International Journal of Physical Distribution & Logistics Management

Green supply chain management and the circular economy: Reviewing theory for advancement of both fields

Junjun Liu, Yunting Feng, Qinghua Zhu, Joseph Sarkis,

Received 30 January 2017
Revised 18 August 2017
5 March 2018
5 April 2018
6 April 2018
3 May 2018
7 May 2018
Accepted 8 May 2018

Green supply chain management and the circular economy

Reviewing theory for advancement of both fields

Junjun Liu, Yunting Feng and Qinghua Zhu
Department of Operations Management, Shanghai Jiao Tong University, Shanghai, China, and
Joseph Sarkis
Foisie School of Business, Worcester Polytechnic Institute, Worcester, Massachusetts, USA

Abstract

Purpose – Green supply chain management (GSCM) and the circular economy (CE) overlap but also differ. The purpose of this paper is to clarify linkages between these two concepts. It identifies mutual theory applications used to study GSCM and CE.
Design/methodology/approach – A systematic literature review is conducted to identify theories from GSCM and CE studies. A critical analysis explores the theories that can provide mutual applications between GSCM and CE fields. Propositions are developed.
Findings – In all, 12 theories are applied in both GSCM and CE studies. Several theories are only applied in GSCM studies, but can help to advance CE study. These theories include complexity, transaction cost economics, agency, and information theories. Each of the eight theories only applied to CE can potentially advance GSCM study.
Research limitations/implications – The findings contribute to further theory development for both GSCM and CE study. A methodological review can advance theoretical development and cross-pollination in both fields.
Originality/value – This work is the first study to explicitly explore linkages of GSCM and CE from a theoretical perspective.

Keywords Green supply chain management, Literature review, Theoretical analysis, Circular economy, Critical analysis

Paper type Literature review

Introduction

Green supply chain management (GSCM) and the circular economy (CE) are emerging sustainable development concepts overlapping and supplementing each other (Genovese *et al.*, 2017; Zhu, Geng and Lai, 2011). GSCM and CE practices both aim to improve environmental and economic performance but with somewhat different perspectives. GSCM mainly focuses on improved environmental performance while economic performance can also be associated with the concept (Sarkis, 2012). Similarly, the CE philosophy has been promoted as a policy that can improve economic development while alleviating environmental and resource challenges (Geng *et al.*, 2009). Studies considering both GSCM and the CE have been published (Zhu and Sarkis, 2004; Su *et al.*, 2013; Brandenburg *et al.*, 2014; Dubey *et al.*, 2016; Ghisellini *et al.*, 2016); but a conceptual and theoretical linkage of the research literature is still needed. In most of these studies, GSCM can been regarded as an organizational element to support CE practices.

Supply chain cooperation can improve CE performance (Zhu, Geng and Lai, 2011). Alternatively, GSCM can gain environmental benefits by integrating CE principles

This work is supported by National Natural Science Foundation of China (71632007, 71690241 and 71472021), Program of Shanghai Academic/Technology Research Leader (18XD1402100) and Key Project of Shanghai Soft Science Research Program (18692101400).

International Journal of Physical Distribution & Logistics Management
Vol. 48 No. 8, 2018
pp. 794-817

0960-0035
DOI 10.1108/IJPDLM-01-2017-0049

(Genovese *et al.*, 2017). GSCM practices, as part of the systems perspectives, has had a focus on motivators and drivers (Sajjad *et al.*, 2015) and associated performance improvement (Kuei *et al.*, 2015). CE has been organized into three levels of analysis and application. Micro, meso and macro levels of CE are proposed. Their boundaries and practices vary based on their breadth of exposure (Geng and Doberstein, 2008). Although researchers have sought to posit the linkage between these two research streams from a practical conceptualization, a theoretical clarification on the linkages of CE with GSCM is still required. This theoretical development can be parlayed from the multi-level characteristics of CE philosophy and policy; and systemic characteristics of GSCM. The levels of analysis allow for multiple theoretical viewpoints ranging from macroeconomic to organizational theories. The systemic perspectives rely on theories to help explain antecedents for adoption and performance outcomes (Zhu *et al.*, 2005). Both fields have these commonalities of systemic and multi-levels of analysis; and thus these perspectives underlie this study's developments.

Much of the theoretical foundation in GSCM derives from organizational level theories (Sarkis *et al.*, 2011). As evidenced by the analysis later in this paper, CE studies have also utilized various theoretical perspectives, but to a more limited extent (Patala *et al.*, 2014; Zheng and Jia, 2017). Much of the CE research has focused on practice and analysis, with limited theory development and expansion (Su *et al.*, 2013; Ghisellini *et al.*, 2016; Murray *et al.*, 2017).

Several interrelated research questions remain to be answered and are fundamental motivations for this study. Which theories are portable? Which can be applied to either area? Which theoretical perspectives may be conveyed from one perspective to the other when seeking to understand various phenomena? Which theories can be more effective in understanding the other field?

To address the research questions and achieve the research goals, this paper first defines GSCM and CE concepts; an examination of linkages between GSCM and CE are also summarized in the second section. In the third section, a systematic literature review is used to identify theories that are used for GSCM and CE studies and collect papers for further analysis. The fourth section applies a critical analysis of all selected papers to explore mutual application of theories that can be used for GSCM and CE, projecting from one field to the other. Research propositions are put forward based on the in-depth critical analysis. The final section includes a summary of the overall study and results; in addition implications and limitations provide directions for future studies.

GSCM, CE concepts and their linkages

Green supply chain management

GSCM practices may include organizational, supply chain, industrial, and global industrial network levels of analysis (Zhu and Cote, 2004; Yu *et al.*, 2008; Ageron *et al.*, 2012; Sarkis, 2012; Tachizawa and Wong, 2014). Typically, GSCM has been defined from the product life cycle process perspective for an enterprise. This process perspective includes internal environmental management (IEM), external environmental management from supplier (upstream) and customer (downstream), and reverse logistics dimensions (Zhu and Sarkis, 2004). Introduced and confirmed in earlier studies (e.g. Zhu *et al.*, 2008a) and further reinforced and summarized by a recent publication (Geng *et al.*, 2017), GSCM practices have been defined to include five major elements: green purchasing (GP), eco-design or design for the environment (ECO), IEM, customer cooperation for environmental concerns (CC), and investment recovery (IR). These five GSCM practices are further defined and serve to inform our evaluation of the literature and theoretical foundations.

IEM focuses on intra-organizational environmental performance improvement. It includes top manager commitment, ISO14001 certification, cleaner production, environmental management system, and knowledge sharing activities (Zhu *et al.*, 2008a; Gavronski *et al.*, 2011; Laari *et al.*, 2016).

ECO integrates ecological considerations into products and production process systems designs for achieving eco-efficiency (Aoe, 2007) and fulfilling stakeholder demands (Zhu and Cote, 2004; Eltayeb *et al.*, 2011; Green Jr *et al.*, 2012; Choi and Hwang, 2015).

GP involves selection, monitoring, control, and collaboration with suppliers. Key activities include environmental auditing, information sharing and eco-labeling (Zhu *et al.*, 2007; Eltayeb *et al.*, 2011; Gavronski *et al.*, 2011; Zailani *et al.*, 2012; Youn *et al.*, 2012).

CC includes customer cooperation activities for improving environmental performance. Key activities are cooperation with customers for products recycling, green consumption, green marketing and third-party logistics (Zhu *et al.*, 2005; Green Jr *et al.*, 2012; Laari *et al.*, 2016; Yu, 2016).

IR occurs in closed-loop supply chains with the 3Rs principles, reduction, recycling, and reuse of materials during production and consumption processes. Key activities include reverse logistics, product take-back programs, recycling systems and sale of excess materials (Zhu *et al.*, 2008b; Lai *et al.*, 2013; Bing *et al.*, 2015).

Geng *et al.* (2017) conclude that all five GSCM practices result in improved economic and environmental performance, albeit at differing levels of improvement. IEM has the greatest relative improvement in economic performance followed by CC, ECO and GP. ECO results in the highest relative environmental performance improvement followed by GP, CC and IEM. IR has the lowest relative performance improvement for both economic and environmental performance.

The circular economy

CE can be defined as an economic model wherein resourcing, purchasing, production, reprocessing are designed to consider environmental performance and human well-being (Murray *et al.*, 2017). From a 1,031 paper review, Ghisellini *et al.* (2016) argued that the CE has its foundation in industrial ecology, industrial ecosystems, or industrial symbiosis; with reverse logistics playing an important role. CE incorporates policies and strategies for more efficient energy, materials, and water consumption, limiting waste that flows into the environment (Geng *et al.*, 2013).

CE requires efforts at different levels (micro, meso and macro) for effective implementation (Yuan *et al.*, 2006; Geng and Doberstein, 2008). These three levels are defined (Ghisellini *et al.*, 2016; Su *et al.*, 2013):

(1) At the micro level CE practices are implemented in a single enterprise. Practices include cleaner production, eco-design, GP/consumption and product recycling or reuse.

(2) Most CE practices are at the meso level. Using industrial symbiosis, CE efforts focus on developing eco-industrial parks. An eco-industrial park can be defined as a community of businesses aiming to synergistically achieve joint economic and environmental gains by effectively and efficiently utilizing resources (Côté and Hall, 1995; Côté and Cohen-Rosenthal, 1998).

(3) At the macro level, industrial metabolism can be defined as physical flows of energy and material inputs while outputing final products and waste (Anderberg, 1998); and can be used to understand regional or national scale flows of resources and materials (Murray *et al.*, 2017). Eco-cities are broadly defined as urban cities and regional designs which explicitly incorporate an ecological governance philosophy to achieve the goals of zero emissions and economic benefits (Roseland, 1997), collaborative municipal consumption, and zero waste programs (Roseland, 1997), collaborative consumption and zero waste programs (Song *et al.*, 2015).

CE concept has been introduced at the global scale. CE initiatives occur in Europe, the USA, Japan, Korea, China and Vietnam (Ghisellini *et al.*, 2016). Global level CE has included

inter-nation risk analysis of recycling (Bilitewski, 2012) and international material flow and energy use assessment (Haas *et al.*, 2015).

This paper evaluates CE theoretical developments at the enterprise, industrial park, regional and national, and global levels; and will be evaluated and linked to GSCM practices and theoretical applications.

Linkages between GSCM and the CE practices

Some studies have sought theoretical and practical linkages between GSCM and CE, but there exists some uncertainty of the relationship between these two concepts and their linkages. There are similarities between GSCM and the CE, and their practices have been considered equivalent at some levels in some instances (Zhu and Cote, 2004; Sarkis, 2012). A United Nations Environment Programme report argued that GSCM and CE has seen increasing alignment (Genovese *et al.*, 2017). GSCM dimensions also relate or parallel CE (Sarkis, 2012) at various levels: i.e. enterprise, industrial park, regional/national, global levels. Green supply chains are an important unit of action towards CE (Aminoff and Kettunen, 2016). At the enterprise level, CE practices advance the design of reverse supply chains, recycling, reusing or remanufacturing end-of-life products (Nasir *et al.*, 2017). Eco-industrial parks can be considered a practical implementation of GSCM; firms within an industrial park seek to realize some GSCM practices (Zeng *et al.*, 2017). The relative core objectives of the two concepts differ. GSCM tends to emphasize environmental performance, while CE has a relatively greater emphasis on economic performance (Geng *et al.*, 2009; Sarkis, 2012).

The linkages (relations) between five GSCM practices and four-level CE practices are summarized in Figure 1. These paired GSCM–CE inter-relationships also result in greater performance improvement from joint GSCM–CE practices adoption. Support for these relationships are discussed in the following paragraphs.

We have identified some GSCM and CE practice linkages. A question exists on whether similar or differing theoretical perspectives are used to understand the GSCM and CE fields. Which theoretical lenses show promise to help in their practical and theoretical advancement? A systematic literature review and evaluation provide important insights to help answer these questions.

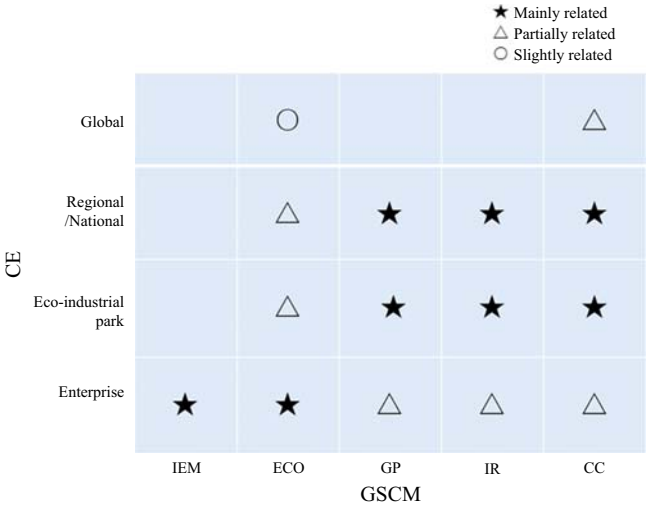

Figure 1.
The linkages between GSCM and CE practices

Methodology and results – a systematic literature review

In this section, a descriptive analysis summarizes theories along the five GSCM practices and the four CE levels.

Theories in GSCM studies

To identify theories applied within GSCM studies, a systematic literature review is conducted. Keywords for determining the GSCM sample literature include "supply chain," and "green (environmental, sustainable, sustainability, ecological)" (Dubey *et al.*, 2016). "Theory" is also added to each.

Initially, a "title, keywords and abstract" search for "supply chain," and "green (environmental, sustainable, sustainability, ecological)," and an "all field" search for "theory," are used to identify papers in the Scopus database. Only peer-reviewed English language journals until 2017 are included (Touboulic and Walker, 2015). The process results in 2033 papers (see Table I for classifications).

Two researchers completed this classification process independently (Seuring and Muller, 2008; Seuring and Gold, 2012). For disagreements a reconciliation discussion is completed until agreement is achieved.

Publications may appear in different search categories since overlaps exist. After duplicates are removed, 1,643 papers remain. We then excluded additional papers and theories. First, we excluded papers that have a word of "theory" in the text but do not mention specific theories. Second, this study only considers organization-related theories. Other theories including methodological theories (e.g. grey system theory, uncertainty theory) and individual or marketing theories are not included. Third, we only include theories that have been applied. Theory application includes using theories to build conceptual models, develop analytical models, and completing an explicit theoretical or data analysis. Many theories, such as balance theory (Tachizawa and Wong, 2014), structuration theory (Touboulic and Walker, 2015) and actor-network theory (Hazen *et al.*, 2016), are only mentioned in literature reviews without detailed argumentation and evaluation. These theories are excluded. In the end, 19 theories (Table II) with 182 papers[1] are used in the final analysis, including 12 theories applied in both GSCM and CE, and seven theories only applied in GSCM.

Search words (searching items)	Search results (no. of papers)
GSCM	
Green (title, abstract, keywords) AND "supply chain" (title, abstract, keywords) AND theory (all field)	915
Environmental (title, abstract, keywords) AND (sustainable or sustainability) (title, abstract, keywords) AND "supply chain" (title, abstract, keywords) AND theory (all field)	961
ecological (title, abstract, keywords) AND "supply chain" (title, abstract, keywords) AND theory (all field)	157
Total	2,033*
CE	
"circular economy" (title, abstract, keywords) AND theory (all field)	222
"eco-industrial" (title, abstract, keywords) AND theory (all field)	193
"industrial symbiosis" (title, abstract, keywords) AND theory (all field)	199
"urban ecology" (title, abstract, keywords) AND theory (all field)	441
Total	1,055**

Table I.
Search keywords and summary results

Notes: *Including 390 duplications; after deleting duplications, the total is 1,643; **including 298 duplications; after deleting duplications, the total is 757

Theories			Abbreviation	GSCM practices					CE implementation levels			
				IEM	ECO	GP	IR	CC	Enterprise	Industrial park	Regional/national	Global
Theories applied in both GSCM and CE	Popular GSCM theories	1-1 Resource-based view	RBV	■	■	■	■	■	△	▲	△	△
		1-2 Institutional theory	InsT	■	■	■	■	■	▲	△		
		1-3 Stakeholder theory	ST	■	■	■	■	■	△	▲	▲	△
		1-4 Resource dependence theory	RDT	■	■	■	■	■		▲	△	
		1-5 Social network theory	SNT			■	■	■	▲	▲	▲	
		1-6 Diffusion of innovation theory	DIT		■	■	■	■	△	▲	△	
	Popular CE theories	1-7 Theory of industrial symbiosis	TIS		■	■	■	■		▲	▲	△
		1-8 Ecological modernization theory	EMT	■	■	■	■	■	△	▲	▲	△
	Potentials in both GSCM and CE studies	1-9 Social capital theory	SCT			■	■	■		▲	▲	
		1-10 Systems theory	SyT	■		■		■		▲		
		1-11 Social exchange theory	SeT			■		■		▲		
		1-12 Theory of production frontier	TPF				■				▲	
Theories only applied in GSCM	Mentioned in CE studies	2-1 Complexity theory	CT	■	■	■	■	■	△	△	△	
		2-2 Transaction cost economics	TCE			■	■	■		△	△	△
		2-3 Agency theory	AT	■		■				△	△	△
		2-4 Information theory (signaling theory)	InfoT(SigT)			■	■	■		△	△	
	Not mentioned in CE studies	3-1 Contingency theory	CogT	■	■	■	■	■				
		3-2 Path dependency theory	PDT	■	■			■				
		3-3 Strategic choice theory	StcT	■	■	■		■				
Theories only applied in CE	Mentioned in GSCM studies	4-1 Cluster theory	ClsT			□		□		▲		
		4-2 Theory of socio-technical transitions	TSTT	□				□	▲	▲	▲	
		4-3 Social embeddedness theory	SET		□					▲	▲	
		4-4 Knowledge-based view	KBV	□				□		▲		
	Not mentioned in GSCM studies	5-1 Endogenous growth theory	EGT						▲	▲	▲	
		5-2 Ecosystem theory	EcoT							▲		
		5-3 Social cognition theory	SenT							▲	▲	
		5-4 Evolutionary theory	EvoT						▲	▲		

Note: "□" mentioned in GSCM studies; "■" applied in GSCM studies ; "△" mentioned in CE studies; "▲" applied in CE studies

Table II.
Theories and distribution in GSCM and CE fields of study

Theories in CE studies

To systematically identify theories appearing in CE studies, "circular economy," "eco-industrial," "urban ecology," "industrial symbiosis" (Ghisellini *et al.*, 2016; De Jesus *et al.*, 2018) and "theory" are used as combinations. The keywords of "circular economy" "eco-industrial," "urban ecology," "industrial symbiosis" are searched across title, keywords and abstract while the key word "theory" is searched across the full text. Totally 757 papers from peer-reviewed English language journals, excluding 298 duplications, are identified in the initial search. Twenty theories, including 12 theories applied in both fields and seven theories only applied in CE, are identified for CE studies and 64 papers[2] are included for the final analysis under the similar inclusion criteria for GSCM studies.

Descriptive analysis for GSCM and CE theories

We group theories into three levels ("applied," "mentioned" and "not mentioned") for both SCM and CE studies. An applied theory indicates that this theory is actually applied for conceptual model development or analysis; or the study seeks to expand the theory. A mentioned theory indicates a theory is included to support some arguments or as potential theories to consider for future studies; but not the central application. A non-mentioned theory indicates that it does not appear anywhere in any paper. Table II descriptively summarizes the results.

For the 19 GSCM theories, 12 theories (Theories 1-1~1-12) are also used for CE studies. Totally 12 theories are applied for both GSCM and CE. For the remaining seven applied GSCM theories, four theories are mentioned in CE papers to support arguments, or as potential theories for future studies. Thus, we define these four theories as GSCM applied theories and mentioned in CE studies (Theories 2-1~2.4). The remaining 3 GSCM applied theories (Theories 3-1~3-3), lack any mention in CE studies. Correspondingly, the additional eight theories for CE studies, 4 CE theories (Theories 4-1~4-4) are mentioned and 4 (Theories 5-1~5-4) are not mentioned in GSCM studies.

Extended critical and theoretical analyses

In Table II, critical and theoretical analyses provide insights into theory applications and shed light on extending theory applicability across both fields. To further check if results in

Table II validate results in Figure 1, we examine theories that overlap in GSCM and CE studies. This evaluation includes 12 theories applied in both fields (1-1~1-12), 4 theories applied in GSCM while mentioned in CE (2-1~2-4), and 4 theories applied in CE while mentioned in GSCM (4-1~4-3). These theories seem to be the best contributors to both fields.

We first check what practices a theory is evaluating. Table II shows that the resource-based view (Theory 1-1) is used to examine six practices, including all five GSCM practices; along with evaluating CE practices at the industrial park level.

Second, we further determined if the theory validates results in Figure 1 with a focus on the eight highly related GSCM practices and CE level pairs; the cells with a "star" in them. If a highly related relationship uses the same theory (e.g. GP and industrial park level, IR and industrial park level, and CC and industrial park level for resource-based view); then the hypothesized high relationship is more strongly supported. If a theory only examines a GSCM or a CE practice and the other identified practice is not studied, then we further explore potential reasons for this lack of study. For example, it may be due to different performance (environmental or economic) objectives; or that additional research is required, identifying a research gap. Figure 1 shows that both IEM and ECO are related to the enterprise level CE practice. Unfortunately, the resource-based view only examines IEM while it is only mentioned, not applied, in CE studies at the enterprise level. A summation of these results are shown in Table III.

Theories applied by both GSCM and CE studies

As introduced above and summarized in Table II, 12 theories are applied in both GSCM and CE studies. These theories are further categorized into popular GSCM theories (theories that have traditionally focused and cover multiple aspects of GSCM) with further potential for CE (six theories); popular CE theories with further potential for GSCM (two theories); and theories with further potential in both GSCM and CE (four theories). Table IV defines these 12 theories.

Popular GSCM theories to advance CE study. Six theories have been applied in at least ten GSCM publications, each of these appear in three or fewer CE publications. These theories can be defined as "popular" GSCM theories.

The resource-based view and resource dependence theory are relatively traditional supply chain theories. Tables II and III show that these theories are used to explore all five GSCM practices. These theories have also been used to examine barriers for eco-industrial park development (Zhu *et al.*, 2014) and evaluating stakeholder power in forming and sustaining industrial symbiotic relationships (Hein *et al.*, 2017). Thus, three relations (GP, IR, CC with CE at the eco-industrial park level) from Figure 1 are supported through the common application of these theoretical perspectives. By extension from Figure 1, it is highly probable that these two popular GSCM theories can be applied to explore the other five "mainly related" relations from Figure 1. These two theories can be used to further explore CE at the enterprise or a regional level; and is a potential direction for future research that has yet to be examined.

Social network theory has been used to examine three external GSCM practices (GP, CC and IR) as well as on CE practices such as developing conceptual models to initiate industrial synergies and their organization (Ashton, 2008; Ghali *et al.*, 2016). All six Figure 1 relations are validated. Stakeholder theory has been applied to understand quantitative and qualitative value network models for industrial symbiosis (Hein *et al.*, 2017). This theory can be further used to explore enterprise CE efforts.

Institutional theory has been used to construct conceptual models exploring external institutional drivers for CE implementation among manufacturers (Wang *et al.*, 2014; Zheng and Jia, 2017). It can further explore industrial park or provincial level CE practices.

Theories	Examined GSCM practices	Examined levels for CE studies	Mainly related practices (identified in Figure 1) IEM and enterprise	ECO and enterprise	GP and industrial park	IR and industrial park	CC and industrial park	GP and regional/ national	IR and regional/ national	CC and regional/ national
1-1 RBV	Five practices	Industrial park	G	G	✓	✓	✓	G	G	G
1-2 InsT	Five practices	Enterprise	✓	✓	G	G	G	G	G	G
1-3 ST	Five practices	Industrial park, Regional/ national	G	G	✓	✓	✓	✓	✓	✓
1-4 RDT	Five practices	Industrial park	G	G	✓	✓	✓	G	G	G
1-5 SNT	GP, IR, CC	Industrial park, Regional/ national	–	–	✓	✓	✓	✓	✓	✓
1-6 DIT	ECO, GP, IR, CC	Industrial park	–	G	✓	✓	✓	G	G	G
1-7 TIS	ECO, GP, IR, CC	Industrial park, Regional/ national	–	G	✓	✓	✓	✓	✓	✓
1-8 EMT	Five practices	Industrial park, Regional/ national	G	G	✓	✓	✓	✓	✓	✓
1-9 SCT	GP, IR, CC	Industrial park, Regional/ national	–	–	✓	✓	✓	✓	✓	✓
1-10 SyT	IEM, GP, CC	Industrial park	G	–	✓	C	✓	G	–	G
1-11 SeT	GP, CC	Industrial park	–	–	✓	C	✓	G	–	G
1-12 TPF	IR	Regional/national	–	–	–	G	–	C	✓	C
2-1 CT	Five practices		✓	✓	✓	✓	✓	✓	✓	✓
2-2 TCE	GP, IR, CC		–	–	✓	✓	✓	✓	✓	✓
2-3 AT	IEM, GP		–	–	–	–	–	–	–	–
2-4 InfoT	GP, IR, CC		–	–	✓	✓	✓	✓	✓	✓
4-1 ClsT		Industrial park	–	C	✓	C	✓	GM	–	–

(*continued*)

Table III.
Validation summary of theories on mainly related GSCM and CE practices

Table III.

Theories	Examined GSCM practices	Examined levels for CE studies	Mainly related practices (identified in Figure 1) IEM and enterprise	ECO and enterprise	GP and industrial park	IR and industrial park	CC and industrial park	GP and regional/ national	IR and regional/ national	CC and regional/ national
4-2 TSTT		Enterprise, Industrial park, Regional/national	✓	C	C	C	✓	C	C	✓
4-3 SET		Industrial park, Regional/ national	–	–	–	–	–	–	–	–
4-4 KBV		Industrial park	GM	–	C	C	✓	–	–	GM

Notes: "✓" applied in both field; "–" no related studies; "G" applied in GSCM studies; "GM" mentioned in GSCM studies; "C" applied in CE studies

Institutional theory can motivate proactive environmental practices at organizational or supply chain levels, which can result in greater environmental performance; while economic performance may not be achieved in the short-term. Considering the key objective of CE practices is economic, institutional theory may be applied, but with a different objective or perspective.

Innovation diffusion theory has been applied to evaluating industrial symbiosis (Zheng and Jia, 2017). Table II shows that these popular GSCM theories were used to study one or more CE levels. There is clear potential to examine additional CE levels.

Thus, we posit the first proposition:

P1a. Promising GSCM theories, including resource-based view, institutional, stakeholder, resource dependence, social network, and diffusion of innovation theories can be extended to further CE study.

Popular CE theories to advance GSCM study. Industrial symbiosis and ecological modernization theories have been utilized by 25 and 11 CE studies, respectively. GSCM studies using these two theories are limited.

The theory of industrial symbiosis (TIS) can play a significant role for evaluating carbon-intensive influences at the global supply chain level; especially by emphasizing greater collaboration among global supply chain partners (Hu *et al.*, 2016). Given that GSCM studies have explored supply chain networks, TIS can also be used to further explore these directions. Ecological modernization theory (EMT) was used to develop GSCM-related policies (Berger *et al.*, 2001). Using EMT GSCM is evaluated using the green innovation perspective (Zhu, Geng, Sarkis and Lai, 2011). Considering similarities to lower CE levels, GSCM can further explore related policies using EMT.

Thus, we develop the following proposition:

P1b. Given some similarities between GSCM and CE, the CE theories of industrial symbiosis and ecological modernization can be extended to additional GSCM studies.

Theories to advance both GSCM and CE study. Social capital, systems, social exchange and production frontier theories are applied in both GSCM and CE studies. Social aspects have become increasingly important for both GSCM and CE (e.g. Sarkis *et al.*, 2010; Hickle, 2017). The two socially focused theories, social capital and social exchange theories, have significant potential to understand and study both fields. GSCM and CE can be defined as systems (Genovese *et al.*, 2017), thus studying them utilizing systems theory seems natural.

The theory of production frontiers is only applied for one of the five GSCM practices and a CE study at the national level. Based on its definition with a goal to maximize output to input ratios, it can be extended to study other GSCM practices and CE at all four levels. Outputs and inputs are important systems theory dimensions.

Thus, the following proposition is introduced:

P1c. Social capital, social exchange, systems and production frontier theories, in early GSCM and CE study stages provide further potential study, elicitation, and advancement in both fields.

GSCM applied theories that can advance CE study

Seven theories are applied in GSCM, but are not used to investigate CE phenomena. They are grouped into two contextual categories: only mentioned in CE study, with no true application (four theories), and not mentioned in any CE study (three theories).

GSCM applied theories mentioned but not applied in CE studies. Four GSCM applied theories have been mentioned but are not applied or tested in CE studies. These four theories

Category	Theory	Conception	No. of articles in GSCM	No. of articles in CE
Popular GSCM theories to advance CE study	1-1 Resource Resource-based view	RBV suggests that resources with four attributes (valuable, rare, inimitable and non-substitutable) simultaneously have potential to sustain competitive advantage of a firm (Barney, 1991)	55	1
	1-2 Institutional theory	Institutional theory emphasizes that the regulative, normative and cultural-cognitive elements conduct coercive, normative, and mimetic mechanisms respectively to influence organizational social behavior (DiMaggio and Powell, 1983; Richard, 2001)	40	2
	1-3 Stakeholder theory	Stakeholder is defined as "A stakeholder in an organization is (by definition) any group or individual who can affect or is affected by the achievement of the organization's objectives" (Edward, 1984). Power, legitimacy, and urgency are the key attributes to identify stakeholders (Mitchell *et al.*, 1997)	31	3
	1-4 Resource dependence theory	RDT examines how inter-organzational power of organizations affects the ability to obtain resources and maintain executive succession with dynamic power in the environment (Pfeffer, 1977)	12	2
	1-5 Social network theory	SNT is suggested to understand how the behaviors of social actors in relational system and how the relationship structure influence behaviors. Density and centrality are the two aspects of social networks (Rowley, 1997)	10	3
	1-6 Diffusion of innovation theory	Diffusion of innovation is defined as an innovation is diffused by certain communication channels (mass media or interpersonal channels) with time among members within a social system (Rogers, 2003)	10	1
Popular CE theories to advance GSCM study	1-7 Theory of industrial symbiosis	The most commonly cited definition of industrial symbiosis was proposed by Chertow (2000) as follows: "The part of industrial ecology known as industrial symbiosis engages traditionally separate industries in a collective approach to competitive advantage involving physical exchange of materials, energy, water and by-products. The keys to industrial symbiosis are collaboration and the synergistic possibilities offered by geographic proximity"	3	25
	1-8 Ecological modernization theory	Ecological modernization theory addresses jointly achieving industrial development and environmental protection through innovation and technological development, or "modernity" (Spaargaren, 2000). At least two dimensions of an EMT can influence GSCM research and practice, new politics of pollution and technological innovation	4	11

Table IV.
A summary of theories and definitions currently adopted by GSCM and CE studies

(*continued*)

Category	Theory	Conception	No. of articles in GSCM	No. of articles in CE
Theories that can advance both GSCM and CE study	1-9 Social capital theory	Social capital is defined as the sum of the actual and potential resources embedded in and derived from the network of relationships possessed and developed by an organization (Putnam, 1995). Social capital theory addresses that relationship networks is a valuable resource for the organization to conduct social affairs, providing their members with "the collectivity-owned capital enabling them to credit (Bourdieu, 2001)	4	3
	1-10 Systems theory	Systems theory regards the organization as a system with interconnected activities to produce products and provide service (Von Bertalanffy, 1968). Organizations have complex social systems; separating the parts from the whole reduces the overall effectiveness of organizations	2	3
	1-11 Social exchange theory	Social exchange theory posits that relationships between organizations are formed by the use of a subjective cost-benefit analysis and the comparison of alternatives. The two assumption of social exchange are rationality and structuralism in making decision (Emerson, 1976)	1	1
	1-12 Theory of production frontier	A production frontier is defined as the maximum output that can be produced from any given set of inputs, given technical considerations (Aigner *et al.*, 1977). The diagram of production frontier is a concave decreasing curve, on which inputs are Pareto efficient and points under the curve are not Pareto efficient	1	1

Table IV.

include complexity, transaction cost economics, agency and information (signaling) theories. Application of these four theories in GSCM practices are initially described. Then potential application for CE studies is discussed.

2-1 Complexity theory (CT). Environmental factors typically cause complexities faced by organizations and supply chains (Chakravarthy, 1997). GSCM complexities may derive from suppliers, customers, technology and regulations. CT analyzes supply chain dynamics with sustainability parameters (Matos and Hall, 2007). For example, firm size and supplier-customer relationship are regarded as factors of complexities for GSCM implementation (Vachon and Klassen, 2006).

For CE implementation, complex adaptive systems occur in eco-industrial parks (Shi *et al.*, 2010). CT can help understand different features of companies and multiple interactions in an eco-industrial park setting. Not only are there issues related to multiple complex relationships, but also variations in traded materials and by-products, with differing characteristics. The theory can help explore if and how these companies can cooperate for potential win-win opportunities, such as joint treatment for similar wastes and exchanges of by-products. Moreover, at a higher level of analysis, CT can be used to explore opportunities of cooperation among different eco-industrial parks in a region; and their interaction with local communities.

The understanding of how eco-industrial park networks form and evolve may be investigated through a CT lens.

2-2 Transaction cost economics (TCE). TCE is flexibly applied, for example, to explore the link between buyer-supplier relationship stability (Lai *et al.*, 2005); and with multi-objective minimization green supply chain risk (Cruz, 2009; Cruz and Matsypura, 2009).

TCE can help explore mutual transactional relationships among multiple entities in a CE system. For example, enterprises exchange their wastes, by-products and energy for second-use in eco-industrial parks or regional networks. Transactional costs exist among these enterprises (Ehrenfeld and Gertler, 1997). Evaluation and minimization of transaction cost among inter-enterprises within eco-industrial parks can help optimize CE networks. Investing in assets (asset specificity) may allow for greater relationship building between members in a CE context, how "strong" the relationships are in an eco-industrial park and network settings, and where whole industrial parks can invest in specific assets to form particular networks.

2-3 Agency theory (AT). GSCM-related studies using AT are emerging. AT aided in examining top management roles in enterprise sustainable consumption and production behaviors (Dubey *et al.*, 2016). AT has also been used to investigate CEO compensation for green management practices performance (Goktan, 2014); analyzing sustainability in logistic enterprises' buyer-supplier relationships (Kudla and Klaas-Wissing, 2012); and how suppliers play a dual agency role in sustainable multi-tier supply chains (Wilhelm *et al.*, 2016).

Agency issues exist at all four CE study levels. AT has been mentioned at the industrial park, regional/national and global CE levels (see Table II). Surprising, AT is not mentioned at the enterprise CE level. Four categories of agents (business, labor, community and technical agents) have been mentioned to understand eco-industrial systems (Romero and Ruiz, 2014). AT can help understand and explore eco-industrial development governance modes. For example, enterprises within an eco-industrial park can establish the business-agent relationships with a third party, for acquiring professional services such as logistics or sewage disposal.

2-4 Information theory (signaling theory) (InfoT (SigT)). Information theory includes information asymmetry as a core tenet. Information collection is important to minimize environmental information asymmetry about between suppliers and buyers (Erlandsson and Tillman, 2009). Enterprises tend to require ISO14001 certification among their suppliers when information asymmetries between customers and suppliers occur (Jiang and Bansal, 2003).

Information asymmetries exist for CE actors and their stakeholders including governments, non-governmental organizations and consumers. These asymmetries increase transaction and marketing cost (Chen, 2009). CE complexities that derive from various forms and sources of information asymmetries increase the uncertainty and risk of CE systems. Material availability and flows, byproducts, and their costs, have similar information asymmetry and power issues as GSCM material flows. Examining and dealing with information asymmetries among actors and stakeholders within the CE context require exploration.

These four theories, although mentioned, have not been applied within the CE studies context. All four theories may have significant explanatory power within CE studies. Thus, a second general research proposition is derived:

P2. Four GSCM applied theories, including complexity, transaction cost economics, agency, and information theories have significant potential CE study applications.

GSCM theories missing in CE studies. Three GSCM theories not mentioned in CE studies and have potential application in the CE context. Contingency (CogT), path dependency (PDT), and strategic choice (StcT) may all be insightful theoretical lenses to investigate CE. Definitions, GSCM study application for each theory, and an evaluation of CE context theory application are presented.

3-1 Contingency theory (CogT). Contingency theory states that appropriate organizational structure and management style are dependent on some "contingency" factors, and these factors are usually uncertain and unstable (Tosi and Slocum, 1984).

CogT examines contingency factor impacts on relationships between supply chain integration and performance (Wong *et al.*, 2011). Contingency factors appear in all five GSCM practices (see Table II). Studies include environmental management systems and extended enterprise responsibility practices adoption (Lai *et al.*, 2014; Feng *et al.*, 2016).

Uncertain and unstable contingency factors also exist for each CE level. These contingency factors will influence effect of CE practices (positively and negatively) on overall economic and environmental performance. Understanding these factors could promote cooperation among entities in a CE system, such as industrial symbiosis effects in various regions under varying regulatory regimes.

3-2 Path dependency theory (PDT). Path dependence is a dynamic process driven by increasing returns (Pierson, 2000). Initial PDT applications focus on technology, political, and social studies (Sydow *et al.*, 2009).

PDT can explain GSCM adoption as a positive-feedback loop process (Sarkis *et al.*, 2011). PDT can explain developing dynamic GSCM capabilities (Gavronski *et al.*, 2011). Joint green management and mass customization capabilities have also utilized the PDT lens (Trentin *et al.*, 2015).

Continuous CE development relies on accumulated experiences, capabilities and resources (De Los Rios and Charnley, 2017). PDT can evaluate multiple CE levels. CE-related technologies and capabilities accumulation in enterprises, and successful experiences from demonstration and pilot projects for eco-industrial parks or eco-cities development have potential PDT relationships (Geng *et al.*, 2016).

3-3 Strategic choice theory (StcT). StcT contends that managers' decisions are critical for organizational development (Child, 1972). StcT has been used with other theories. StcT along with stakeholder and institutional theories have been proposed as a research framework to study building sustainable competitive advantage strategies (Roh *et al.*, 2015). StcT and resource-based theory were jointly utilized to understand the role of GSCM adoption and performance (Kirchoff *et al.*, 2016).

Strategic choices are important for all CE levels development orientation, but also affect economic and environmental performance. Managers' cognition, capabilities, personality characteristics or other environmental elements can be examined within the StcT CE context. GSCM-related studies that test the relationships among drivers, practices and performance (e.g. Zhu *et al.*, 2005) can also be applied to StcT focused CE studies.

Thus, the third proposition is:

P3. Contingency theory can be applied to explore different influencing factors for CE practices; PDT can be applied to evaluate CE implementation paths; and StcT can be applied to understand CE strategy development.

CE applied theories for advancing GSCM study

Eight CE context theories have not been applied to GSCM study. Four of the eight theories are mentioned in GSCM study; the other four theories have not seen any linkage to GSCM study.

CE applied theories mentioned but not applied in GSCM studies. Cluster theory (ClsT), theory of socio-technical transitions (TSTTs), social embeddedness theory (SET), and the knowledge-based view (KBV) have seen CE context application; and are mentioned in GSCM studies (see Table II). This section explores how these four theories may be applied to GSCM study.

4-1 Cluster theory (ClsT). A cluster is a geographically proximate group of interconnected enterprises and associated institutions, linked by commonalities and

complementarities (Mayer, 2005). In CE study, clustering allows enterprises to be in close geographic proximity. ClsT facilitates sharing of related competitive advantages, information, processes and other resources unique to a region (Berke and Satir, 2011). Eco-industrial park cluster members function together to improve their resource efficiency, reduce costs; and benefit from shared spillover outcomes such as technology innovation or new business opportunities (Anthony, 2006; Berke and Satir, 2011).

For GSCM studies, ClsT has potential for analyzing the inter-relationships of supply chain network members. ClsT may provide theoretical understanding for identifying enterprise clusters for GSCM practices, such as focal enterprises, strategic and nexus suppliers. ClsT can further theoretically explore how these members in the same and/or different clusters could collaborate and compete under different GSCM structures. ClsT and geographic proximity in GSCM can help evaluate geographic and organizational boundaries (Sarkis, 2012).

4-2 Theory of socio-technical transitions (TSTTs). TSTTs posits that transitions in technologies do not emerge alone but relate to a series of changes in society such as regulations, norms, infrastructure and industrial networks (Voß *et al.*, 2009; Chen, 2012; Jurgilevich *et al.*, 2016). TSTT frameworks helped develop practical guidance for transition of metals management towards a CE mode (Jackson *et al.*, 2014).

Changing competitive, normative, and regulatory landscapes are transitionary pressures causing regime transition that can motivate GSCM adoption (Scrase and Smith, 2009). TSTT for GSCM study can explore the effect of new and evolving environmental regulations. Governments sometimes implement new and stricter environmental regulations associated with best available technology requirements. These new policies will cause enterprises to review and evaluate their processes and potentially to green technology innovations. Hence, TSTTs can be used to evaluate emergent regulatory policy on GSCM; or the effect of community environmental awareness on GSCM practice and performance.

4-3 Social embeddedness theory (SET). In CE, enterprises are embedded in eco-industrial networks with social relationships characterized by their locations and ongoing relations within networks (Granovetter, 1985; Domenech and Davies, 2011). The increasing attention on social embeddedness has included studies on industrial symbiosis (Baas, 2011). Three social embeddedness constructs (cognitive, culture, structural) were used to evaluate eco-industrial networks social characteristics (Ashton and Bain, 2012). Social embeddedness dimensions helped to comparatively evaluate industrial symbiosis in two regions (Baas, 2011).

Potential GSCM SET application has been mentioned in some review studies (e.g. Sarkis *et al.*, 2011; Tachizawa and Wong, 2014). For future GSCM study, SET can be used to explain why and how leading enterprises build connections with sub-suppliers directly instead of just with direct suppliers (Tachizawa and Wong, 2014). Moreover, SET can be helpful to investigate how social networks help diffuse GSCM experiences from leading enterprises to laggards (Sarkis *et al.*, 2011).

4-4 Knowledge-based view (KBV). In the resource-based view, knowledge is seen as a unique and inimitable resource, with complex social interaction, which makes it is hard to copy (Grant, 1996). For CE studies, a knowledge-based framework is applied to evaluate adoption of technological tools for developing industrial symbiosis (Grant *et al.*, 2010).

KBV has been mentioned in GSCM and is regarded as a potential theory for evaluating the GSCM context (Rameshwar *et al.*, 2017). Green knowledge or capabilities possessed by enterprises could be classified as green capital, human capital and social relationships capital (Lopez-Gamero *et al.*, 2010). Limited studies have investigated relations between green knowledge categories in GSCM with supply chain economic and non-economic performance, with opportunities for future research investigation.

CE theories missing in GSCM studies. As shown in Table II, endogenous growth, ecosystem, social cognition and evolutionary theories are applied in CE studies, but are not mentioned in GSCM studies. This section explores if and how these four CE theories can advance GSCM study.

5-1 Endogenous growth theory (EGT). EGT considers natural resources as rare productive factors (Lucas, 1988; Bigano *et al.*, 2016). EGT explores the balance of economic and environmental performance by improving resource efficiency (Smulders, 1995). This theoretical perspective is similar to CE goals for achieving "win-wins" in economic and environmental performance.

EGT can help GSCM study. Balancing economic and environmental performance has been a traditional GSCM goal. A consensus does not exist on how to achieve this balance. EGT takes waste, pollution and end-of-life products as production resources as endogenous factors. Evaluating and designing GSCM systems from EGT can provide insights; it can also help evaluate rare and endogenous resource roles.

5-2 Ecosystem theory (EcoT). EcoT is fundamentally related to the CE industrial park level by incorporating closed-loop industrial systems and the idea of mutualism (Nielsen, 2007). EcoT postulates two aspects of survival patterns exist: organism vs organism, which leads to competition, and organism vs the environment, which leads to mutualism (Fox, 2016).

The concept could be expanded to GSCM to explore supply chain member collaboration behaviors. Cooperation with suppliers and customers for ECO practices, supply chain logistics optimization, and eco-packaging are example GSCM behaviors. Still, collaboration and competition between supply chains for GSCM implementation are of interest to be further investigated from an optimization perspective; and survival and mutualism seem to be potential constructs that may explain some GSCM outcomes.

5-3 Social cognition theory (ScnT). ScnT identifies three elements for social integration, individual cognition, personal behaviors and social observation, and their interrelations (Hsieh, 2011; Constantinos and Leonidas, 2011; Butt *et al.*, 2017). Individual cognition within CE (e.g. waste disposal) relates to recycling behaviors. Recycling behaviors can gradually cause new patterns of CE implementation cognition (Hsieh, 2011). In addition, individual behaviors in recycling may affect the social construct structure of the CE concept, along with culture and CE identification; conversely, society will also affect individual behaviors (Hsieh, 2011). The logic can also be applied to enterprises and GSCM practices, that is, individual enterprise's cognition would affect their GSCM behaviors and the GSCM social environment.

5-4 Evolutionary theory (EvoT). EvoT presumes that the economy is always in a process of change, with economic activities that are always evolving in a context that is not completely familiar to or understood by actors (Nelson, 2008). For CE, a cluster of organizations and individuals interact and collaborate with each other to generate innovation. Organizations in an eco-industrial park are closely connected, and they collaborate and interact to form an evolutionary stable state in which each enterprise improves their eco-efficiency (Mathews and Tan, 2011).

For GSCM studies, collaboration can help achieve green efficiency improvement. Taking the ECO GSCM practice as an example, Cecere *et al.* (2014) found that locked-in and path dependence (high cost to switch into cleaner technologies) are two inhibitors to ECO innovation. Regulatory instruments and social awareness are prominent ECO innovation motivators. Future research needs more investigation on these eco-innovation evolution mechanisms.

Each of the eight CE theories have potential application to advance GSCM study. Thus, we propose the last proposition:

P4. With the development of GSCM practices, enterprises have extended collaboration from supply chains to supply chain networks. GSCM has many commonalities and relationships to CE practices. Each CE applied theory can further advance, explore, and understand GSCM.

Conclusions

In this paper, linkages between GSCM and the CE are identified and mutual theoretical applications are discussed. A systematic literature review identified 19 and 20 theories used in GSCM and CE studies, respectively. In all, 12 theories overlapped both fields of study. A critical analysis is employed to explore the mutual potential application of GSCM and CE theories; a cross-pollination of theories to advance both fields. Totally 182 GSCM studies have applied 19 theories. Each theory shows substantial promise for exploring and advancing CE study. CE studies with theoretical analysis are relatively limited, when evaluated as a percentage of all CE studies. These CE studies did seek to introduce 20 theoretical perspectives. In addition to the 12 theories already applied in both GSCM and CE, the remaining eight CE theories show promise to advance GSCM study.

This paper contributes to the literature by explicitly investigating the relationship between GSCM and CE. This investigation includes considering overlapping practices as well as similar, but different focused, performance objectives. Additionally, a summary of theories identified within GSCM and CE studies provide a valuable source for theoretical underpinning, further advancement of the theories, and advancing the fields of study. An in-depth analysis of theories, with a focus on theories applied in one topic and mentioned in the other topic, can provide ample opportunities to investigate multiple directions of theory cross-pollination; and at multiple levels of analysis across both fields. This paper serves as a good initial foundation for theory development, transfer, and application between CE and GSCM studies.

However, limitations still exist. Additional and emergent GSCM theories may exist that can help address nascent CE research issues. Conversely, additional CE theories could also help to address unforeseen issues in GSCM. Even though we identify the applied and potential theories, researchers will be able to identify alternative ways to develop potential theories; only a limited set of potential applications were identified in this paper. Methodologies and tools are not discussed in detail on how to link theories. Future research could more effectively discuss the most appropriate methodologies and tools that can help apply and advance theories in both fields. Overall, there is substantial research and theoretical progress to be made and falls within the goals of advancing theory in sustainability of supply chains and their networks. For example, much of this work focused on environmental sustainability; whether these theories and approaches can support advancement in social sustainability of supply chains and industrial practices requires nuanced investigation.

Notes

1. A list of 182 papers with details of publication information can be provided by contacting the corresponding author at qhzhu@sjtu.edu.cn
2. A list of 64 papers with details of publication information can be provided by contacting the corresponding author at qhzhu@sjtu.edu.cn

References

Ageron, B., Gunasekaran, A. and Spalanzani, A. (2012), "Sustainable supply management: an empirical study", *International Journal of Production Economics*, Vol. 140 No. 1, pp. 168-182.

Aigner, D., Lovell, C.A.K. and Schmidt, P. (1977), "Formulation and estimation of stochastic frontier production function models", *Journal of Econometrics*, Vol. 6 No. 1, pp. 21-37.

Aminoff, A. and Kettunen, O. (2016), "Sustainable supply chain management in a circular economy-towards supply circles", in Setchi, R., Howlett, R.J., Liu, Y. and Theobald, P. (Eds), *Sustainable Design and Manufacturing 2016*, Springer, Cham, pp. 61-72.

Anderberg, S. (1998), "Industrial metabolism and the linkages between economics, ethics and the environment", *Ecological Economics*, Vol. 24 No. 2, pp. 311-320.

Anthony, L.P. (2006), "Economic clusters and the supply chain: a case study", *Supply Chain Management: An International Journal*, Vol. 11 No. 3, pp. 266-270.

Aoe, T. (2007), "Eco-efficiency and ecodesign in electrical and electronic products", *Journal of Cleaner Production*, Vol. 15 No. 15, pp. 1406-1414.

Ashton, W. (2008), "Understanding the organization of industrial ecosystems – a social network approach", *Journal of Industrial Ecology*, Vol. 12 No. 1, pp. 34-51.

Ashton, W.S. and Bain, A.C. (2012), "Assessing the 'short mental distance' in eco-industrial networks", *Journal of Industrial Ecology*, Vol. 16 No. 1, pp. 70-82.

Baas, L. (2011), "Planning and uncovering industrial symbiosis: comparing the Rotterdam and Ostergotland regions", *Business Strategy and the Environment*, Vol. 20 No. 7, pp. 428-440.

Barney, J. (1991), "Firm resources and sustained competitive advantage", *Journal of Management*, Vol. 17 No. 1, pp. 99-120.

Berger, G., Flynn, A., Hines, F. and Johns, R. (2001), "Ecological modernization as a basis for environmental policy: current environmental discourse and policy and the implications on environmental supply chain management", *Innovation*, Vol. 14 No. 1, pp. 67-72.

Berke, J.D. and Satir, A. (2011), "Sustainability in supply chain management: a literature review and a conceptual flow cycle", *International Journal of Sustainable Strategic Management*, Vol. 3 No. 1, pp. 50-72.

Bigano, A., Śniegocki, A. and Zotti, J. (2016), "Policies for a more dematerialized EU economy. theoretical underpinnings, political context and expected feasibility", *Sustainability (Switzerland)*, Vol. 8 No. 8, pp. 1-22.

Bilitewski, B. (2012), "The circular economy and its risks", *Waste Management*, Vol. 32 No. 1, pp. 1-2.

Bing, X., Bloemhof-Ruwaard, J., Chaabane, A. and Van Der Vorst, J. (2015), "Global reverse supply chain redesign for household plastic waste under the emission trading scheme", *Journal of Cleaner Production*, Vol. 103, pp. 28-39.

Bourdieu, P. (2001), "The forms of capital", in Granovetter, M. and Swedbe, R. (Eds), *Sociology of Economic Life*, Westview Press, Boulder, CO, pp. 96-111.

Brandenburg, M., Govindan, K., Sarkis, J. and Seuring, S. (2014), "Quantitative models for sustainable supply chain management: developments and directions", *European Journal of Operational Research*, Vol. 233 No. 2, pp. 299-312.

Butt, M.M., Mushtaq, S., Afzal, A., Khong, K.W., Ong, F.S. and Ng, P.F. (2017), "Integrating behavioural and branding perspectives to maximize green brand equity: a holistic approach", *Business Strategy and the Environment*, Vol. 26 No. 4, pp. 507-520.

Cecere, G., Corrocher, N., Gossart, C. and Ozman, M. (2014), "Lock-in and path dependence: an evolutionary approach to eco-innovations", *Journal of Evolutionary Economics*, Vol. 24 No. 5, pp. 1037-1065.

Chakravarthy, B. (1997), "A new strategy framework for coping with turbulence", *Sloan Management Review*, Vol. 38 No. 2, pp. 69-82.

Chen, J.Z. (2009), "Material flow and circular economy", *Systems Research and Behavioral Science*, Vol. 26 No. 2, pp. 269-278.

Chen, X. (2012), "Spatial analysis and evaluation system for the planning of regional recycling network: empirical and modeling analyses in Japan", PhD, Nagoya University, Nagoya.

Chertow, M.R. (2000), "Industrial symbiosis: literature and taxonomy", *Annual Review of Energy and the Environment*, Vol. 25 No. 1, pp. 313-337.

Child, J. (1972), "Organizational structure, environment and performance: the role of strategic choice", *Sociology*, Vol. 6 No. 1, pp. 1-22.

Choi, D. and Hwang, T. (2015), "The impact of green supply chain management practices on firm performance: the role of collaborative capability", *Operations Management Research*, Vol. 8 Nos 3/4, pp. 69-83.

Constantinos, N.L. and Leonidas, C.L. (2011), "Research into environmental marketing/management: a bibliographic analysis", *European Journal of Marketing*, Vol. 45 Nos 1/2, pp. 68-103.

Côté, R. and Hall, J. (1995), "Industrial parks as ecosystems", *Journal of Cleaner Production*, Vol. 3 No. 1, pp. 41-46.

Côté, R.P. and Cohen-Rosenthal, E. (1998), "Designing eco-industrial parks: a synthesis of some experiences", *Journal of Cleaner Production*, Vol. 6 No. 3, pp. 181-188.

Cruz, J.M. (2009), "The impact of corporate social responsibility in supply chain management: multicriteria decision-making approach", *Decision Support Systems*, Vol. 48 No. 1, pp. 224-236.

Cruz, J.M. and Matsypura, D. (2009), "Supply chain networks with corporate social responsibility through integrated environmental decision-making", *International Journal of Production Research*, Vol. 47 No. 3, pp. 621-648.

De Jesus, A., Antunes, P., Santos, R. and Mendonça, S. (2018), "Eco-innovation in the transition to a circular economy: an analytical literature review", *Journal of Cleaner Production*, Vol. 172, pp. 2999-3018.

De Los Rios, I.C. and Charnley, F.J.S. (2017), "Skills and capabilities for a sustainable and circular economy: The changing role of design", *Journal of Cleaner Production*, Vol. 160, pp. 109-122.

DiMaggio, P. and Powell, W.W. (1983), "The iron cage revisited: collective rationality and institutional isomorphism in organizational fields", *American Sociological Review*, Vol. 48 No. 2, pp. 147-160.

Domenech, T. and Davies, M. (2011), "The role of embeddedness in industrial symbiosis networks: phases in the evolution of industrial symbiosis networks", *Business Strategy and the Environment*, Vol. 20 No. 5, pp. 281-296.

Dubey, R., Gunasekaran, A., Childe, S.J., Papadopoulos, T., Wamba, S.F. and Song, M. (2016), "Towards a theory of sustainable consumption and production: constructs and measurement", *Resources, Conservation and Recycling*, Vol. 106 No. 1, pp. 78-89.

Edward, F.R. (1984), "Strategic management: a stakeholder approach", *Journal of Management Studies*, Vol. 29 No. 2, pp. 131-154.

Ehrenfeld, J. and Gertler, N. (1997), "Industrial ecology in practice: the evolution of interdependence at Kalundborg", *Journal of Industrial Ecology*, Vol. 1 No. 1, pp. 67-79.

Eltayeb, T.K., Zailani, S. and Ramayah, T. (2011), "Green supply chain initiatives among certified companies in Malaysia and environmental sustainability: investigating the outcomes", *Resources Conservation and Recycling*, Vol. 55 No. 5, pp. 495-506.

Emerson, R.M. (1976), "Social exchange theory", *Annual Review of Sociology*, Vol. 2 No. 1, pp. 335-362.

Erlandsson, J. and Tillman, A.M. (2009), "Analysing influencing factors of corporate environmental information collection, management and communication", *Journal of Cleaner Production*, Vol. 17 No. 9, pp. 800-810.

Feng, T., Cai, D., Wang, D. and Zhang, X. (2016), "Environmental management systems and financial performance: the joint effect of switching cost and competitive intensity", *Journal of Cleaner Production*, Vol. 113, pp. 781-791.

Fox, S. (2016), "Open prosperity: how latent realities arising from virtual-social-physical convergence (VSP) increase opportunities for global prosperity", *Technology in Society*, Vol. 44 No. 1, pp. 92-103.

Gavronski, I., Klassen, R.D., Vachon, S. and Machado Do Nascimento, L.F. (2011), "A resource-based view of green supply management", *Transportation Research Part E-Logistics and Transportation Review*, Vol. 47 No. 6, pp. 872-885.

Geng, R., Mansouri, A. and Aktas, E. (2017), "The relationship between green supply chain management and performance: a meta-analysis of empirical evidences in Asian emerging economies", *International Journal of Production Economics*, Vol. 183 No. 1, pp. 245-258.

Geng, Y. and Doberstein, B. (2008), "Developing the circular economy in China: challenges and opportunities for achieving 'leapfrog development' ", *International Journal of Sustainable Development and World Ecology*, Vol. 15 No. 3, pp. 231-239.

Geng, Y., Sarkis, J. and Ulgiati, S. (2016), "Sustainability, well-being, and the circular economy in China and worldwide", *Science*, Vol. 6278, pp. 73-76.

Geng, Y., Sarkis, J., Ulgiati, S. and Zhang, P. (2013), "Measuring China's circular economy", *Science*, Vol. 339 No. 6127, pp. 1526-1527.

Geng, Y., Zhang, P., Cote, R.P. and Fujita, T. (2009), "Assessment of the national eco-industrial park standard for promoting industrial symbiosis in China", *Journal of Industrial Ecology*, Vol. 13 No. 1, pp. 15-26.

Genovese, A., Acquaye, A.A., Figueroa, A. and Koh, S.C.L. (2017), "Sustainable supply chain management and the transition towards a circular economy: evidence and some applications", *Omega-International Journal of Management Science*, Vol. 66 No. B, pp. 344-357.

Ghali, M.R., Frayret, J.M. and Robert, J.M. (2016), "Green social networking: concept and potential applications to initiate industrial synergies", *Journal of Cleaner Production*, Vol. 115, pp. 23-35.

Ghisellini, P., Cialani, C. and Ulgiati, S. (2016), "A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems", *Journal of Cleaner Production*, Vol. 114, pp. 11-32.

Goktan, A.B. (2014), "Impact of green management on CEO compensation: interplay of the agency theory and institutional theory perspectives", *Journal of Business Economics and Management*, Vol. 15 No. 1, pp. 96-110.

Granovetter, M. (1985), "Economic action and social structure: the problem of embeddedness", *American Journal of Sociology*, Vol. 91 No. 3, pp. 481-510.

Grant, G.B., Seager, T.P., Massard, G. and Nies, L. (2010), "Information and communication technology for industrial symbiosis", *Journal of Industrial Ecology*, Vol. 14 No. 5, pp. 740-753.

Grant, R. (1996), "Toward a knowledge-based theory of the firm", *Strategic Management Journal*, Vol. 17 No. 52, pp. 109-122.

Green, K.W. Jr, Zelbst, P.J., Meacham, J. and Bhadauria, V.S. (2012), "Green supply chain management practices: impact on performance", *Supply Chain Management*, Vol. 17 No. 3, pp. 290-305.

Haas, W., Krausmann, F., Wiedenhofer, D. and Heinz, M. (2015), "How circular is the global economy? an assessment of material flows, waste production, and recycling in the European Union and the world in 2005", *Journal of Industrial Ecology*, Vol. 19 No. 5, pp. 765-777.

Hazen, B.T., Skipper, J.B., Ezell, J.D. and Boone, C.A. (2016), "Big data and predictive analytics for supply chain sustainability: a theory-driven research agenda", *Computers & Industrial Engineering*, Vol. 101 No. 11, pp. 592-598.

Hein, A.M., Jankovic, M., Feng, W., Farel, R., Yune, J.H. and Yannou, B. (2017), "Stakeholder power in industrial symbioses: a stakeholder value network approach", *Journal of Cleaner Production*, Vol. 148, pp. 923-933.

Hickle, G. (2017), "Extending the boundaries: an assessment of the integration of extended producer responsibility within corporate social responsibility", *Business Strategy and the Environment*, Vol. 26 No. 1, pp. 112-124.

Hsieh, M.Y. (2011), "An empirical survey: can green marketing really entice customers to pay more?", *E3 Journal of Business Management and Economics*, Vol. 2 No. 4, pp. 132-146.

Hu, Y., Lin, J., Cui, S. and Khanna, N.Z. (2016), "Measuring urban carbon footprint from carbon flows in the global supply chain", *Environmental Science & Technology*, Vol. 50 No. 12, pp. 6154-6163.

Jackson, M., Lederwasch, A. and Giurco, D. (2014), "Transitions in theory and practice: managing metals in the circular economy", *Resources*, Vol. 3 No. 3, pp. 516-543.

Jiang, R.H.J. and Bansal, P. (2003), "Seeing the need for ISO 14001", *Journal of Management Studies*, Vol. 40 No. 4, pp. 1047-1067.

Jurgilevich, A., Birge, T., Kentala-Lehtonen, J., Korhonen-Kurki, K., Pietikäinen, J., Saikku, L. and Schösler, H. (2016), "Transition towards circular economy in the food system", *Sustainability (Switzerland)*, Vol. 8 No. 1, pp. 1-14.

Kirchoff, J.F., Tate, W.L. and Mollenkopf, D.A. (2016), "The impact of strategic organizational orientations on green supply chain management and firm performance", *International Journal of Physical Distribution and Logistics Management*, Vol. 46 No. 3, pp. 269-292.

Kudla, N.L. and Klaas-Wissing, T. (2012), "Sustainability in shipper-logistics service provider relationships: a tentative taxonomy based on agency theory and stimulus-response analysis", *Journal of Purchasing and Supply Management*, Vol. 18 No. 4, pp. 218-231.

Kuei, C.H., Madu, C.N., Chow, W.S. and Chen, Y. (2015), "Determinants and associated performance improvement of green supply chain management in China", *Journal of Cleaner Production*, Vol. 95, pp. 163-173.

Laari, S., Toyli, J., Solakivi, T. and Ojala, L. (2016), "Firm performance and customer-driven green supply chain management", *Journal of Cleaner Production*, Vol. 112, pp. 1960-1970.

Lai, K.H., Cheng, T.C.E. and Yeung, A.C.L. (2005), "Relationship stability and supplier commitment to quality", *International Journal of Production Economics*, Vol. 96 No. 3, pp. 397-410.

Lai, K.H., Wong, C.W.Y. and Lun, Y.H.V. (2014), "The role of customer integration in extended producer responsibility: a study of Chinese export manufacturers", *International Journal of Production Economics*, Vol. 147 No. 1, pp. 284-293.

Lai, K.H., Wu, S.J. and Wong, C.W.Y. (2013), "Did reverse logistics practices hit the triple bottom line of Chinese manufacturers?", *International Journal of Production Economics*, Vol. 146 No. 1, pp. 106-117.

Lopez-Gamero, M.D., Molina-Azorin, J.F. and Claver-Cortes, E. (2010), "The potential of environmental regulation to change managerial perception, environmental management, competitiveness and financial performance", *Journal of Cleaner Production*, Vol. 18 Nos 10/11, pp. 963-974.

Lucas, R.E. (1988), "On the mechanics of economic development", *Journal of Monetary Economics*, Vol. 22 No. 1, pp. 3-42.

Mathews, J.A. and Tan, H. (2011), "Progress toward a circular economy in China: the drivers (and inhibitors) of eco-industrial initiative", *Journal of Industrial Ecology*, Vol. 15 No. 3, pp. 435-457.

Matos, S. and Hall, J. (2007), "Integrating sustainable development in the supply chain: the case of life cycle assessment in oil and gas and agricultural biotechnology", *Journal of Operations Management*, Vol. 25 No. 6, pp. 1083-1102.

Mayer, H. (2005), "Cluster monitor", *Economic Development Journal*, Vol. 4 No. 4, pp. 40-53.

Mitchell, R.K., Agle, B.R. and Wood, D.J. (1997), "Toward a theory of stakeholder identification and salience: defining the principle of who and what really counts", *Academy of Management Review*, Vol. 22 No. 4, pp. 853-886.

Murray, A., Skene, K. and Haynes, K. (2017), "The circular economy: an interdisciplinary exploration of the concept and application in a global context", *Journal of Business Ethics*, Vol. 140 No. 3, pp. 369-380.

Nasir, M.H.A., Genovese, A., Acquaye, A.A., Koh, S.C.L. and Yamoah, F. (2017), "Comparing linear and circular supply chains: a case study from the construction industry", *International Journal of Production Economics*, Vol. 183 No. 1, pp. 443-457.

Nelson, R.R. (2008), "Economic development from the perspective of evolutionary economic theory", *Oxford Development Studies*, Vol. 36 No. 1, pp. 9-21.

Nielsen, S.N. (2007), "What has modern ecosystem theory to offer to cleaner production, industrial ecology and society? The views of an ecologist", *Journal of Cleaner Production*, Vol. 15 No. 17, pp. 1639-1653.

Patala, S., Hämäläinen, S., Jalkala, A. and Pesonen, H.L. (2014), "Towards a broader perspective on the forms of eco-industrial networks", *Journal of Cleaner Production*, Vol. 82, pp. 166-178.

Pfeffer, J. (1977), "The ambiguity of leadership", *Academy of Management Review*, Vol. 2 No. 1, pp. 104-112.

Pierson, P. (2000), "Increasing returns, path dependence, and the study of politics", *American Political Science Review*, Vol. 94 No. 2, pp. 251-267.

Putnam, R.D. (1995), "Bowling alone: America's declining social capital", *Journal of Democracy*, Vol. 6 No. 1, pp. 65-78.

Rameshwar, D., Angappa, G. and Thanos, P. (2017), "Green supply chain management: theoretical framework and further research directions", *Benchmarking: An International Journal*, Vol. 24 No. 1, pp. 184-218.

Richard, S.W. (2001), *Institutions and Organizations*, Sage, Thousand Oaks, CA.

Rogers, E. (2003), *Diffusion of Innovation* , 5th ed., Free Press, New York, NY.

Roh, J.J., Yang, M.G., Park, K. and Hong, P. (2015), "Stakeholders' pressure and managerial responses: lessons from hybrid car development and commercialisation", *International Journal of Business Information Systems*, Vol. 18 No. 4, pp. 506-529.

Romero, E. and Ruiz, M.C. (2014), "Proposal of an agent-based analytical model to convert industrial areas in industrial eco-systems", *Science of the Total Environment*, Vol. 468 No. 2, pp. 394-405.

Roseland, M. (1997), "Dimensions of the eco-city", *Cities*, Vol. 14 No. 4, pp. 197-202.

Rowley, T.J. (1997), "Moving beyond dyadic ties: a network theory of stakeholder influences", *Academy of Management Review*, Vol. 22 No. 4, pp. 887-910.

Sajjad, A., Eweje, G. and Tappin, D. (2015), "Sustainable supply chain management: motivators and barriers", *Business Strategy and the Environment*, Vol. 24 No. 7, pp. 643-655.

Sarkis, J. (2012), "A boundaries and flows perspective of green supply chain management", *Supply Chain Management-An International Journal*, Vol. 17 No. 2, pp. 202-216.

Sarkis, J., Helms, M.M. and Hervani, A.A. (2010), "Reverse logistics and social sustainability", *Corporate Social Responsibility and Environmental Management*, Vol. 17 No. 6, pp. 337-354.

Sarkis, J., Zhu, Q. and Lai, K.H. (2011), "An organizational theoretic review of green supply chain management literature", *International Journal of Production Economics*, Vol. 130 No. 1, pp. 1-15.

Scrase, I. and Smith, A. (2009), "The (non-)politics of managing low carbon socio-technical transitions", *Environmental Politics*, Vol. 18 No. 5, pp. 707-726.

Seuring, S. and Gold, S. (2012), "Conducting content-analysis based literature reviews in supply chain management", *Supply Chain Management-An International Journal*, Vol. 17 No. 5, pp. 544-555.

Seuring, S. and Muller, M. (2008), "From a literature review to a conceptual framework for sustainable supply chain management", *Journal of Cleaner Production*, Vol. 16 No. 15, pp. 1699-1710.

Shi, H., Chertow, M. and Song, Y.Y. (2010), "Developing country experience with eco-industrial parks: a case study of the Tianjin economic-technological development area in China", *Journal of Cleaner Production*, Vol. 18 No. 3, pp. 191-199.

Smulders, S. (1995), "Environmental policy and sustainable economic growth", *De Economist*, Vol. 143 No. 2, pp. 163-195.

Song, Q., Li, J. and Zeng, X. (2015), "Minimizing the increasing solid waste through zero waste strategy", *Journal of Cleaner Production*, Vol. 104, pp. 199-210.

Spaargaren, G. (2000), "Ecological modernization theory and domestic consumption", *Journal of Environmental Policy and Planning*, Vol. 2 No. 4, pp. 323-335.

Su, B., Heshmati, A., Geng, Y. and Yu, X. (2013), "A review of the circular economy in China: moving from rhetoric to implementation", *Journal of Cleaner Production*, Vol. 42, pp. 215-227.

Sydow, J., Schreyogg, G. and Koch, J. (2009), "Organizational path dependence: opening the black box", *Academy of Management Review*, Vol. 34 No. 4, pp. 689-709.

Tachizawa, E.M. and Wong, C.Y. (2014), "Towards a theory of multi-tier sustainable supply chains: a systematic literature review", *Supply Chain Management-an International Journal*, Vol. 19 Nos 5/6, pp. 643-663.

Tosi, H.L. and Slocum, J.W. (1984), "Contingency theory: some suggested directions", *Journal of Management*, Vol. 10 No. 1, pp. 9-26.

Touboulic, A. and Walker, H. (2015), "Theories in sustainable supply chain management: a structured literature review", *International Journal of Physical Distribution & Logistics Management*, Vol. 45 Nos 1/2, pp. 16-42.

Trentin, A., Forza, C. and Perin, E. (2015), "Embeddedness and path dependence of organizational capabilities for mass customization and green management: a longitudinal case study in the machinery industry", *International Journal of Production Economics*, Vol. 169 No. 11, pp. 253-276.

Vachon, S. and Klassen, R.D. (2006), "Green project partnership in the supply chain: the case of the package printing industry", *Journal of Cleaner Production*, Vol. 14 Nos 6/7, pp. 661-671.

Voß, J.-P., Smith, A. and Grin, J. (2009), "Designing long-term policy: rethinking transition management", *Policy Sciences*, Vol. 42 No. 4, pp. 275-302.

Von Bertalanffy, L. (1968), *General System Theory*, Braziller, New York, NY.

Wang, P., Che, F., Fan, S. and Gu, C. (2014), "Ownership governance, institutional pressures and circular economy accounting information disclosure an institutional theory and corporate governance theory perspective", *Chinese Management Studies*, Vol. 8 No. 3, pp. 487-501.

Wilhelm, M.M., Blome, C., Bhakoo, V. and Paulraj, A. (2016), "Sustainability in multi-tier supply chains: understanding the double agency role of the first-tier supplier", *Journal of Operations Management*, Vol. 41 No. 1, pp. 42-60.

Wong, C.Y., Boon-Itt, S. and Wong, C.W.Y. (2011), "The contingency effects of environmental uncertainty on the relationship between supply chain integration and operational performance", *Journal of Operations Management*, Vol. 29 No. 6, pp. 604-615.

Youn, S., Yang, M.G. and Roh, J.J. (2012), "Extending the efficient and responsive supply chains framework to the green context", *Benchmarking*, Vol. 19 No. 4, pp. 463-480.

Yu, J., Hills, P. and Welford, R. (2008), "Extended producer responsibility and eco-design changes: perspectives from China", *Corporate Social Responsibility and Environmental Management*, Vol. 15 No. 2, pp. 111-124.

Yu, J.C.P. (2016), "3PL implementing corporate social responsibility in a closed-loop supply chain: a conceptual approach", *International Journal of Supply Chain Management*, Vol. 5 No. 2, pp. 7-15.

Yuan, Z.W., Bi, J. and Moriguichi, Y. (2006), "The circular economy – a new development strategy in China", *Journal of Industrial Ecology*, Vol. 10 Nos 1/2, pp. 4-8.

Zailani, S., Jeyaraman, K., Vengadasan, G. and Premkumar, R. (2012), "Sustainable supply chain management (SSCM) in Malaysia: a survey", *International Journal of Production Economics*, Vol. 140 No. 1, pp. 330-340.

Zeng, H., Chen, X., Xiao, X. and Zhou, Z. (2017), "Institutional pressures, sustainable supply chain management, and circular economy capability: empirical evidence from Chinese eco-industrial park firms", *Journal of Cleaner Production*, Vol. 155, pp. 54-65.

Zheng, K. and Jia, S. (2017), "Promoting the opportunity identification of industrial symbiosis: agent-based modeling inspired by innovation diffusion theory", *Sustainability (Switzerland)*, Vol. 9 No. 5, pp. 1-24.

Zhu, Q. and Cote, R.P. (2004), "Integrating green supply chain management into an embryonic eco-industrial development: a case study of the Guitang Group", *Journal of Cleaner Production*, Vol. 12 Nos 8/10, pp. 1025-1035.

Zhu, Q. and Sarkis, J. (2004), "Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises", *Journal of Operations Management*, Vol. 22 No. 3, pp. 265-289.

Zhu, Q., Geng, Y. and Lai, K.H. (2011), "Environmental supply chain cooperation and its effect on the circular economy practice-performance relationship among Chinese manufacturers", *Journal of Industrial Ecology*, Vol. 15 No. 3, pp. 405-419.

Zhu, Q., Geng, Y., Sarkis, J. and Lai, K.H. (2011), "Evaluating green supply chain management among Chinese manufacturers from the ecological modernization perspective", *Transportation Research Part E-Logistics and Transportation Review*, Vol. 47 No. 6, pp. 808-821.

Zhu, Q., Geng, Y., Sarkis, J. and Lai, K.H. (2014), "Barriers to promoting eco-lndustrial parks development in China: perspectives from senior officials at national industrial parks", *Journal of Industrial Ecology*, Vol. 19 No. 3, pp. 457-467.

Zhu, Q., Sarkis, J. and Geng, Y. (2005), "Green supply chain management in China: pressures, practices and performance", *International Journal of Operations & Production Management*, Vol. 25 Nos 5/6, pp. 449-468.

Zhu, Q., Sarkis, J. and Lai, K.H. (2007), "Initiatives and outcomes of green supply chain management implementation by Chinese manufacturers", *Journal of Environmental Management*, Vol. 85 No. 1, pp. 179-189.

Zhu, Q., Sarkis, J. and Lai, K.H. (2008a), "Confirmation of a measurement model for green supply chain management practices implementation", *International Journal of Production Economics*, Vol. 111 No. 2, pp. 261-273.

Zhu, Q., Sarkis, J. and Lai, K.H. (2008b), "Green supply chain management implications for 'closing the loop' ", *Transportation Research Part E-Logistics and Transportation Review*, Vol. 44 No. 1, pp. 1-18.

Corresponding author
Qinghua Zhu can be contacted at: qhzhu@sjtu.edu.cn