Proceedings of the International Conference on Industrial Engineering and Operations Management
Bangkok, Thailand, March 5-7, 2019

Environment Sustainability in Petrochemical Industry in Indonesia

Yuary Farradia and Abdul Talib Bin Bon
Faculty of Technology and Management
Universiti Tun Hussein Onn
Batupahat, Johor , Malaysia
juaryfarradia@yahoo.com, talibon@gmail.com

Tutus Rully
Faculty of Economics Pakuan University Bogor, Indonesia
tutusrully@rocketmail.com

Abstract

Indonesia, have embarked on basic petrochemical product expansion. Despite the effort for expanding domestic petrochemical plants, however, petrochemicals contribute to Indonesia emissions due to its relatively high share of biomass. In order to prevent further degradation of the environment, Indonesia's Industry Ministry has prepared a new regulation to set sustainability requirement and layout the incentive for businesses to help the country lower its carbon emissions by 29% by 2030. Green Supply Chain Management plays the main role for the manufacturing industry to reduce the environmental impacts to the business which could reduce the business cost incurred to the business. The overall objective of this study is to identify the extent of external GSCM practices toward environment sustainability and to draw the relationship between external GSCM practices on environment sustainability of petrochemical industry in Indonesia. External GSCM consist of green purchasing and reverse logistic. This study was conducted among petrochemical olefin manufactures based in Banten Province Indonesia. The result showed that External GSCM has direct effect on environment sustainability which supported by the Indonesia Ministerial Decree No 6/2013 regarding company environmental performance program namely PROPER program.

Keywords
Environment Sustainability, External Green Supply Chain Management, Petrochemical, Green Purchasing, Reverse Logistic

1. Introduction

Based on the KPMG Asia Pacific Report (2014), ASEAN countries, in particular, Indonesia, have embarked on basic petrochemical product expansion. However, despite the effort to improve Indonesia's petrochemical production capacity, these petrochemical companies also need to care and protects the environment with minimizing every environmental impact from its activities in which supported by Environmental Aspect & Impact Document to make sure its safety in order to prevent pollution. In order to compete sustainably in the evolving ecosystem, producers must adapt to their regional environments. One of the longer-term goals of the sector are guided by the Presidential Decree No. 5/2006 on KEN emphasizes environmental sustainability concerns. In order to prevent further degradation of the environment, Indonesia's Industry Ministry has prepared a new regulation to set sustainability requirement and layout the incentive for businesses to help the country lower its carbon emissions by 29% by 2030 (Jakarta Globe, 2017). Further, strategic plan 2015 – 2019 of Directorate General of Climate Change Ministry of Environment and Forests (Directorate General of Climate Change Ministry of Environment and Forests, 2015), has followed the regulation issued by the Ministry of National Development such as economically feasible, socially acceptable, environmentally sustainable.

Environmental management is becoming more important for corporations as the emphasis on the environmental protection by organizational stakeholders, governments, employees, customers, competitors, and communities, keeps increasing. Some popular programs developed for environmentally conscious practices are started from design for environment, life cycle analysis, total quality environmental management, ISO 14001, up to an establishment of a Green Supply Chain Management (GSCM) concept. The green supply chain management (GSCM) not only can lower the costs leading to significant advantages and profit but also make companies be more responsible towards the environment issues (Nikbakhsh, 2009). Laari (2016) has emphasized that collaboration between various supply chain members is an essential tool for reducing the products' environmental impact and enhancing a firm's environmental performance.

The study is aimed to understand in what extent of the external GSCM practice within the petrochemical industry in Indonesia toward environment sustainability. This study also analyzes the relationship between external GSCM and environment sustainability.

2. Conceptual Model

Resource Based View Theory. The Resource Based Theory (RBV) takes the stand point that firm's resources and capabilities are they key sources of sustainable competitive advantage (Hart, 1995; Shi et al., 2012). Hart (1995) extended the RBV and included the natural environment as a previously ignored but important source of resources and capabilities, creating the NRBV. The NRBV has often been used to study green practices in the supply chain (Vachon & Klassen, 2006, 2008). In addition to the RBV theory, the natural environment is seen as a new resource that firms can use to create differentiated products or services, leading to brand loyalty and a good reputation for them (Suansawat, 2013). In this study, the RBV theory is used to explain the relationship between collaborative practices and performance. The dimension of external green supply chain management practice (green purchasing and reverse logistics) is the implementations of RBV theory in the industry. This study then needs to know in what extent the industry implements external green supply chain management practices subject to environment concern.

Institutional Theory. The institutional theory determines how external forces influence organizational actions (Lai, et al. 2006). In this study, we adopt the lenses of Institutional Theory to examine how external pressures coming from the environment in which the firm operates (particularly coercive and normative pressures in the country in which firms are located). GSCM practices are a kind of organizational action that reduce environmental impact while flow products and services from origin to end customers. The theory explained that the external drivers are government important customers and partnerships (Sarkis, et al. 2011). So there can be a connection between GSCM practices and institutional theory. Institutional theory is relevant to the adoption of GSCM practices as firms operate in a way that meets social and legal expectations (Tate, et al., 2011). The Environment Management in Indonesia was managed by the Ministry of Environment and Forestry (MOEF) which is principally regulated by Law No. 32 on Environmental Management and Protection and PROPER is one of a government program to review and give a rating on the corporation subject to environmental management system standardization. Thus this practice is part of normative pressures by the government in Indonesia to the Petrochemical Industry as well.

Stakeholder Theory. The stakeholder theory (Freeman, 1984, p.43), stated that "Any organization performs to benefit and satisfy its stakeholders including government, investors, political groups, customers, suppliers, communities, trade associations, and employees". The Tri Bottom Line (TBL) concept on sustainability firm performance is related to the stakeholder theory. Not only the firm's concern on their economic, environment and social performance sustainability, but also the government itself. From petrochemical firms stakeholder perspective, there are other factors that also motivate businesses to improve their environmental records and enhance their competitiveness in the marketplace, despite the government enforcement on green industry concept that drives businesses to go green and implement environmental management systems (EMS).

2.1. Green supply chain management practice

The most important goal of GSCM is to reduce the environmental pollution from upstream to downstream when procuring raw materials, producing, distributing, selling products and in product depreciation (Felatoonitoosi *et al*., 2013). In addition, the risk associated with the environmental non - compliance also drive GSCM practices. Risk can be exogenous, such industry environment (Roechrich et al. 2014) whilst, environment incidents might damage a firm's image and reputation and have customers boycott firms or cancel their orders (Hajmohammad and Vachon, 2016).

2.2 External green supply chain management practice

External GSCM involves the integration of environmentally conscious thinking into all phases of key supply chain management processes. Such activities include green materials sourcing, shipment and end of life management for products including easy recycling and or clean disposal. The external GSCM has direct contact with the external factor of a firm such as with supplier and customer. The External GSCM practices used in this study are referred to Green Purchasing (GP) and Reverse Logistics (RL).

2.3 Green purchasing practice

GP refers to the procurement of products and services that have a reduced effect on human health and the environment when compared with competing products or services that serve the same purpose (Vishal & Avinash, 2016). Pradeepa et al., (2012) also added that the aspect of social and environmental are associated with the acquisition of raw materials and resources, procedures and the product itself. Environmentally responsible purchasing is vital as unplanned purchasing of goods can severely damage the environment (Joshi & Rahman, 2015). Consumers possess the capability to prevent or decrease environmental damage by purchasing green products. Previous research indicates that consumers have a positive attitude towards environmental protection (Liu et al., 2012).

2.4 Reverse logistics practice

The term "green logistics" is defined as supply chain management practices and strategies that reduce the environmental and energy footprint of freight distribution, which focuses on material handling, waste management, packaging and transport (Rodrigue et al., 2012). Angeli (2016) supported by stating that the Green Logistics integrates environmentally conscious transport, the management of dangerous goods and the returned goods, the use of appropriate packaging, energy consumption and the use of natural resources. Green logistics relates to understanding and minimizing the environmental impacts of logistics as well as to measure the environmental impact of transport modes, certification to ISO 14001, the energy use reduction of logistics and reduce activities material use. Nevertheless, some activities can be classified as part of reverse logistics, such as reusable packaging materials and recycling. By applying reverse logistics practices, industries can efficiently use the resources and prevent pollution (Prakash & Barua, 2015).

3. Hypothesis Development

Hence, this study postulates that GSCM practices influence firm economic performance. The research hypotheses framework is illustrated at figure 1 below with hypotheses are developed as follow:
H_1: External GSCM directly has a positive effect on environment sustainability

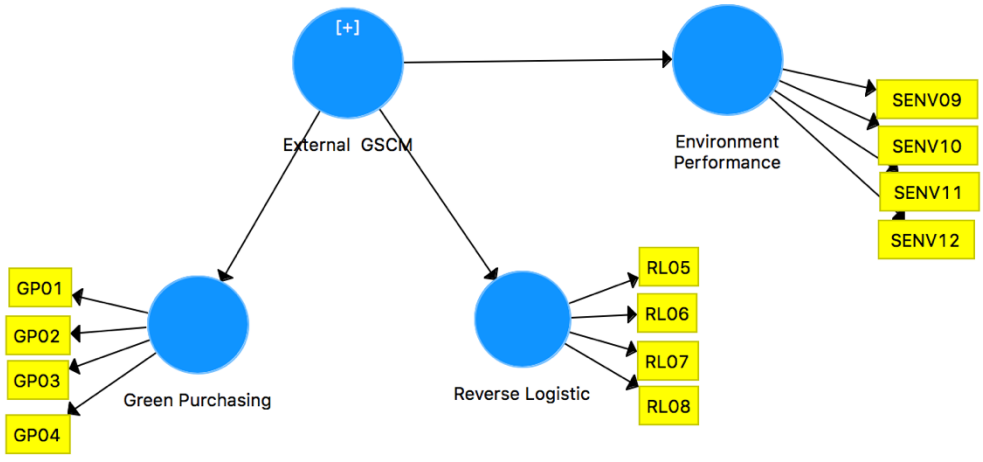

Figure 1. Research Model

4. Sample, Data Collection and Measurements

This study is focus on the Olefin petrochemical group located in Banten province Indonesia. As this survey is a purposive random sampling, thus the respondents are based on various department which relate to the activity of external green supply chain management. Having data screening form outliers by SPSS then the data ready for measurement analysis is 255. These 255 data then be analyzed by using Structural Equation Model (SEM) from Partial Least Square (PLS). In addition, the research model (figure 1) of this study consists a higher order construct. According to Hair et al (2017) higher-order modeling involves summarizing the lower-order components into a single multidimensional higher-order construct.

The measurement validity of these reflective variables within the first order construct covers environmental criteria of supplier selection; cooperation with the suppliers; environmental audit for supplier's internal management; environmental design specification to the suppliers; remanufacturing; cost savings in return process; revenue contribution by reverse logistics; decreasing inventory holding cost. According to Ramayah, et al., (2018), in the assessment of reflective measurement model, three main assessment criteria are needed at the outset such as the internal consistency reliability, convergent validity (indicator reliability / outer loading and average variance extracted) and discriminant validity. In this study, all the items' loadings for reflective construct have fullfilled all the criteria of the minimum cut-off value such as at 0.70 for the consistency reliability (Hair, et.al., 2013) as well as pass the threshold of minimum 0.70, 0.70 and 0.50 (Fornell & Larker, 1981) for the convergent validity Cronbach's alpha, composite reliability (CR) and average variance extracted (AVE) respectively.

Having measured the green purchasing and reverse logistic, then the higher order construct measurement of external green supply chain management will use the two stage approach as the tool for higher order construct measurement. Hence, the Green Purchasing and Reverse Logistic are modeled to the second order namely External GSCM. The two-stage approach is also can be applied to models with interaction effect among all constructs that are measured by reflective indicators.

Once we have confirmed that the construct measures are reliable and valid, the next step addresses the assessment of the structural model (figure 2) results.

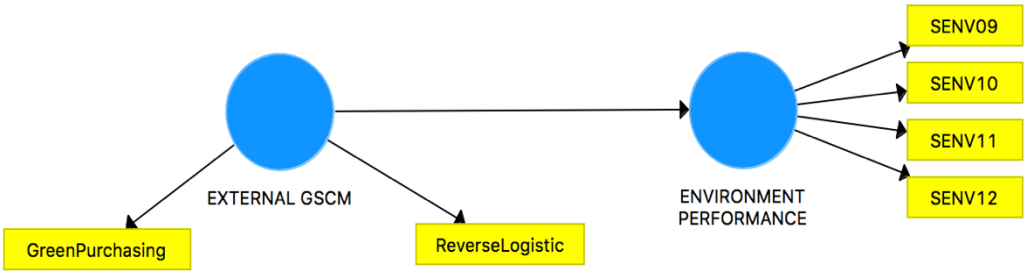

Figure 2. Structural Model

Hair (2018), suggested five indicators for the inner model measurement namely coefficient of determination (R^2), Effect size (f^2), predictive relevance (Q^2), the goodness of fit (GoF) and path coefficient. The measurement results are presented at table 1 – 6 below.

Table 1. Inner VIF value

	ENVIRONMENT PERFORMANCE
EXTERNAL GSCM	2.127

Table 2. Path values

RELATIONSHIP	PATH COEFFICIENT	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
	Original Sample (O)				
EXTERNAL GSCM -> ENVIRONMENT PERFORMANCE	0.14	0.139	0.081	1.734	**0.042**

Table 3. Confidence interval bias results

	Original Sample (O)	Sample Mean (M)	Bias	5.00%	95.00%
EXTERNAL GSCM -> ENVIRONMENT PERFORMANCE	0.14	0.139	-0.002	**0.018**	**0.281**

Table 4. R Square result

Construct	R Square	R Square Adjusted	Remarks for R Square
ENVIRONMENT PERFORMANCE	0.322	0.311	Substantial (Cohen, 1989); Moderate (Chin, 1998); close to moderate (Hair *et al*., 2017)

Table 5. Effect size result

	ENVIRONMENT PERFORMANCE
EXTERNAL GSCM	**0.014**

Table 6. Construct cross-validated redundancy

CONSTRUCT	SSO	SSE	Q^2 (=1-SSE/SSO)	REMARKS
ENVIRONMENT PERFORMANCE	1,020.00	781.578	0.234	Have Predictive Relevance for Endogenous Construct

Table 7. Hypothesis

Hypothesis	Relationship	Std Beta	Std Error	t - value	p - value	Decision
H1	EXTERNAL GSCM ➔ SUSTAINABILITY ENVIRONMENT PERFORMANCE	0.14	0.081	1.734	0.042	Supported

The result stated on table 1 up to table 6 above, fulfilled all criterion of structural model. Though R^2 value does not fulfilled for two tail criterion however this value still be accepted based on one tail criterion. Hence the hypothesis of this study can be concluded that external GSCM have positive relationship with environment performance.

5. Discussion and Conclusion

5.1 The extent of external green supply chain management practice within petrochemical industry in Indonesia toward environment sustainability

Sustainability and environmental issues are among the most pressing concerns for modern humanity, governments, and environmentally conscious business organizations to promote organizational sustainability, specifically for the emerging economies (Hsu et al., 2013; Fabbe-Costes et al., 2014; Tseng et al., 2015). Previous researchers, Dubey et al. (2015) and Zhu et al. (2012) have suggested that the regulatory bodies have forced the industries to improve adoption of green supply chain management (GSCM) practices

Green industry standardization has started to be implemented by some of the petrochemical producers in Indonesia. The Indonesia government also put high effort on the integrated petrochemical industry development by strengthening research and development toward green industry of petrochemical industry in order to create more market potential as well as to achieve the sustainability (Indonesia Development Regulation no 14, 2015). In addition, Indonesia's Industry Ministry law no 51/M-Ind/PER/6/2015 about Green Industry Standard Arrangement Guidance has an aim to establish green industry within Indonesia based on particular green industry standard covering scope, definition, technical requirement as well as manufacturing process management.

The Indonesia government also has issued a ministerial Decree No 6/2013 regarding company environmental performance program environment namely PROPER assessment to be implemented at all industry subject to their environment performance. Further on Indonesia PROPER certificates, there was a PROPER AWARD incentive to the all manufactures. Khoirunissa et al, (2015) in their study stated that The PROPER AWARD policy in Indonesia aims to encourage business industry to obey environmental regulations and achieve environmental excellence through the integration of sustainable development principles. The evaluation assesses the process of operation and service activity, implementation of environmental management systems, hazardous and nonhazardous waste management 3R (reuse, reduce, recycle), energy efficiency, natural resource conservation and company social responsibility for the community nearby. PROPER rating has classified the performance of a company that is characterized by certain colors which can drive companies to get more focused on environmental protection, which in turn creates sustainability for companies as well as for the environment and the communities (Reliantoro, 2013). The ratings of environmental business performances and/or activities are classified as follow:

a). Gold is for businesses and/or activities that have consistently demonstrated environmental excellence in terms of production or service processes, conducting business ethically and responsibly towards society. This award is KLH's highest recognition in the program for delivering excellent environmental operation.
b) Green is for businesses and/or activities that have performed environmental management beyond compliance through the implementation of environmental management systems, efficient utilization of resources and adequately implement community development programs.
c) Blue is for businesses and/or activities that have performed environmental management as required in accordance with any applicable laws or compliance criteria
d) Red denotes that the environmental management effort does not meet the requirements stipulated in the law.
e) Black is for activities that intentionally perform any act or omission that leads to pollution or environmental damage and violations of laws and regulations applicable or not carrying out administrative sanctions handed down to them.

5.3. External green supply chain management

The finding results indicate that external GSCM has a positive effect on environment performance. The dimension of external GSCM in this study is green purchasing and reverse logistic. Petrochemical industries, are responsible for consuming a huge share of energy, generating significant air emissions, and production of greenhouse gases, wastewater, noise pollution, toxic, and hazardous wastes and posing damages to the environment (Samuel et al. 2013). Environmental factor in an organization can be attributed to external and long-term focus which impacts society and organizational culture and thereby economic aspect in the long run. So, good corporate performance depends equally on the stewardship of the financial and environmental resources. As sustainability focuses on future for which present utilization of resources is necessary, hence, a good environmental performance by organization goes as an investment for future. Further Aryansl et al., (2016) study found that the organization operational components cover all aspects of sustainability, considering materials (raw material, intermediate material, and products, by-products, emission, and waste), the processes including synthesis, separation, refinement, handling, and storage of products, reducing emission level, and finally technology and infrastructure aspects.

External GSCM have already been implemented within the petrochemical industry in Indonesia, particularly in olefin petrochemical based. In line with the various green certification (i.e. ISO 14001, Eco label, Indonesia PROPER certificates) majority of the petrochemical manufacturers have set their product specification to be based on the green basis. Thus it implemented on their purchasing or procurement product specification.

Green purchasing has implemented in relation to their procurement activities as well as reverse logistic policy for both cost saving and waste minimization. Khastagir and Roy (2014) stated that Green development is one of the primary focus in sustainable development as it prioritizes environmental sustainability over economic and cultural considerations.

Majority implementation of external green supply chain management based on each dimension at petrochemical industry are at high extent level. For instance, most of the process suppliers selection are based on environmental criteria. However, not all suppliers are selected based on the environment point of view, such as vendor for the catering, uniform, safety shoes and some heavy duty spare parts. On the other side, firms provide design specification to suppliers that include environmental requirements indicates that firms already aware to implement the GSCM and its communicated to suppliers.

Reverse logistics is the least adopted practice by the petrochemical industry in Indonesia, in particular of inventory cost. Abdulrahman et al. (2014) described that one of a possible reason that causes reverse logistics to have less attention is due to low commitment to reverse logistics practices and lack of reverse logistics expert at management level in the manufacturing firms. Similarly, Yacob et al. (2012) also argue that lack of commitment to environmental issues, negative corporate attitudes toward environmental friendly activities, inadequate company culture and inconsistent top management support represent another set of barriers to implement reverse logistics activities. Thus without a strategic focus on environmental issues and standard operating procedures in place, organizations may not be able to be green and adopt reverse logistics (Abdullah, 2016).

5.4. Conclusion

In summary, the petrochemical industry in Indonesia indicates that the external GSCM practices affect the sustainability of environmental in line with the government effort toward fulfillment the green industry implementation. The external green supply chain management practice is one of the tool toward green industry model. Hence, it can be concluded that petrochemical industry in Indonesia is has a tendency toward fulfillment the green supply chain management application. Green purchasing is the most implemented dimension at the industry.

Acknowledgement

Thank you for the Faculty of Technology and Management - Universiti Tun Hussein Onn for the literatures access. Thank you for the support from Faculty of Economics – Universitas Pakuan.

References

Abdullah, R., (2016). Green Supply Chain Practices and Sustainable Performance Among ISO 14001 Manufacturing Firms: The Moderating Effect of Supply Chain Integration. PhD. Thesis Universiti Sains Malaysia

Abdulrahman, M. D., Gunasekaran, A., & Subramanisan, N. (2014). Critical bariers in implementing reverse logistics in the Chinese manufacturing sectors. *International Journal of Production Economics*, 147 (part B), 460-471

Angeli, E. (2016). Green Supply Chain Management Practices among Large Global Corporations. Thesis Master of Science (MSc) in Sustainable Development. Scholl of Economics, Business Administration & Legal Studies.

Aryanasl, A., Ghodousi J., Arjmandi, R., and Mansouri, N. (2017). Components of sustainability considerations in management of petrochemical industries. Environmental Monitoring and Assessment 189:274. Springer International Publishing Switzerland 2017. DOI 10.1007/s10661-017-5962

Directorate General of Climate Change Ministry Of Environment And Forestry. (2015). A Glance of Directorate General of Climate Change. Directorate General of Climate Change.

Dubey, R., Gunasekaran, A, and Ali, S. (2015). Exploring the Relationship Between Leadership, Operational Practices, Institutional Pressures and Environmental Performance: A Framework for Green Supply Chain. International Journal of Production Economics. Vol. 160, Part A, pp. 120 -132.

Fabbe-Costes, N,. Roussat, C., Taylor, M and Taylor, A. (2014), Sustainable Supply Chains: A Framework for Environmental Scanning Practices. International Journal of Operations and Production Management, Vol. 34 No 5, pp.664-694.

Falatoonoitoosi, E., Leman, Z., Sorooshian, S. and Salimi, M. (2013). Decision Making Trial and Evaluation Laboratory. Research Journal of Applied Sciences, Engineering, and Technology, vol. 5, no. 13, pp. 3475–3480.

Fornell, C., and Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research* (18:1), pp. 39-50.

Freeman, R.E. (1984). Strategic Management: A Stakeholder Approach. Pittman, Marshfield, M.A

Hair, J., Black, W., Babin, B., & Anderson, R. (2013). Multivariate Data Analysis. Pearson Education Limited.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). A primer on partial least squares structural equation modeling (PLS-SEM). Second Edition. Thousand Oaks, Califonia: Sage Publications.

Hair, J.F., Sarstedt, M., Ringle, CM., & Gudergan, S.P. (2018). Advanced Issues in Partial Least Square Structual Equation Modeling (PLS-SEM). Thousand Oaks, CA: Sage.

Hajmohammad, S., Vachon, S., 2016. Mitigation, avoidance, or acceptance? managing supplier sustainability risk. J. Supply Chain Management. 52 (2), 48e65.

Hart, S. L. 1995. A natural-resource-based view of the firm. Academy of Management. The Academy of Management Review, 20, 986.

Hsu, C., Tan, K.C., Zailani, S.H.M. and Jayaraman, V. (2013). Supply Chain Drivers that Foster the Development of Green Initiatives in An Emerging Economy, International Journal of Operations & Production Management, Vol. 33 No. 6, pp. 656-688

Indonesia Development Regulation no 14, (2015)

Indonesia's Industry Ministry law no 51/M-Ind/PER/6/2015, (2015)

Jakarta Globe. (2017). Indonesia's Industry Ministry Prepares Green Industry Standard. https://jakartaglobe.id/context/indonesias-industry-ministry-prepares-green-industry-standard

Joshi, Y and Rahman, Z. (2015). Factors Affecting Green Purchase Behaviour and Future Research Directions. International Strategic Management Review 3. pp.128-143.

Khastagir, D and Roy, M. (2014). Environment Responsiveness of Petrochemical Organisation in India. *European Journal of Business and Management* .ISSN 2222-1905 (Paper) ISSN 2222-2839 (Online) Vol.6, No.2.

Khoirunissa, I., Napitupulu, W., Dwikorianto, T. (2015). Gold PROPER achievement of environmental and social management. In Proceeding, World Geothermal Congress 2015. Melbourne, Australia.

KPMG Asia Pacific Report. (2014). Asia Pacific's Petrochemical Industry: A Tale of Contrasting Regions. KPMG Global Energy Institute. KPMG Services Pte. Ltd.

Laari, S (2016). Green Supply Chain Management Practices and Firm Performance: Evidence from Finland.

Lai, K.H., Wong, C.W.Y., Cheng, T.C. E., (2006). Institutional Isomorphism and The Adoption of Information Technology for Supply Chain Management. Computers in Industry, 57 (1), pp. 93–98.

Liu, X., Wang, C., Shishime, T., and Fujitsuka, T. (2012). Sustainable Consumption: Green Purchasing Behaviours of Urban Residents Chine. Sustainable Development 20 (4), pp. 293 – 308.

Nikbakhsh, E. (2009). Green supply chain management. Book chapter in Contributions in Management Science, pp. 195-220, Springer.

Pradeepa, J., Lee, S., & Nelson, P. (2012). Role of Supply Chain Mapping in Sustainable Supply Chain Management. Paper presented at the 2nd International Conference on Management, Holiday Villa Beach Resort

& SPA, Langkawi Kedah, Malaysia.
Prakash, C., & Barua, M. K. (2015). Integration of AHP-TOPSIS method for prioritizing the solutions of reverse logistics adoption to overcome its barriers under fuzzy environment. Journal of Manufacturing Systems.
Ramayah, T., Cheah, J., Chuah, F., Ting, H., Memon., M.A. (2018). Partial Least Squares Structural Equation Modeling (PLS-SEM) using smartPLS 3.0. An Updated and Practical Guide to Statistical Analysis. Second Edition. Pearson.
Reliantoro, S. (2012). The Gold for Green, How the Gold PROPER Award Five Major Companies Achieve Innovation, Value Creation and Environmental Excellence.
Rodrigue, J.P., Slack, B., and Comtoi, C. (2012). Green Logistics. http://www. people.hofstra.edu/geotrans/eng/
Roechrich, J. K,. Grosvold, J., Hoejmose, S.U. (2014). Reputational Risks and Sustainable Supply Chain Management: Decision Making Under Bounded Rationality. International Journal of Operations & Production Management, Vol. 34 (5), pp. 695 – 719.
Samuel, V. B., Agamuthu, P., & Hashim, M. A. (2013). Indicators for assessment of sustainable production: a case study of the petrochemical industry in Malaysia. Ecological Indicators, 31(24), pp. 392–402.
Sarkis,J., Zhu, Q., & Lai, K.H (2011). An Organizational Theoretic Review of Green Supply Chain Management Literature. *International Journal Production Economics*, 130, 1-15
Shi, V. G., Koh, S. C. L., Baldwin, J. & Cucchiella, F. 2012. Natural resource based green supply chain management. Supply Chain Management, 17, 54-67.
Suansawat, R. (2013). The Influence of Supply Chain Integration and Green Supply Chain Management Practices on Sustainable Firm Performance – in Thai Manufacturing Industry. PhD Thesis. University of Hull.
Tate, W. L., Dooley, K.J., Ellram, L. M. (2011). Transaction Cost and Institutional Drivers of Supplier Adoption of Environmental Practices. Journal of Business Logistics, Vol 32 (1), pp. 6-16.
Tseng, M.-L., Tan, K. & Chiu, A.S. (2015), "Identifying the competitive determinants of firms' green supply chain capabilities under uncertainty", Clean Technologies and Environmental Policy, Vol. 18, No. 5, pp. 1-16.
Vachon, S., & Klassen, R. D. (2006). Extending Green Practices Across The Supply Chain: The Impact of Upstream and Downstream Integration. *International Journal of Operations & Production Management*, 26(7), 795–821.
Vachon, S. – Klassen, R.D. (2008). Environmental management and manufacturing performance: The role of collaboration in the supply chain. International Journal of Production Economics, Vol. 111 (2), pp. 299– 315.
Vishal, M.S,. and Avinash, S,. (2016). Green Supply Chain Management – An Overview. *International Journal of Advanced Engineering and Innovative Technology (IJAEIT)* ISSN No 2348-7208. Special Issue on "Emerging Technology for Innovative India".
Yacob, P., Mohamad Makmor, M.F., Mohd Zin, A. W., & Aziz, N.S. (2012). Barriers to reverse logistics practices in Malaysia SMEs. International Journal of Academic Research in Economics and Management Sciences, 1(5).
Zhu, Q,. Sarkis, J,. Lai, K. (2012). Examining the Effects of Green Supply Chain Management Practices and Their Mediations on Performance Improvements. *International Journal of Production Research*, 50 (50), 1377 – 1394.

Biographies

Abdul Talib Bon is a professor of Production and Operations Management in the Faculty of Technology Management and Business at the Universiti Tun Hussein Onn Malaysia since 1999. He has a PhD in Computer Science, which he obtained from the Universite de La Rochelle, France in the year 2008. His doctoral thesis was on topic Process Quality Improvement on Beltline Moulding Manufacturing. He studied Business Administration in the Universiti Kebangsaan Malaysia for which he was awarded the MBA in the year 1998. He's bachelor degree and diploma in Mechanical Engineering which his obtained from the Universiti Teknologi Malaysia. He received his postgraduate certificate in Mechatronics and Robotics from Carlisle, United Kingdom in 1997. He had published more 150 International Proceedings and International Journals and 8 books. He is a member of MSORSM, IIF, IEOM, IIE, INFORMS, TAM and MIM.

Yuary Farradia is currently PhD candidate in Production and Operations Management in the Faculty of Technology Management and Business at the Universiti Tun Hussein Onn Malaysia since October 2018. Her master degree in natural resources economics has been obtained from Universiti Putra Malaysia (UPM) in the year 1993-1995. Her bachelor degree in Agriculture in field of fisheries has been obtained from Universitas Padjadjaran , Bandung Indonesia in 1991. Currently she is a lecture at various universities in both Jakarta and Bogor, Indonesia where she teachs production and management operation, strategic management operation, global marketing, entrepreneurship,

service management, organization behavior, human resource development plan at both undergraduate and postgraduate level.

Tutus Rully is currently a senior lecturer at Universitas Pakuan,Bogor Indonesia in the faculty of Economics. She is also PhD candidate in management science at post graduate program Universitas Pakuan, Bogor, Indonesia. Her master degree in magister management economic has been obtained from Universitas Soedirman, Solo, Indonesia. Her bachelor degree in management has been obtained from Universitas Pakuan, Bogor Indonesia. Currently she is a lecture in filled of production and management, risk management and operation research at undergraduate level at Universitas Pakuan, Bogor , Indonesia