EKONOMIA I PRAWO. ECONOMICS AND LAW
Volume 17, Issue 4, December 2018
p-ISSN 1898-2255, e-ISSN 2392-1625
www.economicsandlaw.pl

ORIGINAL ARTICLE
received 02.01.2018; revised 09.05.2018; accepted 31.12.2018
Citation: Szymańska-Brałkowska, M., & Malinowska, E. (2018). Improving company's environmental performance through Green Lean approach. *Ekonomia i Prawo. Ecomomics and Law*, 17(4): 433–442. doi:10.12775/EiP.2018.031.

Improving company's environmental performance through Green Lean approach

MAŁGORZATA SZYMAŃSKA-BRAŁKOWSKA

corresponding author
University of Gdańsk, Faculty of Management, Department of Business Economics, Division of Quality and Environmental Management, ul. Armii Krajowej 101, 81-824 Sopot, Poland
m.bralkowska@ug.edu.pl

EWA MALINOWSKA

University of Gdańsk, Faculty of Management, Department of Business Economics, Division of Quality and Environmental Management
ewa.malinowska@ug.edu.pl

Abstract

Motivation: Green Lean (Lean and Green) approach is based on the lean method. As the literature and case studies show the Japanese quality improvement tools can be used in environmental management as well as in quality management. Companies that focus on sustainability may use those tools and methods to improve its processes and eliminate green waste at the same time. The research concentrates on the examples of the companies that started to implement the Green Lean (Lean and Green). The study shows interesting ways of minimalizing company's negative impact on the environment by using Green Lean approach.

Aim: The purpose of the article is to present how the application of Green Lean (Lean and Green) approach improves the environmental performance of the company and what are the benefits.

Results: By identifying and eliminating the green waste i.e. in energy, materials, garbage, water, emissions, biodiversity, transportation researched companies are minimizing its negative impact on environment. As the research shows the employees should be motivated and involved in the process so does the management to make it work. Green Lean

(Lean and Green) approach enables the companies to perform in profitable and sustainable way at the same time.

Keywords: Lean Management; Green Lean; Lean and Green; environment
JEL: Q5; Q59

1. Introduction

Reducing the negative impact on the environment should be one of the key issues for every company that is performing on the market. Environmentally aware companies could be profitable and successful in business by identifying, monitoring and reducing green wastes located in areas such as water, energy, transportation, materials, garbage, emissions and biodiversity (Pampanelli et al., 2014, pp. 24–25; Wills, 2009, pp. 3–9).

Using the lean method in environmental management may lead to reducing environmental impact of the company. The integration of 'lean' and 'green' practices could be beneficial for the company in many ways such as increase in productivity and costs savings (Dües et al., 2013, p. 93; Pampanelli et al., 2014, pp. 24–25).

The purpose of the article is to present how the application of Green Lean (Lean and Green) approach improves the environmental performance of the company and what are the benefits.

2. Green Lean (Lean and Green) — literature review

The idea of lean gave organizations the possibility to reduce the waste in every aspect of company's performance and activities. The Japanese improvement approach that was known as Lean manufacturing and described as Toyota Production System (TPS) (Garza-Reyes, 2015, p. 18) focused on reduction of every activity that does not give and value. Moreover, this approach has given the companies the chance to improve its activities to be more cost effective, efficient and customer friendly (Carvalho et al., 2017, p. 75; Prasad et al., 2016, p. 409).

Green Lean presented in literature also as 'Lean and Green' (Garza-Reyes, 2015, p. 18; Kainuma & Tawara, 2006, p. 99; Ng et al., 2015, p. 243; Verrier et al., 2014, p. 83) is based on the lean method, using its tools and techniques in minimalizing company's negative impact on the environment. It concentrates on the reduction of green waste.

Green waste is an activity that does not bring any value in environmental management. It is identified in area of water, energy, materials, garbage, emissions, land contamination, transportation, noise and nuisance, lost potential of people and biodiversity. The types of green waste are presented in table 1.

Identifying the green waste in area of energy may lead to many advantages. Support for the energy saving educational programs creates the awareness of what single employee may do to consume less energy and how it impacts the company (see table 1). Some companies may decide to invest in new energy

efficient equipment or in simple solutions for example; changing the bulbs for LEDs in the production buildings and in the offices (Winston, 2009, pp. 50–51). Some of them decide for switching on to renewable energy sources.

Recycling and reuse of the materials, eco-design of products and lowering the usage of non-recyclable materials are the key issues for reduction in materials and waste. Minimizing the amount of garbage by implementing the garbage selection educational programs for employees in the administration and production, may lead to cost savings (table 2).

Saving the water resources is one of the most important global environmental issues therefore companies by monitoring water consumption and supporting water educational programs, reduce the costs (see table 1 and table 2).

Investing in new technologies and equipment that reduces air emissions, land contamination, discharges to water, noise and nuisance may lead to cost savings, better working environment for the employees. It makes the local environment cleaner and enhance company's image for customers and local community.

Transportation is the area of green waste where a lot of positive actions towards the environment could be done. Supporting sustainable transport initiatives among the employees such as car-sharing or eco-driving, may lead to savings on transportation and it is a better choice for the environment. Company benefits from the new transport equipment, cars, trucks that consume less fuel and have lower environmental impact.

Employees are the key factor in implementing Green Lean (Lean and Green) approach. They should be trained and evaluated so the general management know their skills and knowledge and their potential.

One of the green waste areas is biodiversity. Supporting local environment programs makes company more integrated with local community and improves its image at the same time.

3. Methods

Research methods contain the critical review of the literature, observation and interviews in two selected companies. The case study was carried out during the workshops for the group of students from the Faculty of Management University of Gdansk in two production companies and started on March 2016 till beginning of 2017. During that time observations and interviews have been made by the authors. The cooperating companies that took part in the study are in Pomorskie Voivodship.

4. Results of case study

The case study was carried out in two production companies in Pomorskie Voivodship in Poland. In the study the researched companies were coded as A and B. The direct interviews with Lean Managers and employees of Lean De-

partments were used to collect information. Moreover, the authors used observations in production units and administration as research method.

Both companies organized together with Division of Quality and Environmental Management (Department of Business Economics, Faculty of Management, University of Gdansk) workshops for students. The research started on March 2016 and continued till the beginning of 2017. Students were divided into groups and they had to solve the problems on production lines and work stations.

Company B is implementing the approach Green Lean (Lean and Green), company A is using Lean Management tools and techniques not naming it specifically 'Green Lean (Lean and Green)'. Both companies are using Lean Management tools and techniques to improve its processes.

Based on the observation and interviews with Lean Managers in both companies the conclusions have been made (see table 3). While planning the investments and building new production facilities and offices, both companies use energy efficient equipment and energy saving solutions such as LED bulbs in new facilities, light and water sensors. Both companies monitor the energy consumption and try to reduce it as well as water consumption. They also work on reduction of waste and reuse of the materials. Moreover, they are motivating the employees to give the ideas on changes in their working environment.

Company B has more experience with implementation of Lean Management tools and techniques into environmental management, so it also discovered problems during the implementation. Though the years those problems were:

- the lack of authority to implement changes;
- the lack of support from supervisors;
- the lack of proper involvement and engagement of the employees;
- problems with employees' motivation;
- low knowledge level of the employees about the environmental issues.

As the research shows both companies are using Lean Management tools and techniques in environmental management. One company is describing it as Green Lean (Lean and Green) approach. Company B is already facing some problems with implementation, concerned mostly with human factor.

The right motivation and engagement of the employees makes these green changes successful so does the company and employees may benefit in a long run. The study is ongoing and there are a lot of aspects of research approach that authors find interesting to evaluate in the future. Working with students gives a lot of satisfaction and makes this cooperation valuable for both parties.

5. Conclusion

Based on the literature review, case studies of the companies that implemented Green Lean (Lean and Green) approach it is a very interesting solution for minimizing negative impact on environment (Verrier et al., 2014, p. 83) and saving money at the same time. Companies that already are using Lean Management

tools and techniques may also implement Green Lean (Lean and Green) (Garza-Reyes, 2015, p. 24; Pampanelli et al., 2014, p. 21). Moreover, the lean tools and techniques could be successfully used in identifying and reducing green waste (Fercoq et al, 2016, p. 576; Pampanelli et al., 2014, p. 21).

As the research shows many companies worldwide benefit from this approach by improving operational, economic and performance measures (Pampanelli et al., 2014, p. 21; Prasad et al., 2016, p. 419). It may also improve the competitiveness of the company (Verrier et al., 2014, p. 91), its supply chain (Carvalho et al, 2017, p. 75; Dües et al., 2013, p. 93) and social and environmental image. Green Lean (Lean and Green) approach enables the companies to perform in profitable and sustainable way at the same time.

As further research shows there has been some interest about this approach in Poland and in Pomorskie Voivodship but still not many companies are motivated enough to take this direction. Those who decide to implement Green Lean (Lean and Green) will have to solve the problems that may come during the process including the lack of; authority to implement changes, support from supervisors, involvement and engagement of the employees.

In the opinion of authors, it is the matter of time till the companies find it useful to improve its economic and environmental performance. They should train the employees and motivate them so the Green Lean (Lean and Green) implementation is successful. In authors' opinion, the human factor is the key issue in Green Lean (Lean and Green) approach and employees should be motivated to understand economic and environmental aspects of changes.

The purpose of the article was to present how the application of Green Lean (Lean and Green) approach improves the environmental performance of the company and what are the benefits that relate to researched approach. Authors presented the types of green waste in area of water, energy, materials, garbage, emissions, land contamination, transportation, noise and nuisance, lost potential of people and biodiversity with the examples of environmental and economic benefits. Future study will focus on the barriers of the Green Lean (Lean and Green) implementation in Poland.

References

Association for Manufacturing Excellence. (2008). *Green manufacturing. Case studies in lean and sustainability*. New York: Productivity Press.

Averill, D. (2011). *Lean sustainability. Creating safe, enduring, and profitable operations.* New York: A Productivity Press.

Bachman, G. (2009). *The green business guide.* Franklin Lakes: Career Press.

Carvalho, H., Govindan, K., Azevedo, S.G., & Cruz-Machado, V. (2017). Modelling green and lean supply chains: an eco-efficiency perspective. *Resources, Conservation and Recycling*, 120. doi:10.1016/j.resconrec.2016.09.025.

Dües, C.M., Hua Tan, K., & Lim, M. (2013). Green as the new lean: how to use lean practices as a catalyst to greening your supply chain. *Journal of Cleaner Production*, 40. doi:10.1016/j.jclepro.2011.12.023.

Fercoq, A., Lamouri, S., & Carbone, V. (2016). Lean/green integration focused on waste reduction techniques. *Journal of Cleaner Production*, 137. doi:10.1016/j.jclepro.2016.07.107.

Friend, G. (2009). *The truth about green business.* New Jersey: FT Press.

Garza-Reyes, J.A. (2015). Lean and green: a systematic review of the state of the art literature. *Journal of Cleaner Production*, 102. doi:10.1016/j.jclepro.2015.04.064.

Kainuma, Y., & Tawara, N. (2006). A multiple attribute utility theory approach to lean and green supply chain management. *International Journal of Production Economics*, 101. doi:10.1016/j.ijpe.2005.05.010.

Ng, R., Sze Choong Low, J., & Song, B. (2015). Integrating and implementing lean and green practices based on proposition of carbon-value efficiency metric. *Journal of Cleaner Production*, 95. doi:10.1016/j.jclepro.2015.02.043.

Pampanelli, A.B., Found, P., & Bernardes, A.M. (2014). A lean & green model for a production cell. *Journal of Cleaner Production*, 85. doi:10.1016/j.jclepro.2013.06.014.

Prasad, S., Khanduja, D., & Sharma, S.K. (2016). An empirical study on applicability of lean and green practices in the foundry industry. *Journal of Manufacturing Technology Management*, 27(3). doi:10.1108/JMTM-08-2015-0058.

Schendler, A. (2009). Getting green done. *Hard truths from the front lines of the sustainability revolution.* New York: Public Affairs.

Verrier, B., Rose, B., Caillaud, E., & Remita, H. (2014). Combining organizational performance with sustainable development issues: the lean and green project benchmarking repository. *Journal of Cleaner Production*, 85. doi:10.1016/j.jclepro.2013.12.023.

Wills, B. (2009). *Green intentions. Creating a green value stream to compete and win.* New York: Productivity Press.

Winston, A. (2009). *Green recovery.* Boston: Harvard Business Press.

Zokaei, K., Lovins, H., Wood, A., & Hines, P. (2013). *Creating a lean and green business system. Techniques for improving profits and sustainability.* New York: Productivity Press Book.

Acknowledgements

Author contributions: authors have given an approval to the final version of the article. Authors contributed to this work equally.

Funding: this research was fully funded by the University of Gdańsk, Faculty of Management, Department of Business Economics, Division of Quality and Environmental Management statutory sources.

Note: the results of this study were presented at *9th International Conference on Applied Economics Contemporary Issues in Economy* (June 22–23, Toruń, Poland).

Appendix

Table 1.
Type of green waste in production with the examples of environmental improvements

Type of green waste	Description	Examples of environmental improvements
energy	energy consumption in production and administration	energy saving educational programs for employees, investments in new energy efficient equipment, using energy from renewable sources, green office programs, energy management programs and initiatives
materials	physical wastes during production process	recycling and reuse of the materials, eco-design of products so that the materials are recycled and reused, lowering the usage of non-recyclable materials
garbage	physical wastes such as garbage	garbage selection educational programs for employees, garbage selection on production, minimizing the amount of garbage
water	water that is used during production process, water used in the office	reduction of the water consumption in production processes and in the office, water saving programs for the employees, new technologies supporting more effective water consumption
emissions	emissions to air	reduction of the emissions to air by implementing innovate technologies, investing in new equipment
land contamination	land contamination	reduction land contamination by implementing innovate technologies, investing in new equipment
discharges to water	discharges to water	reusing the water, using eco-friendly detergents, implementing the water saving programs for employees
noise and nuisance	noise and nuisance during the production	implementing innovate technologies, investing in new equipment and monitoring system
transportation	transportation of produced goods, transportation during the production, transport of the employees	implementing eco-driving programs for employees, investing in lower emissions programs for trucks and cars, car-sharing initiatives, green lean supply chain management programs
lost potential of people	misused employees' potential and knowledge	employees' involvement programs, trainings, kaizen teams and initiatives
biodiversity	the diversity of fauna and flora in the company and in its environment	green building initiatives, supporting the green areas near company's facilities, planting the trees, supporting local environment programs

Source: Averill (2011, pp. 182–185); Bachman (2009, p. 23); Friend (2009, p. 49); Pampanelli et al. (2014, p. 27); Schendler (2009, pp. 182–185); Wills (2009, pp. 3–9); Winston (2009, pp. 45–76); Zokaei et al. (2013, pp. 44–46).

Table 2.
Type of green waste in production — examples of companies and environmental benefits

Type of green waste	Example of the company	Examples of economic and environmental benefits in researched companies
energy	Coca-Cola Enterprises, InterContinental Hotels Group (IHG), Home Depot, The Boeing Company, Lockheed Martin, 3M, Coors Brewing Company, Toyota, Tesco	cost savings, reduction of energy consumption, lower emissions, improve energy efficiency
materials	The Boeing Company, Baxter Healthcare Corporation, General Motors Corporation, Dell, Coors Brewing Company, Toyota, Marks & Spencer, Tesco	cost savings, reduction in materials and waste, release inventory
garbage	3M, Lockheed Martin, General Motors Corporation, DuBois-Johnson Diversey and Steelcase, Coca-Cola Enterprises, Coors Brewing Company, Marks & Spencer, Tesco	garbage selection educational programs for employees, garbage selection on production, minimizing the amount of garbage
water	DuBois-Johnson Diversey and Steelcase, Baxter Healthcare Corporation, Coca-Cola Enterprises	cost savings, reduction of water consumption, improve water efficiency
emissions	3M, DuBois-Johnson Diversey and Steelcase, Lockheed Martin, General Motors Corporation, General Electric, The Boeing Company, Tesco	cost savings, reduction of air emissions
land contamination	Coors Brewing Company	Cost savings
discharges to water	Columbia Paint and Coatings, Coca-Cola Enterprises, General Motors Corporation	cost savings, reduction of liquid waste, reduction of hazard chemicals
noise and nuisance	Tesco, Marks & Spencer	cost savings on penalties, improving the health of the employees
transportation	Coca-Cola Enterprises, General Motors Corporation, Marks & Spencer, Tesco	cost savings, new transport technologies, reduced fuel consumption
lost potential of people	Baxter Healthcare Corporation, Lockheed Martin, Marks & Spencer	increase employee loyalty and engagement, improved communication in the company, increased employee efficiency
biodiversity	Coors Brewing Company, Tesco, Marks & Spencer	enhanced company's green image, increase in biodiversity, supporting environmental initiatives in local communities

Source: Association for Manufacturing Excellence (2008, pp. 46–49, 54, 63, 65, 72, 107, 112, 121); Averill (2011, pp. 182–185); Pampanelli et al. (2014, p. 27); Wills (2009, pp. 3–9); Winston (2009, pp. 50–51); Zokaei et al. (2013, pp. 44–46, 91, 141, 147, 158).

Table 3.
Type of green waste in production in researched companies

Type of green waste	Example of the company	Examples of economic and environmental benefits in researched companies
energy	A, B	cost savings, reduction of energy consumption, lower emissions, improve energy efficiency
materials	A, B	cost savings, reduction in materials and waste, release inventory
garbage	A, B	garbage selection educational programs for employees, garbage selection on production, minimizing the amount of garbage
water	A, B	cost savings, reduction of water consumption, improve water efficiency
emissions	B	cost savings, reduction of air emissions
land contamination	B	cost savings
discharges to water	A, B	cost savings, reduction of liquid waste, reduction of hazard chemicals
noise and nuisance	B	cost savings on penalties, improving the health of the employees
transportation	A, B	cost savings, new transport technologies, reduced fuel consumption
lost potential of people	A, B	increase employee loyalty and engagement, improved communication in the company, increased employee efficiency
biodiversity	A, B	enhanced company's green image, increase in biodiversity, supporting environmental and social initiatives in local communities

Source: Own preparation.