmental commitment and
221 responsibility on the part of project participants, thereby leading them to exert additional
222 effort to meet project environmental goals, perform at a high level, and engage in
223 discretionary OCBs. All of the above reasoning suggests the following hypotheses:

224 **H4a.** Project participants' perceptions of MER-L are positively related to their environmental
225 commitment.

226 **H4b.** Project participants' perceptions of MER-L are positively related to their OCBs.

227 *2.3.5 MER practices directed toward the general public*

228 Environmental responsibility directed toward the general public refers to the eco-friendly
229 philosophy of megaproject managers and their targeted measures for secondary (i.e., indirect
230 and external) stakeholders. Based on SIT and the OCBs literature (Bartels et al., 2010;
231 Newman et al., 2015), when a megaproject undertakes environmental measures that benefit
232 the whole society (even at the risk of budget overruns or schedule delays), this tends to build a
233 sense of environmental commitment on the part of project participants via identification with
234 and adherence to the environmental goals of the project. Moreover, this outcome may lead to
235 the project participants and their colleagues feeling that they possess similar attributes and
236 shared values. Rather than simply focusing on achieving their own goals, MER practices
237 directed toward the general public (MER-P) cause project participants to be more likely to
238 engage in risky discretionary behaviors that benefit others (e.g., OCBs). Thus, the following
239 hypotheses are developed:

240 **H5a.** Project participants' perceptions of MER-P are positively related to their environmental

241 commitment.

242 **H5b.** Project participants' perceptions of MER-P are positively related to their OCBEs.

243 *2.4. Control variables*

244 To isolate the variations within the organizational and project contexts (Cao et al., 2017),
245 four control variables were included in the analysis of the relationships between project
246 participants' perceptions of MER practices and their OCBEs. As the first control variable,
247 project role was operationalized as a dummy variable reflecting whether or not the surveyed
248 respondents were owners (0 = yes; 1 = no). With regard to the remaining three control
249 variables, project size was measured by the investment value of the surveyed project (1 =
250 below CNY 500 million; 2 = between CNY 500 and 1000 million; 3 = between CNY 1000
251 and 5000 million; 4 = between CNY 5000 and 10000 million; 5 = above CNY 10000 million);
252 project type was measured as a dummy variable indicating whether or not the surveyed
253 project is a basic infrastructure (0 = basic infrastructure; 1 = non-basic infrastructure);¹ and
254 project duration was measured by the construction period of the surveyed project (1 = less
255 than 24 months; 2 = between 24 and 36 months; 3 = between 36 and 48 months; 4 = between
256 48 and 60 months; 5 = more than 60 months).

257 **3. Research methods**

258 *3.1. Questionnaire design*

259 This study used a questionnaire survey to collect primary data. This questionnaire was
260 designed and developed with the support of literature reviews, project observations, and

¹ Basic infrastructures refer to energy, transportation, and communications projects that provide fundamental and essential services for social production and everyday life. Non-basic infrastructural megaprojects, e.g., skyscrapers, exhibition facilities, and industrial parks, provide specialized value-added services for culture, business, and so on.

261 semi-structured explorative interviews conducted prior to the survey.²

262 The construct environmental responsibility is derived from CSR to reflect an organization's
263 social performance in dealing with environmental issues. As such, the environmental
264 responsibility section of the questionnaire was initially adapted from CSR measurement items
265 (Turker, 2009a). This kind of measurement adaptations has been validated over a large
266 spectrum of organizations and industries (De Roeck and Delobbe, 2012; Ho et al., 2012;
267 Sparks et al., 2013).

268 In this study, environmental responsibility items with respect to the general public
269 (including NGOs), the local community, non-owner stakeholders, and governments were
270 adapted based on CSR constructs related to society, customers,³ employees, and the
271 government, respectively. All 18 related measurement items in Turker's (2009a) CSR scale
272 were modified to suit the environmental management perspective in the megaproject context.
273 Moreover, these items were further refined and validated through a series of interviews with
274 researchers and practitioners who have extensive experiences in megaproject management.

275 With respect to environmental commitment (EC), seven measurement items were adapted
276 from Raineri and Paillé (2016) to reflect project participants' sense of attachment to
277 environmental concerns in the megaproject. As for OCBs, seven measurement items
278 developed by Boiral and Paillé (2012) were used to reflect how project participants initiated
279 innovative and spontaneous behaviors directed at environmental improvement. All the
280 OCBs items were integrated into a construct to better understand the relationships between

² The four interviewed project managers from a large construction consulting corporation have engaged in several influential megaprojects in China, e.g., Shanghai World Expo, Shanghai Disney Resort, and Suzhou–Nantong Bridge. The two interviewed professors from Tongji University have conducted megaproject research for over 15 years.

³ Construction projects are typically operated through the “production-to-order” system, with the aim to meet the demands of clients (Cao et al., 2014). Local communities are the primary users of megaprojects and play a role analogous to that of “customers” who are directly affected by the “product” (i.e., the megaproject).

281 project participants' perceptions of MER practices and their overall OCBEs performance.

282 The measurement items developed by Raineri and Paillé (2016) and Boiral and Paillé (2012)
283 were selected in this study because they are relatively general and therefore applicable to a
284 variety of organizations, activity sectors, occupations, and/or circumstances. Similarly, EC
285 and OCBEs items were also refined and contextualized after the rounds of interviews.

286 All the abovementioned variables were operationalized as reflective constructs. Appendix
287 A shows the measurement items in detail. These measurement items were rated on a
288 five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Although the
289 questionnaire was originally developed in English, it was subsequently translated into Chinese
290 to facilitate the respondents' comprehension. This study employed the back-translation
291 technique to establish linguistic equivalence between the two versions.

292 *3.2. Participants and procedures*

293 A pre-test involving 23 megaproject professionals⁴ was conducted to identify ambiguous
294 expressions and to test the validity of the related constructs in the questionnaire. In view of
295 the feedback from those pre-test respondents, the questionnaire was further revised. For
296 example, the expression "environmental impacts" in the environmental responsibility item
297 "Our project implements green and low-carbon technologies to mitigate the environmental
298 impacts" was rephrased to "negative environmental impacts" in the questionnaire.

299 The survey was conducted from November 2015 to March 2016 in China. After contacting
300 the megaproject owners,⁵ the project departments and participants involved in MER practices
301 were preliminarily identified for this survey. There was a short communication prior to the

⁴ The 23 pre-test respondents were senior and professional individuals with jobs related to construction environmental management (e.g., environmental training and supervision). They were familiar with environmental codes, laws, and project policies; and all had more than five years of experiences in megaproject management.

⁵ Megaproject owners refer to project-specific owner companies, e.g., Shanghai World Expo (Group) Co., Ltd.

302 formal questionnaire survey. The respondents were informed of the survey purpose, assured
303 of the data confidentiality, and offered small gifts⁶ for completing the questionnaire.

304 With the support of the megaproject owners, the questionnaire was distributed to the
305 targeted respondents. To improve the representativeness of the surveyed samples, this study
306 distributed the questionnaire to respondents from different megaprojects and to those who had
307 assumed different roles in MER practices. In this survey, respondents were asked to complete
308 the questionnaire based on their most recently experienced megaproject. In consequence,
309 respondents provided a relatively clear description of the projects' environmental practices
310 and thereby avoided preferentially selecting their most successful experience with
311 environmental protection, which ultimately reduced the risk of socially desirable responding
312 (SDR). According to Milfont (2009), SDR has little impact on the way people answer
313 questions related to their environmental attitudes and ecological behaviors in anonymous
314 questionnaires. For these reasons, SDR effect is limited in this survey.

315 In addition, to further determine the respondents' perceptions of their projects'
316 environmental practices, this survey included the question "Are you familiar with the
317 project's environmental policies and measures?," with the options of "Yes," "No," or
318 "Unsure." The inclusion of the "Unsure" option was based on the work of Norton et al. (2014)
319 to prevent respondents from having to make a forced-choice response. Finally, only the
320 respondents who provided a conclusive answer of "Yes" were retained, while the "No" or
321 "Unsure" answers were discarded as invalid responses. After omitting invalid responses and
322 deleting outliers, a total of 172 completed questionnaires were ultimately included in the

⁶ Each of the participants was given a set of souvenirs (i.e., notepad, gel pen, and bookmark) with the Tongji logo or a cash gift through WeChat.

323 subsequent analysis. Of the 172 respondents, 58 (33.72%) were senior managers (i.e., project
324 managers), 70 (40.70%) were middle managers (i.e., department managers and professional
325 executives), and 44 (25.58%) worked at the operational level (i.e., project engineers).

326 Table 1 shows the demographic characteristics of the surveyed projects and associated
327 respondents. Of the 172 valid responses, 41.28% were collected via on-site visits and the
328 remaining 36.63% and 22.09% were collected via a survey system (<http://www.sojump.com>)
329 and e-mails, respectively. An analysis of variance (ANOVA)⁷ indicates that no statistically
330 significant differences exist in the answers from the three response groups (p-values ranged
331 from 0.118 to 0.861).

332 <Insert Table 1>

333 *3.3. Tools for data analysis*

334 In this study, factor analysis (FA) was used to analyze the collected primary data. FA has
335 been extensively adopted as an effective statistical technique for identifying individual factors
336 that represent sets of interrelated variables (Hon et al., 2013). Exploratory FA with principal
337 component analysis (PCA) makes it possible to identify the underlying grouped factors and to
338 condense the measurement items (He et al., 2016).

339 To test the hypotheses proposed in Section 2, partial least squares (PLS) technique was
340 employed to develop an estimation method for analyzing the path model (Fig. 1). PLS is a
341 technique that combines PCA, path analysis, and regression to simultaneously estimate
342 multiple dependent variables in a single structural equation model (Ringle et al., 2012).

343 Of the two structural equation modeling (SEM) approaches, the PLS-SEM was chosen over

⁷ANOVA tests were conducted on the three response groups (on-site visits, survey system, and e-mail); the p-values for MER-P, MER-L, MER-N, MER-G, EC, and OCBs are 0.643, 0.118, 0.861, 0.431, 0.256, and 0.601, respectively.

344 the covariance-based SEM method due to the following reasons: (1) it is distribution-free and
345 thus suitable for data from perception-based measurement items of unknown distributions
346 (Aibinu and Al-Lawati, 2010); (2) it works efficiently with small sample sizes (Hair et al.,
347 2014), whereas covariance-based SEM considers 200 to be the critical sample size for
348 accurate assessments of model fits (Hoelter, 1983); (3) it avoids factor indeterminacy by
349 estimating constructs as exact linear combinations of the measurement items (Hair et al.,
350 2011); and (4) it is most appropriately applied in early-stage theory development and testing
351 (Astrachan et al., 2014), which fits well with the exploratory nature of this study. Indeed,
352 PLS-SEM has enjoyed steady popularity as a key multivariate analysis method in the study of
353 cooperative behaviors (Aibinu et al., 2008), relational behaviors (Ning and Ling, 2013),
354 environmental behaviors (Yusof et al., 2016), and organizational citizenship behaviors (Lim
355 and Loosemore, 2017) in construction projects.

356 **4. Data analysis and results**

357 *4.1. Factor analysis*

358 In this study, FA was employed to investigate 18 items related to MER practices. The
359 Kaiser–Meyer–Olkin (KMO) value is $0.927 > 0.6$, thereby indicating excellent sample
360 adequacy (Field, 2009). In addition, Bartlett’s test of sphericity (BTS) produced an
361 approximation of $\chi^2 = 2131.110$ ($df = 153$, $p = 0.000 < 0.001$), which suggests that the
362 correlations between variables are sufficiently strong to conduct PCA (George, 2003). As
363 expected, the FA analysis extracted four factors reflecting the MER-P, MER-L, MER-N, and
364 MER-G constructs. Table 2 shows that the rotated loadings of the manifest items with regard
365 to their intended constructs are all above the recommended threshold of 0.5 and are greater

366 than the loadings on other constructs. These results validate the appropriateness of using the
367 18 listed MER items to reflect the four proposed constructs. Similarly, FA procedures were
368 also applied to extract measurement items for EC and OCBEs. And no EC or OCBEs items
369 were removed from the measurement model.

370 <Insert Table 2>

371 4.2. *Evaluation of the measurement models*

372 The validity of all measurements was further assessed in terms of internal consistency,
373 convergent validity, and discriminant validity. Internal consistency was assessed by
374 estimating the composite reliability. Table 3 shows that the composite reliability values are all
375 greater than 0.7, thereby indicating a satisfactory reliability level of the internal indicators for
376 each construct (Hair et al., 2011). Convergent validity measures the extent to which the items
377 underlying a particular construct actually represent this conceptual variable. Initial evidence
378 of convergent validity was reflected by the values of the average variance extracted (AVE).
379 Table 3 shows that the AVE values are all greater than 0.5, thereby suggesting a satisfactory
380 level of convergent validity of the constructs (Hair et al., 2011). Further evidence of
381 convergent validity was provided by the factor loadings of each measurement item. The
382 standardized factor loadings of all the respective constructs of the items are above the
383 threshold of 0.7 and there was no evidence of any cross-loading problem (Table 4). In
384 addition, the square roots of AVE (i.e., values on the diagonal of the correlation matrix in
385 Table 3) are all greater than the absolute value of the inter-construct correlations (i.e.,
386 off-diagonal values), which indicates that the constructs have satisfactory discriminant
387 validity.

388 <Insert Table 3>

389 <Insert Table 4>

390 Harman's single-factor test was used to analyze the possibility of common method bias.
391 The test results reveal no single dominant factor, with the largest factor accounting for only
392 14.72%⁸ of the total measurement variances. Therefore, common method bias is limited in
393 this survey.

394 *4.3 Comparative analysis*

395 The respondents had a mix of project roles, including 41.86% project owners, 35.47%
396 contractors, and 22.67% consultants (Table 1). Compared with project owners and consultants,
397 contractors had more direct experiences in the implementation of project environmental
398 initiatives and provided more positive feedback on MER practices, as shown in Table 5.
399 However, ANOVA test results indicate that none of these differences are statistically
400 significant at the 5% level (p-values range from 0.125 to 0.758). Furthermore, the ANOVA
401 test for OCBEs reveals no significant difference in environmental-behavior-related decision
402 making between project owners, contractors, and consultants. All these results provide
403 evidence that differences in project roles have insignificant impacts on the surveyed
404 respondents' perceptions of MER practices and their OCBE performance.

405 <Insert Table 5>

406 *4.4 Hypothesis testing and results analysis*

407 To compute standard errors and test the statistical significance of the path coefficients, a
408 bootstrapping procedure with 5,000 resamples was performed (Fig. 1). The R² value of the

⁸ Harman's one-factor test was performed for both independent and dependent variables (MER-P, MER-L, MER-N, MER-G, EC, and OCBEs) and for four control variables. The five largest factors account for 14.72%, 13.25%, 12.92%, 12.25%, and 7.76% of the total variances.

409 dependent variable (i.e., OCBEs) is 0.459, thereby suggesting that most of the variances in the
410 construct are explained by the research model. Figure 1 shows that the influence of EC on
411 OCBEs is significant ($\beta = 0.239$, $p < 0.01$); thus, Hypothesis 1 is supported. The results of the
412 bootstrapping analysis also indicate that the MER-G–EC link ($\beta = 0.158$, $p < 0.05$),
413 MER-N–EC link ($\beta = 0.349$, $p < 0.001$), MER-L–EC link ($\beta = 0.175$, $p < 0.01$), and
414 MER-P–EC link ($\beta = 0.233$, $p < 0.01$) are all significant, thereby providing evidence
415 supporting Hypotheses 2a, 3a, 4a, and 5a, respectively.

416 <Insert Fig. 1>

417 Regarding the relationships between MER practices and OCBEs, only the influences of
418 project participants' perceptions of MER practices directed toward *internal* stakeholders (i.e.,
419 MER-G and MER-N) are found to be significant when the effect of EC is included ($\beta = 0.181$,
420 $p < 0.05$; $\beta = 0.218$, $p < 0.05$). Thus, Hypotheses 2b and 3b are supported. Together with the
421 significant links between MER-G and EC and between EC and OCBEs, this finding further
422 indicates that the influence of MER-G on OCBEs is partially mediated by EC. A similar
423 conclusion is also reached for MER-N.

424 To further investigate the effects of project participants' perceptions of MER practices on
425 their OCBEs, an alternative model without the mediator was tested. Figure 2 presents the PLS
426 analysis results for the alternative research model. Although the intermediating effect of EC is
427 excluded, the direct influences of MER-L and MER-P on OCBEs are still insignificant.
428 Therefore, Hypotheses 4b and 5b are not supported by the data. In addition, with regard to the
429 control variables, project duration, project type, project role, and project size, all exert
430 insignificant influences on OCBEs in both models.

431 <Insert Fig. 2>

432 **5. Discussion and implications**

433 *5.1 Discussion of findings*

434 Currently, unprecedented levels of urbanization have led to massive government-financed
435 megaprojects in China. With the emergence of newly built, restructured, or expanded
436 megaprojects, environmental issues have become increasingly prominent and have aroused
437 considerable concerns among megaprojects managers. The success of megaproject
438 environmental management lies in the willingness of project participants to support
439 continuous change and take responsibility for environmental protection on a discretionary
440 basis. Therefore, OCBEs play an important role in improving the efficiency of megaproject
441 environmental practices, specifically through the development of preventive approaches that
442 call for the voluntary commitment of project participants to environmental protection.

443 Different types of environmental responsibility practices affect OCBEs differently. The
444 project participants' perceptions of MER-N emerge as the principal predictor of their OCBEs,
445 with a path coefficient of 0.292 (Fig. 2). Such a strong link between MER-N and OCBEs was
446 expected at the beginning of the survey, because the related items are all closely connected
447 with the respondents' rights and interests, e.g., working conditions, training opportunities, and
448 procedural equalities. According to Maslow's hierarchy of needs, the MER-N practices in
449 megaprojects fill a high-order need for individual self-actualization. Establishing
450 environmental management systems (e.g., ISO 14000) and introducing green technologies
451 have become increasingly popular in megaprojects, whereas there are few incentives for
452 megaprojects to invest in "soft areas" (i.e., human considerations). The empirical results of

453 the current study provide evidence that MER-N practices are perhaps implemented to reap
454 organizational rewards for promoting project participants' OCBs. Although the initial
455 investments in human capital and training may be unattractive to megaproject managers,
456 continuous MER-N efforts are likely to pay off over the long term by eliciting high levels of
457 EC among project participants.

458 Project participants' perceptions of MER-G emerge as the second principal predictor of
459 their OCBs, with a path coefficient of 0.222 (Fig. 2). Interestingly, the effect of MER-G on
460 EC and OCBs is inconsistent with the findings of previous research. In particular, Turker
461 (2009b) determined that employees' perceptions of CSR practices directed toward
462 governments are insignificant factors affecting their organizational commitment. Meanwhile,
463 Newman et al. (2015) argued that employees' perceptions of CSR practices directed toward
464 governments do not result in high levels of OCBs. The findings of the current study may be
465 explained by the dual governmental roles. In China, most megaprojects are initiated by the
466 central or local governments while also involving environmental supervisory departments
467 (e.g., the Ministry of Environmental Protection) (Zeng et al., 2015). Therefore, governments
468 have partially achieved a role transition in megaprojects from external supervisors to internal
469 stakeholders (i.e., owners). MER-G practices are expected to meet both the legal requirements
470 of regulators and the contractual agreements with owners. Megaprojects in China that perform
471 MER-G practices are likely to be considered significant endeavors due to the complexity and
472 diversity of the environmental issues. This perspective might lead project participants who
473 work for such megaprojects to develop high levels of self-esteem and to identify with the
474 environmental values of the project.

475 Project participants' perceptions of MER-L and MER-P represent the least significant set of
476 predictors of their OCBEs. Interestingly, the effects of MER-L and MER-P on OCBEs, as
477 determined in this study, also differ from those of prior empirical studies. As noted by
478 Newman (2015), employees' perceptions of CSR directed toward social and nonsocial
479 stakeholders (e.g., the local environment and general public) strongly influenced their OCBEs.
480 The results of the current study may be related to the essential mission of megaprojects.
481 Megaprojects are committed to providing fundamental public services that benefit local
482 communities and, consequently, the country in general. The ecological protection of the local
483 natural environment is the primary objective of megaprojects. Thus, the more the project
484 participants take MER-P or MER-L for granted, the more ineffective they will perceive it to
485 be. This perspective might lead project participants to respond less positively to MER-P or
486 MER-L than to MER-G and MER-N practices.

487 Although MER-P and MER-L practices have received considerable attention, megaprojects
488 have not demonstrated ideal environmental performance. In the course of preliminary
489 interviews with megaproject managers, several interviewees were skeptical about the real
490 effectiveness of MER-P and MER-L practices. Some MER-P and MER-L practices are little
491 more than environmental slogans and have yet to achieve their expected goals. For example,
492 an interviewee with more than 15 years of experience in managing megaprojects indicated
493 that "*a substantial part of the MER-P and MER-L practices are more often established to*
494 *gain a better social reputation rather than to improve actual environmental performance or*
495 *project participants' environmental skills*"—otherwise known as "green-washing." In this
496 regard, "green-washing" appears to be the external projection of a positive image of a

497 megaproject that is not reflected in its internal initiatives regarding environmental issues
498 (Testa et al., 2015). On this basis, a megaproject's MER-P and MER-L practices are unlikely
499 to engender high levels of project identification or to subsequently affect OCBEs.

500 5.2. Implications

501 This study makes several contributions to the fields of megaproject management,
502 environmental responsibility, and OCBs. First, it extends previous research on the
503 environmental citizenship in permanent corporate organizations and the OCBs in temporary
504 project organizations by providing further insights into the mechanisms underlying project
505 participants' willingness to sustain and support the environmental efforts of megaprojects.

506 Although most previous studies have tended to consider environmental responsibility, the
507 current study shows that MER practices directed toward the four groups of stakeholders
508 account for the unique variance at the EC level, thereby affecting OCBEs differently. The
509 analysis of empirical data supports the claim of Raineri and Paillé (2016) that EC plays a
510 pivotal role in connecting organizational environmental practices with OCBEs. However, this
511 study indicates that OCBEs are only positively related to project participants' perceptions of
512 MER practices directed toward *internal* stakeholders, whereas these behaviors have no
513 significant association with MER practices directed toward *external* stakeholders.

514 Slogan propaganda, which highlights concerns related to the local community and general
515 public, is often posited as an effective approach for enhancing individual awareness of
516 environmental issues and promoting their participation in environmental protection. Although
517 the findings of the current study confirm this key role, macro-policy advocacy is insufficient
518 for encouraging the pro-environmental behaviors of project participants. Megaproject

519 managers should be aware of the priority to improve MER practices directed toward *internal*
520 stakeholders. They should also provide project participants with increased opportunities to
521 access environmental training and to obtain equal rights in expressing environmental appeals.
522 MER practices directed toward *external* stakeholders have often been described as “a means
523 of increasing social reputation” in megaprojects. In the implementation process of project
524 environmental policies, establishing clear goals and supportive measures is a method by
525 which to avoid confusion on the part of project participants regarding the goal of MER
526 practices. Initiatives aimed at improving environmental performance should be accompanied
527 by effective internal communication and project participants’ involvement in environmental
528 practices to ensure their positive perceptions of MER practices.

529 Secondly, this study is novel as it investigated how the principal dimensions of OCBs could
530 be applied to the environmental practices of megaprojects. Successful environmental practices
531 are linked with the input of a multitude of social, economic, and technical elements that
532 cannot be entirely covered by prescribed tasks (Locatelli and Mancini, 2012b). Daily et al.
533 (2009) indicated that the success of environmental practices may hinge on individual
534 behaviors that are beyond the scope of formal contractual systems. Therefore, extra-role
535 OCBs are necessary to promote the implementation of formal management systems and to
536 compensate for their deficiencies, facilitate tacit knowledge sharing, and stimulate
537 collaboration in dealing with environmental issues (Boiral, 2009). OCBs do not
538 underestimate the value of formal management practices or undermine the establishment of
539 considerably robust management systems, but can co-exist with formal environmental
540 methods. Building an integrated and reasonable system of rewards and punishments that go

541 beyond contractual agreement is necessary to encourage the emergence of OCBEs.

542 **6. Conclusions**

543 OCBEs are constituted by individual, informal, and discretionary behaviors that contribute
544 greatly to the efficiency of environmental practices. Prior studies on environmental
545 management have overlooked the key role of OCBEs in megaprojects. However, megaproject
546 managers have realized their importance in dealing with the increasing challenges of
547 environmental management, e.g., the complexity of environmental issues, the deficiencies of
548 formal management systems, the need to consider tacit knowledge, the significance of helping
549 relationships, and the promotion of the environmental legitimacy of projects. Under the
550 increasing pressures to ensure environmental protection, project participants become
551 considerably aware of environmental issues during the implementation of megaprojects. The
552 research presented in this paper takes an SIT perspective and addresses how project
553 participants' perceptions of MER practices directed toward four stakeholder groups influence
554 their EC and OCBEs.

555 The strong link between project participants' perceptions of MER practices and their EC
556 indicates that investments in environmental responsibility practices, particularly those
557 directed toward *internal* stakeholders, yield significant benefits. This paper also clarifies how
558 MER practices directed toward the four stakeholder groups could be used to effectively
559 stimulate the emergence of OCBEs in megaprojects. If they are to foster the widespread
560 "buy-in" of project participants, MER practices should be genuine (i.e., internalization) as
561 opposed to symbolic (i.e., "green-washing"). With this perspective, internalization refers to
562 the substantive rather than superficial integration of specific practices and principles proposed

563 by MER in daily project activities.

564 Despite its valid contributions, this study has limitations and open questions that call for
565 future research. Firstly, this study focused on China's megaprojects. Although some of these
566 are international megaprojects (e.g., Shanghai World Expo and Shanghai Disney Resort), this
567 sampling technique limits the generalizability of research findings with respect to other
568 geographic contexts. Considerable variance in terms of MER practices in different
569 geographical contexts might amplify the significance of research findings.

570 Secondly, after analyzing the social-psychological processes (i.e., antecedents) leading
571 project participants to engage in OCBs, a natural extension of the current study would be to
572 investigate the consequences (or impacts) of OCBs. Specifically, future studies could
573 address how different OCBs categories at the project-level—including helping,
574 sportsmanship, organizational loyalty, organizational compliance, individual initiative, and
575 self-development—make an impact on project environmental performances.

576 Thirdly, leadership has been recognized as one of the most critical factors influencing the
577 emergence of OCBs. However, it remains unclear which leadership styles are most suitable
578 in fostering project participants' OCBs. Future research could explore these relationships
579 and bridge the gap between emerging OCB research and more established literature based
580 on leadership theory (e.g., transformational and transactional leadership) and environmental
581 management.

582 **Conflict of interest**

583 There is no conflict of interest.

584 **Acknowledgments**

585 This work was supported by the National Natural Science Foundation of China (Project No.:
586 71571137, 71471136 and 71390523) and the International Exchange Program for Graduate
587 Students of Tongji University. The authors are very grateful to the anonymous referees that
588 provide valuable suggestions. The authors are also grateful to Yongkui Li, Yujie Lu, Jianxun
589 Xie, Lan Luo, Shuang Dong, Ju Bai, Delei Yang, Zhen Chen, Dongping Cao, Diletta Colette
590 Invernizzi, Yanhong Ma, and Pei Tong for their comments on the preliminary versions of this
591 paper.

592 **Reference**

- 593 Aibinu, A. A., Ofori, G., & Ling, F. Y., 2008. Explaining cooperative behavior in building and civil
594 engineering projects' claims process: Interactive effects of outcome favorability and procedural
595 fairness. *Journal of Construction Engineering and Management*, 134 (9), 681-691.
- 596 Aibinu, A. A., & Al-Lawati, A. M., 2010. Using PLS-SEM technique to model construction
597 organizations' willingness to participate in e-bidding. *Automation in Construction*, 19(6), 714-724.
- 598 Ajzen, I., & Fishbein, M., 1980. *Understanding attitudes and predicting social behaviour*. Prentice-Hall,
599 Englewood Cliffs, New Jersey.
- 600 Ashforth, B. E., & Mael, F., 1989. Social identity theory and the organization. *Academy of*
601 *Management Review*, 14(1), 20-39.
- 602 Astrachan, C. B., Patel, V. K., & Wanzenried, G., 2014. A comparative study of CB-SEM and
603 PLS-SEM for theory development in family firm research. *Journal of Family Business Strategy*, 5(1),
604 116-128.
- 605 Bartels, J., Peters, O., de Jong, M., Pruyn, A., & van der Molen, M., 2010. Horizontal and vertical
606 communication as determinants of professional and organisational identification. *Personnel Review*,
607 39(2), 210-226.
- 608 Boiral, O., 2009. Greening the corporation through organizational citizenship behaviors. *Journal of*
609 *Business Ethics*, 87(2), 221-236.
- 610 Boiral, O., & Paillé, P., 2012. Organizational citizenship behaviour for the environment: Measurement

611 and validation. *Journal of Business Ethics*, 109(4), 431-445.

612 Boiral, O., Talbot, D., & Paillé, P., 2015. Leading by example: A model of organizational citizenship
613 behavior for the environment. *Business Strategy and the Environment*, 24(6), 532-550.

614 Boiral, O., Raineri, N., & Talbot, D., 2016. Managers' Citizenship Behaviors for the Environment: A
615 Developmental Perspective. *Journal of Business Ethics*, 1-15.

616 Braun, T., Ferreira, A. I., & Sydow, J., 2013. Citizenship behavior and effectiveness in temporary
617 organizations. *International Journal of Project Management*, 31(6), 862-876.

618 Brookes, N. J., & Locatelli, G., 2015. Power plants as megaprojects: Using empirics to shape policy,
619 planning, and construction management. *Utilities Policy*, 36, 57-66.

620 Cao, D., Li, H., & Wang, G., 2014. Impacts of isomorphic pressures on BIM adoption in construction
621 projects. *Journal of Construction Engineering and Management*, 140(12), 04014056.

622 Cao, D., Li, H., Wang, G., & Huang, T., 2017. Identifying and contextualising the motivations for BIM
623 implementation in construction projects: An empirical study in China. *International Journal of Project*
624 *Management*, 35(4), 658-669.

625 Daily, B. F., Bishop, J. W., & Govindarajulu, N., 2009. A conceptual model for organizational
626 citizenship behavior directed toward the environment. *Business & Society*, 48(2), 243-256.

627 Carmeli, A., Gilat, G., & Waldman, D. A., 2007. The role of perceived organizational performance in
628 organizational identification, adjustment and job performance. *Journal of Management Studies*, 44(6),
629 972-992.

630 De Roeck, K., & Delobbe, N., 2012. Do environmental CSR initiatives serve organizations' legitimacy
631 in the oil industry? Exploring employees' reactions through organizational identification theory.
632 *Journal of Business Ethics*, 110(4), 397-412.

633 Ekrot, B., Rank, J., & Gemünden, H. G., 2016. Antecedents of project managers' voice behavior: The
634 moderating effect of organization-based self-esteem and affective organizational commitment.
635 *International Journal of Project Management*, 34(6), 1028-1042.

636 Field, A., 2009. *Discovering statistics using SPSS*. Sage, London.

637 Flyvbjerg, B., Bruzelius, N., & Rothengatter, W., 2003. *Megaprojects and risk: An anatomy of*
638 *ambition*. Cambridge University Press, Cambridge.

639 Flyvbjerg, B., 2014. What you should know about megaprojects and why: An overview. *Project*
640 *Management Journal*, 45(2), 6-19.

641 George, D., 2003. SPSS for windows step by step: A simple study guide and reference, 17.0 update,
642 10/e. Pearson Education India, Delhi.

643 Hair, J. F., Ringle, C. M., & Sarstedt, M., 2011. PLS-SEM: Indeed a silver bullet. *Journal of Marketing*
644 *Theory and Practice*, 19(2), 139-152.

645 Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M., 2014. *A Primer on Partial Least Squares*
646 *Structural Equation Modeling (PLS-SEM)*. Sage, Thousand Oaks.

647 Hanisch, B., & Wald, A., 2014. Effects of complexity on the success of temporary organizations:
648 Relationship quality and transparency as substitutes for formal coordination mechanisms. *Scandinavian*
649 *Journal of Management*, 30(2), 197-213.

650 He, Q. H., Yang, D. L., Li, Y. K., & Luo, L., 2015. Research on multidimensional connotations of
651 megaproject construction organization citizenship behavior. *Frontiers of Engineering Management*,
652 2(2), 148-153.

653 He, Q., Dong, S., Rose, T., Li, H., Yin, Q., & Cao, D., 2016. Systematic impact of institutional
654 pressures on safety climate in the construction industry. *Accident Analysis & Prevention*, 93, 230-239.

655 Ho, F. N., Wang, H. M. D., & Vitell, S. J., 2012. A global analysis of corporate social performance:
656 The effects of cultural and geographic environments. *Journal of Business Ethics*, 107(4), 423-433.

657 Hoelter, J. W., 1983. The effects of role evaluation and commitment on identity salience. *Social*
658 *Psychology Quarterly*, 140-147.

659 Hon, C. K. H., Chan, A. P. C., & Yam, M. C. H., 2013. Determining safety climate factors in the repair,
660 maintenance, minor alteration, and addition sector of Hong Kong. *Journal of Construction Engineering*
661 *and Management*, 139(5): 519-528.

662 Invernizzi, D. C., Locatelli, G., & Brookes, N., 2016. Managing social challenges in the nuclear
663 decommissioning industry: a responsible approach towards better performance. *International Journal of*
664 *Project Management*, <http://doi.org/10.1016/j.ijproman.2016.12.002>.

665 Lim, B. T., & Loosemore, M., 2017. The effect of inter-organizational justice perceptions on
666 organizational citizenship behaviors in construction projects. *International Journal of Project*
667 *Management*, 35(2), 95-106.

668 Locatelli, G., & Mancini, M., 2010. Risk management in a mega-project: the Universal EXPO 2015
669 case. *International Journal of Project Organisation and Management*, 2(3), 236-253.

670 Locatelli, G., & Mancini, M., 2012a. Looking back to see the future: Building nuclear power plants in

671 Europe. *Construction Management and Economics*, 30(8), 623-637.

672 Locatelli, G., & Mancini, M., 2012b. A framework for the selection of the right nuclear power plant.
673 *International Journal of Production Research*, 50(17), 4753-4766.

674 Locatelli, G., & Mancini, M., 2013. Sustainability in the power plant choice. *International Journal of*
675 *Business Innovation and Research*, 7(2), 209-227.

676 Locatelli, G., Mancini, M., & Romano, E., 2014. Systems Engineering to improve the governance in
677 complex project environments. *International Journal of Project Management*, 32(8), 1395-1410.

678 Locatelli, G., Mariani, G., Sainati, T., & Greco, M., 2017a. Corruption in public projects and
679 megaprojects: There is an elephant in the room!. *International Journal of Project Management*, 35 (3),
680 252-268.

681 Locatelli, G., Invernizzi, D. C., & Brookes, N. J., 2017b. Project characteristics and performance in
682 Europe: An empirical analysis for large transport infrastructure projects. *Transportation Research Part*
683 *A: Policy and Practice*, 98, 108-122.

684 Maier, E. R., & Branzei, O., 2014. "On time and on budget": Harnessing creativity in large scale
685 projects. *International Journal of Project Management*, 32(7), 1123-1133.

686 Meyer, J. P., & Herscovitch, L., 2001. Commitment in the workplace: Toward a general model. *Human*
687 *Resource Management Review*, 11(3), 299-326.

688 Milfont, T. L., 2009. The effects of social desirability on self-reported environmental attitudes and
689 ecological behaviour. *The Environmentalist*, 29(3), 263-269.

690 Newman, A., Nielsen, I., & Miao, Q., 2015. The impact of employee perceptions of organizational
691 corporate social responsibility practices on job performance and organizational citizenship behavior:
692 Evidence from the Chinese private sector. *International Journal of Human Resource Management*,
693 26(9), 1226-1242.

694 Ning, Y., & Ling, F. Y. Y., 2013. Reducing hindrances to adoption of relational behaviors in public
695 construction projects. *Journal of Construction Engineering and Management*, 139(11), 04013017.

696 Norton, T. A., Zacher, H., & Ashkanasy, N. M., 2014. Organisational sustainability policies and
697 employee green behaviour: The mediating role of work climate perceptions. *Journal of Environmental*
698 *Psychology*, 38, 49-54.

699 Paillé, P., Boiral, O., & Chen, Y., 2013. Linking environmental management practices and
700 organizational citizenship behaviour for the environment: a social exchange perspective. *The*

701 International Journal of Human Resource Management, 24(18), 3552-3575.

702 Paillé, P., Chen, Y., Boiral, O., & Jin, J., 2014. The impact of human resource management on
703 environmental performance: An employee-level study. *Journal of Business Ethics*, 121(3), 451-466.

704 Paillé, P., & Raineri, N., 2015. Linking perceived corporate environmental policies and employees
705 eco-initiatives: The influence of perceived organizational support and psychological contract breach.
706 *Journal of Business Research*, 68(11), 2404-2411.

707 Rahman, N., & Post, C., 2012. Measurement issues in environmental corporate social responsibility
708 (ECSR): Toward a transparent, reliable, and construct valid instrument. *Journal of Business Ethics*,
709 105(3), 307-319.

710 Raineri, N., & Paillé, P., 2016. Linking corporate policy and supervisory support with environmental
711 citizenship behaviors: The role of employee environmental beliefs and commitment. *Journal of*
712 *Business Ethics*, 137(1), 129-148.

713 Ringle, C. M., Sarstedt, M., & Straub, D. W., 2012. Editor's comments: a critical look at the use of
714 PLS-SEM in MIS quarterly. *MIS Quarterly*, 36(1), iii-xiv.

715 Ruuska, I., Ahola, T., Artto, K., Locatelli, G., & Mancini, M., 2011. A new governance approach for
716 multi-firm projects: Lessons from Olkiluoto 3 and Flamanville 3 nuclear power plant projects.
717 *International Journal of Project Management*, 29(6), 647-660.

718 Sainati, T., Locatelli, G., Brookes, N., 2017. Special Purpose Entities in Megaprojects: empty boxes or
719 real companies? An ontological analysis. *Project Management Journal*, 48 (2).

720 Sparks, B. A., Perkins, H. E., & Buckley, R., 2013. Online travel reviews as persuasive communication:
721 The effects of content type, source, and certification logos on consumer behavior. *Tourism*
722 *Management*, 39, 1-9.

723 Stern, P. C., Dietz, T., Abel, T. D., Guagnano, G. A., & Kalof, L., 1999. A value-belief-norm theory of
724 support for social movements: The case of environmentalism. *Human Ecology Review*, 6(2), 81-97.

725 Testa, F., Boiral, O., & Iraldo, F., 2015. Internalization of Environmental Practices and Institutional
726 Complexity: Can Stakeholders Pressures Encourage Greenwashing? *Journal of Business Ethics*,
727 doi:10.1007/s10551-015-2960-2.

728 Turker, D., 2009a. Measuring corporate social responsibility: A scale development study. *Journal of*
729 *Business Ethics*, 85(4), 411-427.

730 Turker, D., 2009b. How corporate social responsibility influences organizational commitment. *Journal*

731 of Business Ethics, 89(2), 189-204.

732 Turner, R., & Zolin, R., 2012. Forecasting success on large projects: developing reliable scales to
733 predict multiple perspectives by multiple stakeholders over multiple time frames. *Project Management*
734 *Journal*, 43(5), 87-99.

735 Van Marrewijk, A., Clegg, S. R., Pitsis, T. S., & Veenswijk, M., 2008. Managing public-private
736 megaprojects: Paradoxes, complexity, and project design. *International Journal of Project Management*,
737 26(6), 591-600.

738 Yusof, N. A., Abidin, N. Z., Zailani, S. H. M., Govindan, K., & Iranmanesh, M., 2016. Linking the
739 environmental practice of construction firms and the environmental behaviour of practitioners in
740 construction projects. *Journal of Cleaner Production*, 121, 64-71.

741 Zeng, S. X., Ma, H. Y., Lin, H., Zeng, R. C., & Tam, V. W., 2015. Social responsibility of major
742 infrastructure projects in China. *International Journal of Project Management*, 33(3), 537-548.

743 Zhang, X., 2013. Going green: initiatives and technologies in Shanghai World Expo. *Renewable*
744 *and Sustainable Energy Reviews*, 25, 78-88.

745 Zhang, M., Di Fan, D., & Zhu, C. J., 2014. High-performance work systems, corporate social
746 performance and employee outcomes: Exploring the missing links. *Journal of Business Ethics*,
747 120 (3), 423-435.

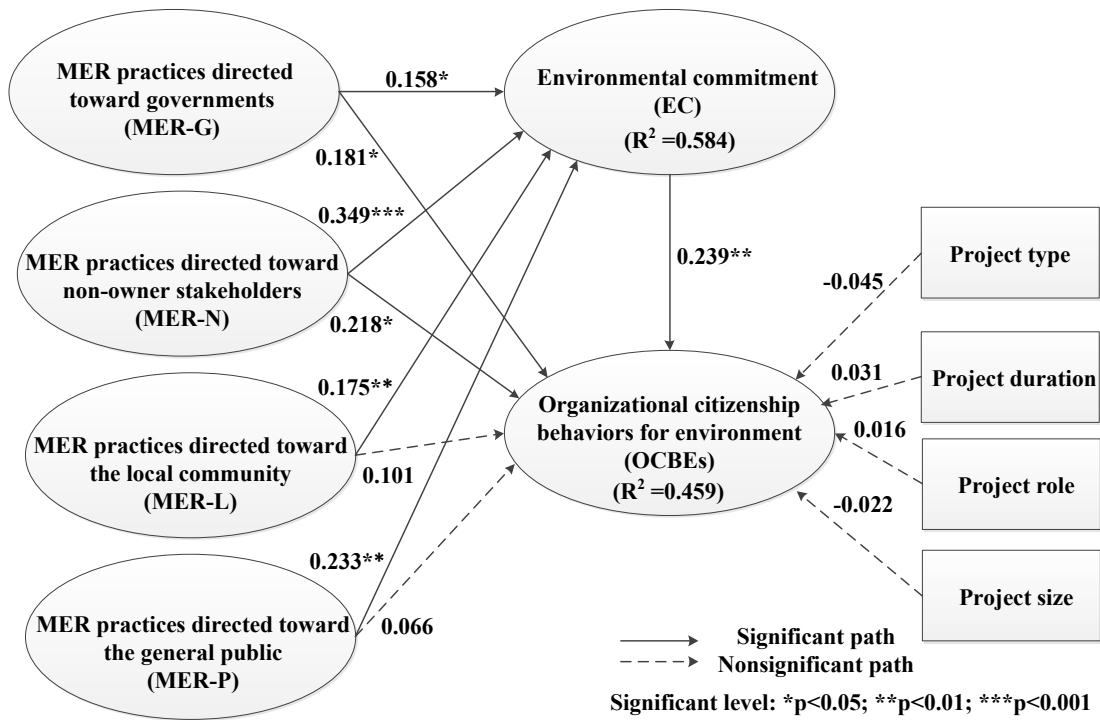


Fig. 1. Results of PLS analysis for the research model.

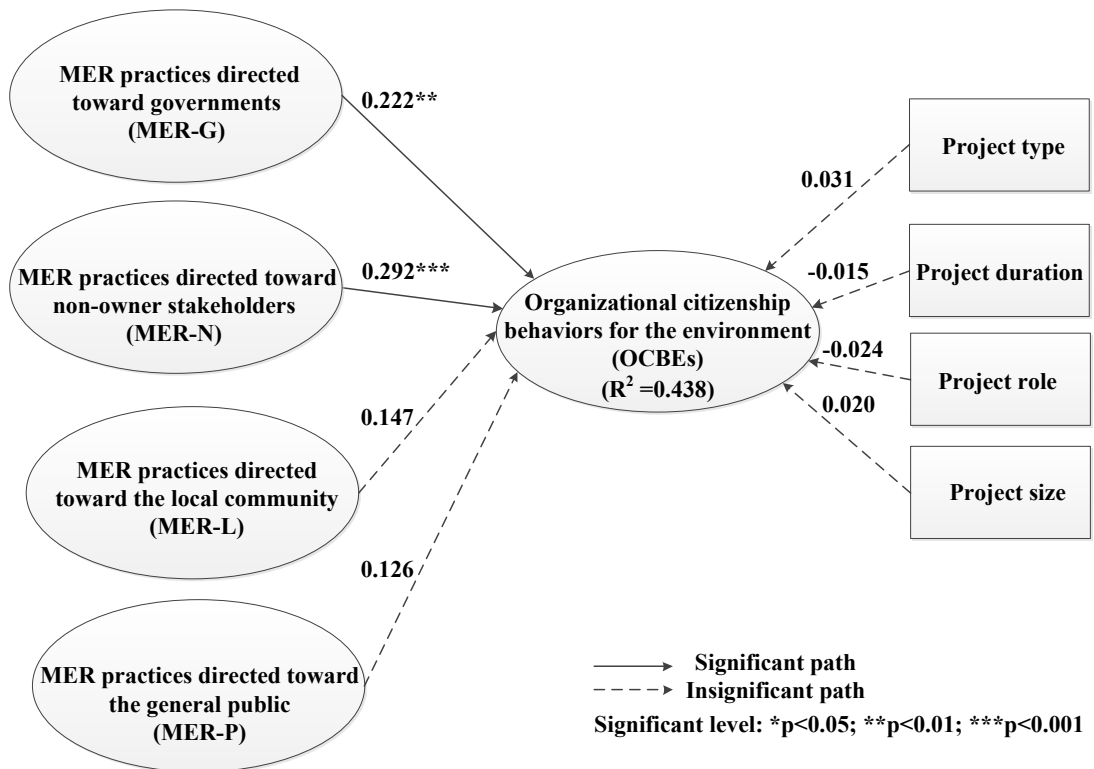


Fig. 2. Results of PLS analysis for the alternative research model.

Table 1 Demographic information of respondents.

Variable	Category	Number of respondents	Percentage
Project role	Owner/Government	72	41.86
	Contractor	61	35.47
	Consultant	39	22.67
Project type	Large-scale exhibition facility/ industry zone	54	31.40
	Urban metro system	35	20.35
	Integrated transport hubs	31	18.02
	Energy source bases	23	13.37
	High speed railways	16	9.30
	Long-span bridge	13	7.56
	East China	76	44.19
Location ^a	South China	32	18.60
	North China	29	16.86
	West China	21	12.21
	Central China	14	8.14
Position	Project manager	58	33.72
	Department manager	29	16.86
	Professional executive	41	23.84
	Project Engineer	44	25.58
Years of experience	≤5 year	45	26.16
	6-10 year	51	29.65
	11-15year	42	24.42
	16-20 year	19	11.05
	>20 year	15	8.72

Location^a refers to the project site where the respondent was employed at the time of the survey.

Table 2 Component list of MER practices.

Measurement items	Factor loadings			
	Factor 1	Factor 2	Factor 3	Factor 4
MER-N4	.915	.089	.136	.083
MER-N5	.902	.088	.146	.059
MER-N1	.813	.128	.189	.265
MER-N2	.707	.345	.181	.274
MER-N3	.703	.470	.184	.151
MER-N6	.584	.408	.305	.333
MER-P4	.236	.815	.245	-.004
MER-P5	.186	.795	.336	-.006
MER-P6	.221	.785	.188	.107
MER-P2	.159	.755	.061	.393
MER-P1	.064	.668	-.048	.525
MER-P3	.150	.559	.371	.456
MER-L1	.154	.325	.773	-.066
MER-L2	.237	.242	.721	.249
MER-L3	.092	-.248	.697	.412
MER-L4	.416	.284	.579	.074
MER-G2	.358	.164	.195	.723
MER-G1	.302	.198	.412	.550
Variance explained (%)	23.99	22.73	15.18	11.15
Variance cumulatively explained (%)	23.99	46.72	61.90	73.05

Bold values represent the factor loadings of each measurement item on its intended construct.

Table 3 Measurement validity and construct correlations.

Construct	CR	AVE	Correlation matrix					
			MER-P	MER-L	MER-N	MER-G	EC	OCBEs
MER-P	0.92	0.66	0.81					
MER-L	0.86	0.61	0.58	0.78				
MER-N	0.94	0.74	0.58	0.60	0.86			
MER-G	0.89	0.81	0.54	0.58	0.59	0.90		
EC	0.93	0.67	0.62	0.61	0.68	0.59	0.82	
OCBEs	0.93	0.66	0.50	0.52	0.59	0.55	0.59	0.81

CR = composite reliability; AVE = average variance extracted. Bold values on the diagonal represent the square root of AVE.

Table 4 Cross loadings for measurement items.

Code	Item loadings					
	MER-P	MER-L	MER-N	MER-G	EC	OCBEs
MER-P1	0.76	0.32	0.38	0.42	0.46	0.36
MER-P2	0.85	0.42	0.48	0.46	0.51	0.33
MER-P3	0.80	0.61	0.51	0.50	0.63	0.47
MER-P4	0.83	0.50	0.50	0.39	0.41	0.35
MER-P5	0.83	0.52	0.48	0.41	0.48	0.42
MER-P6	0.83	0.46	0.49	0.42	0.52	0.48
MER-L1	0.47	0.77	0.40	0.38	0.38	0.33
MER-L2	0.51	0.86	0.51	0.50	0.55	0.45
MER-L3	0.32	0.71	0.35	0.42	0.42	0.33
MER-L4	0.50	0.79	0.57	0.49	0.53	0.50
MER-N1	0.42	0.51	0.87	0.52	0.57	0.52
MER-N2	0.57	0.51	0.86	0.57	0.62	0.51
MER-N3	0.64	0.53	0.87	0.51	0.61	0.55
MER-N4	0.34	0.45	0.87	0.46	0.54	0.44
MER-N5	0.34	0.44	0.86	0.42	0.50	0.47
MER-N6	0.65	0.61	0.83	0.56	0.66	0.50
MER-G1	0.49	0.57	0.52	0.90	0.54	0.51
MER-G2	0.47	0.46	0.55	0.89	0.52	0.48
EC1	0.52	0.55	0.63	0.53	0.84	0.54
EC2	0.42	0.45	0.50	0.40	0.82	0.48
EC3	0.40	0.46	0.50	0.40	0.73	0.34
EC4	0.60	0.58	0.62	0.56	0.81	0.53
EC5	0.50	0.50	0.54	0.45	0.83	0.45
EC6	0.65	0.47	0.58	0.55	0.85	0.53
EC7	0.41	0.45	0.47	0.45	0.84	0.48

OCBEs1	0.35	0.44	0.45	0.40	0.42	0.77
OCBEs2	0.44	0.45	0.51	0.49	0.53	0.87
OCBEs3	0.38	0.36	0.44	0.37	0.42	0.76
OCBEs4	0.42	0.43	0.43	0.42	0.45	0.79
OCBEs5	0.45	0.42	0.45	0.47	0.49	0.80
OCBEs6	0.41	0.46	0.56	0.47	0.56	0.86
OCBEs7	0.40	0.42	0.49	0.50	0.51	0.85

Bold values represent standardized factor loadings of the items on their respective constructs; and T-values are for these loadings.

Table 5 Results of descriptive and comparative analysis.

Construct	Full sample		Project owners		Contractors		Consultants		ANOVA	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F-test	p-value
MER-P	3.35	0.62	3.31	0.65	3.40	0.587	3.33	0.621	0.296	0.744
MER-L	3.63	0.50	3.60	0.51	3.70	0.48	3.60	0.51	0.751	0.474
MER-N	3.75	0.68	3.74	0.67	3.86	0.69	3.58	0.65	2.101	0.125
MER-G	4.17	0.55	4.13	0.60	4.21	0.51	4.17	0.53	0.415	0.661
EC	3.84	0.63	3.82	0.66	3.88	0.60	3.79	0.65	0.277	0.758
OCBEs	4.03	0.60	3.98	0.63	4.08	0.56	4.08	0.59	0.586	0.558

Mean = arithmetic means, SD = standard deviation.