THE IMPACT OF ENVIRONMENTAL MANAGEMENT PRACTICES ON MANUFACTURING FIRMS PERFORMANCE IN JAVA, INDONESIA

INA INDRIYANA HASYIM

UNIVERSITI SAINS MALAYSIA

2022

THE IMPACT OF ENVIRONMENTAL MANAGEMENT PRACTICES ON MANUFACTURING FIRMS PERFORMANCE IN JAVA, INDONESIA

by

INA INDRIYANA HASYIM

Thesis submitted in fulfilment of the requirements
for the degree of
Doctor of Philosophy

January 2022

ACKNOWLEDGEMENT

First and foremost, I offer praise and gratitude to the presence of Allah Almighty who has given the blessings of faith, knowledge, and health so that I can finish writing this thesis. Sholawat and greetings I offer to the Prophet Muhammad who brought the people from the dark to the bright light. Thank you very much to both my supervisors, Dr. Nor Asmat Ismail as the main supervisor and Dr. Siti Rahyla Rahmat as co-supervisor, for knowledge, guidance, motivation and prayer. To the Islamic Development Bank (IsDB) as the scholarship sponsor, to the rector of Sultan Ageng Tirtayasa University, to the PMU-Dikti and PIU-UNTIRTA teams, thank you very much for the financial support, opportunity, trust, prayer and motivation provided to continue and complete doctoral studies. Hopefully the knowledge and networking gained can be practiced and developed so as to provide blessings and broad benefits for the development of knowledge and practical benefits for the community. For parents and the whole family, who always provide prayer, love and support, I thank you profusely. My gratitude goes to the leaders and staff at the School of Social Sciences, staff at the library, IPS and IMCC. To my fellow comrades in arms, IsDB-UNTIRTA awardees, IsDB-UNMUL awardees at USM, colleagues at Social Sciences, the Indonesian Student Association (PPI) USM and friends at Apex Hall thank you for prayer, motivation and accompany my struggle complete study. May Allah increase the goodness of every good that you have all given to me. Aamiin

TABLE OF CONTENTS

ACKNOWLEDGEMENT…….… ii

TABLE OF CONTENTS ……..iii

LIST OF TABLES ……..viii

LIST OF FIGURES …….. xi

LIST OF ABBREVIATIONS…….. xii

ABSTRAK……... xv

ABSTRACT……xvii

CHAPTER 1 INTRODUCTION……1

1.1 Introduction ……..….1

1.2 The Background of The Study..……..…1

1.3 Problem Statement ….……11

1.4 Research Questions ……....12

1.5 Research Objectives …….……..12

1.6 The Significance of The Study…….…….……..13

1.7 Scope and Limitation …….....14

1.8 Operational Definition ……15

1.9 Organization of The Study …….....20

1.10 Chapter Summary…..…….....21

CHAPTER 2 BACKGROUND OF STUDY IN INDONESIA…….....22

2.1 Introduction ……22

2.2 Population and Manufacturing Industry in Indonesia ……22

2.3 The contribution of Java Island on Gross Domestic Product (GDP).……23

2.4 National Environmental Quality and Provinces in Indonesia…….24

2.4.1 Environmental quality index in Java Island…….....26

2.4.2 Environmental quality degradation and its causes in Java……...28

2.4.3 Environmental Degradation and its impact…….35

2.5 Environmental Regulation in Indonesia…..……37

2.6 Manufacturing Firm Performance in Indonesia……...44

2.7 Firm Innovation ……..50

2.8 Employees profile of Manufacturing Firms ……51

2.9 Chapter Summary ……...54

CHAPTER 3 LITERATURE REVIEW…….55

3.1 Introduction ……55

3.2. Theoretical Review ..……..55

3.2.1 Stakeholder Theory…….58

3.2.2 Resource Based Theory…..…….59

3.3.3 Legitimacy Theory……..61

3.2.4 Human Capital Theory ……..…..62

3.2.5 Manufacturing Industry……64

3.2.6 Environmental Quality..……..66

3.2.7 Environmental Management System……..66

3.2.8 Environmental Performance……...68

3.2.9 Green Innovation.……...69

3.2.10 Training …….…….....71

3.2.11 Stakeholder Theory and Environmental Management System……..73

3.2.12 Legitimacy theory and Environmental Performance..……...75

3.2.13 Resource Based Theory and Environmental Management

System, Environmental Performance and Firm' Profitability……76

3.2.14 Resource Based Theory, Environmental Management System, Green Innovation, and Firm's Profitability ……..……...79

3.2.15 Human Capital Theory for Training and Environmental Performance ……82

3.3 Empirical Review..…….....85

3.3.1 Manufacturing Industry and Environmental Quality …….....85

3.3.2 Environmental Management Systems and Environmental Performance …….....91

3.3.3 Environmental Performance and Firm's Profitability…….94

3.3.4 Environmental Management Systems and Firm's Profitability with Mediator Variable ……..... 98

3.3.5 Green Innovation, Environmental Performance and Firm Profitability ……102

3.3.6 Training, Environmental Performance and Firm's Profitability……110

3.3.7 Empirical Review in Indonesia…….....115

3.4 Research Gap ……....178

3.5 Conceptual Framework…….182

3.6 Hypothesis…….....189

3.6.1 Manufacturing Industry and Environmental Quality……....189

3.6.2 Environmental Management Systems and Environmental Performance ……...189

3.6.3 Environmental Management Systems and Firm's Profitability…….....191

3.6.4 Environmental Performance and Firm's Profitability..…….192

3.6.5 Environmental Management Systems and Green Innovation……...194

3.6.6 Green Innovation and Environmental Performance…….....195

3.6.7 Green Innovation and Firm's Profitability..…….....197

3.6.8 Environmental Management Systems and Training …….....198

3.6.9 Training and Environmental Performance.…….....199

3.6.10 Environmental Management Systems, Environmental Performance and Firm's Profitability. ……..……...200

3.6.11 Environmental Management Systems, Green Innovation and Environmental Performance..…….201

3.6.12 Green Innovation, Environmental Performance and Firm's Profitability ……....203

3.6.13 Environmental Management Systems, Training and Environmental Performance ……..……204

3.7 Chapter Summary …….205

CHAPTER 4 RESEARCH METHODOLOGY……..….. 206

4.1 Introduction ……..206

4.2 Research Design ……..206

4.3 Research Data ……...206

4.4 Population and Sample …….....208

4.5 Research Variables …… ……210

4.6 Data Analysis…….……...214

4.6.1 Objective of the study…….....214

4.6.2 Testing Approach……...215

4.6.3 Analysis Data with PLS-SEM.……....217

4.6.4 Data Analysis for Each Objective……..221

4.7 Chapter Sum..……236

CHAPTER 5 RESULT AND DISSCUSSION ……237

5.1 Introduction ……. 237

5.2 Sample Overview …….237

5.3 Diagnostic Result …….238

5.3.1 The Effect of Manufacturing Industry and Environmental Quality.....239

5.3.2 The Role of Environmental Performance in Mediating the Relationship between Environmental Management System and Firm Profitability……. ……244

5.3.3 The Role of Green Innovation in Mediating the Relationship between Environmental Management System and Environmental Performance…..……...……254

5.3.4 The Role of Environmental Performance in Mediating the Relationship between Green Innovation and Firm Profitability 261

5.3.5 The Role of Training in Mediating the Relationship between Environmental Management System and Environmental Performance.……268

CHAPTER 6 CONCLUSION AND POLICY IMPLICATION……276

6.1 Introduction ……..276

6.2 Conclusion ……276

6.3 Policy Implication ……280

6.4 Limitation and Direction for Future Research ……. 284

REFERENCES ……...285

LIST OF PUBLICATIONS

LIST OF TABLES

Page

Table 1.1 Environmental Quality Index (EQI) of 6 Provinces in Java Island…..5

Table 1.2 Firm's Participation in *PROPER* Program…….... 7

Table 1.3 Efficiencies and Green Innovation from Beyond Environmental Management Practices ……8

Table 2.1 The Number of Large-Medium firms in Indonesia and Java Island ……..23

Table 2.2 The contribution of Java Island to Gross Domestic Product……...23

Table 2.3 Contribution of Java Manufacturing Firms to GDP (percent)…..……24

Table 2.4 Environmental Performance of ASEAN Countries …….…...24

Table 2.5 National Rating of Environmental Quality Index…….…...26

Table 2.6 Water Quality Index of Six Provinces ……..…...27

Table 2.7 Air Quality Index in Six Provinces …….……27

Table 2.8 The Land Cover Quality Index …….…..28

Table 2.9 The Contribution of Each Province to National Environmental Quality…….29

Table 2.10 Final Energy Consumption Based on Three Main Sector. ……30

Table 2.11 The Manufacturing Firm Number in Java from 2010-2015……31

Table 2.12 Energy Consumption by Industry and Construction Sectors..…….31

Table 2.13 The Ratio vehicle in Java of total vehicle in Indonesia…….33

Table 2.14 CO2 Emission from Vehicles in Java.……...33

Table 2.15 Percentage of Provincial Budget for Environment by Province, 2013-2017……36

Table 2.16 Firm's Participation in PROPER Program ……..……42

Table 2.17 Savings of Environmental Management Practices from 2015 to 2018 …….……..43

Table 2.18 Indonesia Business Tendency Index……...46

Table 2.19 Manufacturing Firm Performance from 2010-2017……...48

Table 2.20 Value Added and Efficiency Rate of Medium and Large Firms..…... 49

Table 2.21 The Growth and Employment Number of Medium-Large Manufacturing Firm ……...49

Table 2.22 Innovation Number from 2010-2018 ……50

Table 2.23 Labour Productivity Growth ……..52

Table 2.24 The Employment Proportion of Manufacturing Firms 2015-2018…..53

Table 3.1 Empirical Review Manufacture Industry and Environmental Quality ……120

Table 3.2 Previous Study Matrix ……. 135

Table 3.3 Previous Study Matrix in Indonesia ……. 173

Table 5.1 Descriptive Statistic……..239

Table 5.2 Indicator Weight for Manufacturing and Environmental Quality ……..239

Table 5.3 Fit Model, Path Coefficient, P-value, Adjusted R^2, and Q^2 coefficient ……240

Table 5.4 Indicator Weight for Environmental Performance, Environmental Management System and Firm's Profitability ……244

Table 5.5 Path Coefficient, P-value and Adjusted R^2 (Direct Effect)……....246

Table 5.6 Path coefficient, P-value (Indirect Effect) ……250

Table 5.7 Indicator Weight for Environmental Management System, Green Innovation and Environmental Performance ……..254

Table 5.8 Path Coefficient, P-Value, Fit Model, Adjusted R^2, Q-Squared ……256

Table 5.9 Path coefficient, P-value (Indirect Effect) ……259

Table 5.10 Indicator Weight for Green Innovation, Environmental Performance and Firm Profitability……..261

Table 5.11 Path Coefficient, P-value, Adjusted R^2 and Fit Model, Q-squared....263

Table 5.12 Path Coefficient, P-value (indirect effect) ……...267

Table 5.13 Indicator Weight for Environmental Management System, Training and Environmental Performance ……...268

Table 5.14 Path Coefficient, P-value, Adjusted R^2, Fit Model and Q-squared ……..……..270

Table 5.15 Path coefficient, p-value (indirect effect) ……..273

LIST OF FIGURES

Page

Figure 2.1 Indonesia Population Growth 1971-2015……..... 22

Figure 2.2 Indonesia Environmental Quality Index……..26

Figure 2.3 Greenhouse Gas Emission Generated Based on Sector Type ……..32

Figure 2.4 Business Tendency Index……..…….45

Figure 2.5 Green Innovation Number from 2015 to 2018 ……51

Figure 3.1 Conceptual Framework…….....187

Figure 5.1 The Effect of Manufacturing Industry on Environmental Quality …240

Figure 5.2 Indirect Relationship between Environmental Management System and Firm's Profitability through Environmental Performance …… 251

Figure 5.3 Indirect relationship between Environmental Management System and Environmental Performance through Green Innovation…….. ……...260

Figure 5.4 Indirect Link between Green Innovation and Firm's Profitability through Environmental Performance …….. 267

Figure 5.5 Indirect Association between Environmental Management System and Environmental Performance through Training……...274

LIST OF ABBREVIATIONS

3R	Reduce, Reuse, and Recycle
APC	Average Path Coefficient
AQI	Air Quality Index
ARS	Average R-squared
ASEAN	Association Southeast Asian Nations
AVE	Average Variance Extracted
BII	Business Income Index
BOD	Biological Oxygen Demand
BTI	Business Tendency Index
CB-SEM	Covariance-Based Structural Equation Model
CO_2	Carbon Dioxide
COD	Chemical Oxygen Demand
DKI	Daerah Khusus Ibukota (special area of the capital)
DO	Dissolved Oxygen
EBITDA	Earnings before Interest, Taxes, Depreciation and Amortization
EMAS	Environmental Management Audit Schemes
EMS	Environmental Management System
EP	Environmental Performance
EPI	Environmental Performance Index
EPS	Earnings per Share
Eq	Equivalent
EQ	Environmental Quality
EQI	Environmental Quality Index
FP	Financial Performance

GDP	Gross Domestic Products
GDRP	Gross Domestics Regional Products
GHG	Greenhouse Gas
GI	Green Innovation
GJ	Giga Joule
GoF	Goodness of Fit
ICT	Information Computer Technology
ISO	International Organization for Standardization
LCQI	Land Cover Quality Index
M^3	Meter Cubic
MI	Manufacturing Industry
NO_2	Nitrogen Dioxide
NPM	Net Profit Margin
NRBV	Natural-Resource-Based View
NREQI	National Rating Environmental Quality Index
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Square
PCI	Production Capacity Index
PLS	Partial Least Square
PROPER	Program Peringkat Penilaian Kinerja Perusahaan Dalam Pengelolaan Lingkungan (Corporate Performance Assessment Rating Program in Environmental Management)
R&D	Research and Development
R^2	R-square
ROA	Return on Assets
ROCE	Return on Owner Capital Ratio

ROI	Return on Investment
ROS	Return on Sales
SEM-PLS	Structural Equation Model-Partial Least Square
SO_2	Sulfur Dioxide
SOEs	State-Owned Enterprises

IMPAK AMALAN PENGURUSAN ALAM SEKITAR PADA PRESTASI FIRMA PEMBUATAN DI JAWA, INDONESIA

ABSTRAK

Sumbangan aktiviti perniagaan kepada –pendapatan negara adalah penting. Namun, perkembangannya yang pesat, yang tidak selaras dengan amalan mesra alam, memberi kesan negatif kepada alam sekitar. Bagi meminimumkan kesan negatif pada alam sekitar, pihak berkepentingan meminta firma tidak hanya memfokus kepada mencapai prestasi kewangan jangka pendek tetapi juga menangani kesan buruk persekitaran dari aktiviti firma. Amalan pengurusan persekitaran dilaksanakan untuk mengurangkan masalah persekitaran. Kajian ini bertujuan untuk menganalisis pengaruh industri pembuatan kepada kualiti persekitaran, menganalisis peranan prestasi persekitaran perusahaan dalam memediasi hubungan antara sistem pengurusan alam sekitar, inovasi hijau dan keuntungan perusahaan, dan menyelidiki peranan inovasi hijau, latihan sebagai pemboleh ubah mediator dalam hubungan antara sistem pengurusan persekitaran dan prestasi persekitaran firma. Kajian ini melibatkan industri pembuatan di Pulau Jawa dan firma pembuatan yang terletak di indonesia. Data siri masa meliputi tempoh 2010-2017, data keratan rentas dari 6 wilayah Pulau Jawa dan 54 firma pembuatan. Data sekunder diperoleh dari laman web Biro Pusat Statistik, Bursa Efek Indonesia, Kementerian Persekitaran dan Perhutanan, dan firma. Analisis data dilakukan dengan PLS-SEM menggunakan Warpl-PLS versi 7.0. Hasil kajian menunjukkan industri pembuatan memberi kesan negatif dan signifikan pada kualiti alam sekitar, prestasi persekitaran secara positif dan signifikan memediasi hubungan antara sistem pengurusan persekitaran dan keuntungan firma, namun, tidak signifikan memediasi hubungan antara inovasi hijau dan keuntungan firma. Penemuan ini juga menunjukkan bahawa inovasi hijau dan latihan tidak

signifikan memediasi hubungan antara penerapan sistem pengurusan alam sekitar dan prestasi persekitaran firma. Hasil kajian menunjukkan bahawa pertumbuhan firma pembuatan mengurangkan kualiti persekitaran. Kajian ini juga menunjukkan bahawa keuntungan firma adalah signifikan apabila dikaitkan dengan sistem pengurusan persekitaran melalui prestasi persekitaran. Kajian ini menunjukkan bahawa firma perlu menerapkan sistem pengurusan alam sekitar yang formal dan lebih luas, inovasi hijau yang substantif dan mengadakan latihan persekitaran untuk mencapai prestasi firma yang lebih baik. Kajian ini mencadangkan supaya pemerintah untuk mewujudkan peraturan yang memaksa perusahaan pembuatan menggunakan energi terbaru~~kan~~ secara intensif, menyediakan loji rawatan kumbahan, dan mengalihkan perancangan pelaburan ke luar pulau jawa. Pemerintah juga diharapkan untuk mengubah artikel 5 peraturan No 3/2014 tentang program penilaian peringkat perusahaan dalam pengelolaan lingkungan untuk mendorong perusahaan yang patuh meningkatkan prestasi perusahaan mereka.

THE IMPACT OF ENVIRONMENTAL MANAGEMENT PRACTICES ON MANUFACTURING FIRMS PERFORMANCE IN JAVA, INDONESIA

ABSTRACT

Business activities contribution to national income is significant. However, its rapid development, that is not harmonized with environmentally friendly practices, has a negative impact on the environment. Minimizing the negative impact on the environment, stakeholders call firms not only focus on achieving short-term financial performance but also focus on handling the adverse environmental effects of firm activities. An environmental management practices is implemented to mitigate environmental problems. The study is directed to estimate the effect of manufacturing industry on environmental quality, examine the role of firm environmental performance in mediating the relationship between environmental management systems, green innovation, and firm profitability, and investigate the role of green innovation, training as mediator variable in the relationship between environmental management system and firm environmental performance. The study involves manufacturing industry in Java Island and manufacturing firms located in Indonesia. Time series data cover the period 2010-2017, cross section data from 6 provinces of the Java Island and 54 manufacturing firms. Secondary data were obtained from the websites of Statistical Central Bureau, the Indonesia Stock Exchange, the Ministry of Environment and Forestry, and firms. Data analysis was performed with PLS-SEM using Warp-PLS version 7.0. The findings show manufacturing industry negatively and significantly impact on environmental quality, environmental performance is positively and significantly mediating the relationship between environmental management systems and firm profitability, however, it is insignificant mediating the relationship between green innovation and firm profitability. The finding also show

that green innovation and training are not significant mediating the association between environmental management system adoption and firm environmental performance. The result suggests that manufacturing firm growth reduces environmental quality. The present study also suggest that firm profitability is significant when associated with environmental management system through environmental performance. The study implied that firm need to adopt formal and broader environmental management system, substantive green innovation and conduct environmental training to achieve better firm performance. This study is also indicated that the government to formulate regulation that force manufacturing firm intensively use renewable energy, provide wastewater treatment plant, and divert investment target to outside Java Island. Government is also expected to amend the article 5 of regulation No 3/2014 on firm rating assessment program in environmental management to encourage compliant firm increase their firm performance.

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter is comprised of ten sections. It begins with an introduction that gives an overview of the study, followed by the background of the study which discussed the crucial reason why the study should be done. The third section presents details about the problem statement, followed by a section about the research questions and objectives. The next section is the significance of the research which highlights the research contribution. The study limitation, operational definitions, and organization of the study are the final sections of the study. The chapter is then closed with a summary.

1.2 The Background of The Study

In general performance defined as achievement. Performance is also identical with effectiveness (Henri, 2004). According to Daft (1991) firm performance defined as firm's ability in obtaining its' goals by utilizing resources an efficient and effective manner (Fauzi, Svensson, and Rahman, 2010)**.** In sustainability concept, achievement is associated with economic or financial achievement, social achievement, and environmental achievement (Claro and Esteves, 2020). In sustainability development concept, economic performance related to economic welfare, environmental performance associated with protecting the planet and social performance is related to prosperity for all (Claro and Esteves, 2020). In sustainability business context, financial performance is identical with profit, environmental performance is associated with environmental management practices and social performance is related to philanthropy (Fauzi et al., 2010).

The development process is marked by massive growth of industry. The manufacturing industry identical with engine of development, the growth of manufacturing industry increases economic growth (Guclu, 2013; Jeon, 2006). In addition to increasing economic growth, development processes that are not environmentally friendly have resulted in a decline in environmental quality (Alvarado and Toledo, 2016; Begum, Sohag, Abdullah, and Jaafar, 2015). According to European Environmental Agency: 2004, Environmental quality refers to various characteristics such as purity or pollution of air and water, noise, access to open spaces, and the visual effects of buildings, and the potential effects that these characteristics may have on physical and mental health.

Environmental quality influenced by many factors such as manufacturing, urbanization, population growth, agriculture, and transportation. Manufacturing industry is a group of manufacturing firms that focus to transform basic goods to final or intermediate goods (BPS-Statistics Indonesia, 2019). The manufacturing sector is known for being a major source of air pollution, waste, water pollution, a clear contributor to climate change, and over-consumer of natural resources (Rehman, Kraus, Shah, Khanin, and Mahto, 2021). Manufacturing firm participation in reducing environmental impact known as environmental management that defined as a set of management processes that focus on identifying, measuring and controlling various environmental impacts resulted from firm's operation (Bansal and Hunter, 2003; Gasbarro, Rizzi, and Frey, 2013). Environmental management practices include reducing water pollution and air pollution, reducing waste, conserving energy, reducing the use of materials, water, energy, and managing waste through reducing, reuse and recycle practices (Hart and Ahuja, 1996). Firm's achievement in environmental

management reflected on environmental performance (Burgos-Jiménez, Vázquez-Brust, Plaza-Úbeda, and Dijkshoorn, 2013).

The environmental law of the Republic of Indonesia No. 32/2009, environmental performance is defined as the firm's efforts to create a green environment. Environmental management practices is conducted to create green environment. According to regulation No.3/2014 article 5 and 6, the environmental practices include controlling air pollution, controlling water pollution, management of hazardous and toxic waste, controlling environmental damage, adoption environmental management system, utilizing and reducing non-hazardous and solid waste, reducing air pollution and greenhouse gas emission, efficiency in energy usage, reducing water usage and water load, reducing in material usage, applying recycle, reuse, and reduce, empowering community, and protecting biodiversity.

Environmental performance assessed by firm's compliance level in environmental management. Compliance means reaching and maintaining the minimal legal and regulatory standards for acceptable pollution level for the purpose of avoiding sanctions (Sroufe, Mylink 2003). The regulation No. 3/2014 on firm assessment rating program in environmental management *(PROPER)*, article 5 mentions that the criteria of firm compliance in environmental management includes firm compliance in controlling air pollution, water pollution, management of hazardous and toxic waste and environmental damage. Article 6 states that the criteria of beyond compliance firm comprises all criteria of article, and other criteria such as, participation in formal environmental management system adoption, utilizing and reducing non-hazardous and solid waste, reducing air pollution and greenhouse gas emission, efficiency in energy usage, reducing water usage and water load, reducing in material usage, applying recycle, reuse, and reduce, empowering community, and protecting biodiversity.

The population growth, rapid development, increasing firms' growth, fast urbanization and global trade indicated as main drivers of environmental damage. Those phenomena also apply in Indonesia. The World Bank report shows that the population growth rate in Indonesia reaches 1.36% per year. With such a large growth, Indonesia ranks among the fourth countries with the highest population, where the first position is occupied by China, followed by India and the United States in the third position. The current population of Indonesia is approximately 265 million people (BPS-Indonesia Statistics). Population growth followed by increased firm number that causes high demand for production factors, however, obtaining production factors which done by neglecting environmental sustainability leads reduced environmental quality. The production process, packaging, and product distribution of manufacturing firms are also trigger the declining of environmental quality. Environmental problems that arising from manufacturing industry includes air pollution, water pollution, waste, emission, and soil pollution. Indonesia's environment quality assessed based on environmental quality index. The environmental quality index includes air quality index, water quality index and land cover quality index. For the recent years, Indonesian environmental quality index included in fair good category (Ministry of Environment and Forestry).

Study showed manufacturing industry generates significant contribution on Gross Domestics Product. However, the growth of manufacturing industry leads the declining of environmental quality (Moyen, 2020). Study showed that the environmental quality influenced by agglomeration of industry (Afroz, Hassan, and Ibrahim, 2003; Cheng, 2016).The manufacturing industry is a source of air pollution, waste, water pollution, a clear contributor to climate change, and over-consumer of natural resources (Rehman et al., 2021). Previous study revealed that manufacturing industry has great impact on environment than non-manufacturing industry (Liu and Anbumozhi, 2009; Ribeiro,

Guzmán, da Silva Monteiro, and Guzmán, 2012; Russo and Fouts, 1997). The share of manufacturing industry on Gross Domestic Product is about 20%, it is higher than other sectors (BPS-Indonesia Statistics). It is also reported about 57% of Gross Domestic Product resulted from all provinces in Java. The Statistical Central Agency report indicates that 82% of Indonesian manufacturing firms run their operation in Java Island. The environmental quality index published by The Ministry of Environment and Forestry shows that the environmental quality index of 6 provinces in Java Island included in deficient category from 2011-2017 (Table.1.1). According to argument, result of previous study, and data published by Statistical Central Agency and the Ministry of Environment and Forestry, there is a propensity manufacturing industry influences environmental quality in Java Island.

Table 1.1 Environmental Quality Index (EQI) of 6 Provinces in Java Island

Province	Year						
	2011	2012	2013	2014	2015	2016	2017
DKI Jakarta	36.90	36.80	31.97	36.88	43.79	38.69	35.78
West Java	50.49	48.18	47.61	45.06	63.49	51.87	50.26
Central Java	58.36	60.96	58.03	60.63	60.78	58.75	58.15
Yogyakarta	49.82	53.25	52.01	49.53	50.99	51.37	49.80
East Java	60.22	58.96	56.47	56.48	62.67	58.98	57.46
Banten	52.70	46.77	46.33	43.67	55.36	60.00	51.58
Average	51.41	50.82	48.74	48.70	56.18	53.28	50.50

Source: Indonesia-Ministry of Environmental and Forestry, 2014, 2015, 2016, 2018

Note: $50 < EQI \geq 60$ - deficient

Obtaining maximum profit is the goal of every firm. Profit reflects firm effectiveness and efficiency in utilizing firm's resources. Efficiency is always identified with the maximum output from the use of a certain number of inputs. Reduction in inputs usage can be performed by minimizing errors in production, both those caused by errors in the production system and errors caused by the low skills of employees. The pollution, waste and emission resulted from inefficiency and ineffectiveness of

input usage. The increasing of pollution, emission and waste may lead environmental problems and reduce firm's profitability.

Environmental management includes technical and organizational activities carried out by firm to reduce environmental impacts and minimize these impacts on the natural environment (Cramer, 1998). The environmental management system provides systematic steps in minimizing environmental impacts (Cai and Li, 2018). The steps consisting of the preparation of environmental policies, setting targets and environmental goals, compiling environmental programs, compiling procedures, evaluating the achievement of targets and objectives, taking corrective actions and taking follow-up steps (Arimura, Darnall, Ganguli, and Katayama, 2016; Coglianese and Nash, 2001). EMS practices are focused on minimizing the use of materials, water, energy, reducing pollution and waste and improving employee skills through training. Firm's success in reducing environmental impact reflected on environmental performance. The more environmental impacts can be reduced the high the environmental performance. Other than impact on environmental performance, firm's success in reducing materail, water and energy usage as well waste result in cost efficiency that potential improving firm profitability.

Previous study showed that stakeholders pressures firm to adopt environmental management system, green innovation, and training to reduce environmental impact and increase firm competitiveness (Baah et al., 2021; Cai and Zhou, 2014). However, the relationship between environmental management system, green innovation, training and environmental performance and firm profitability shows inconsistent. Many studies have been conducted and the results show that the firm's initiative to adopt an environmental management system, conduct green innovation and conduct training has a positive effect on environmental performance and firm's profitability (Ghisetti and

Rennings, 2014; Montabon, Sroufe, and Narasimhan, 2007; Theyel, 2000; Yu, Ramanathan, and Nath, 2017). However, there is not a small amount of evidence showing the failure of adopting these options (Barla, 2007; Doran and Ryan, 2016; Schonewille, 2001; Wagner, 2007). This fact has provoked debate among academics and firm doubts to concentrate on environmental issues.

The Indonesian Ministry of Environment and Forestry issued a policy on environmental management, this policy is intended to encourage voluntary manufacturing firm participation in environmental management through firm environmental performance assessment program in environmental management that called as *PROPER*. However, these efforts have not provided maximum results in overcoming the deteriorating environmental quality. The Ministry of Environment and Forestry's report shows the number of firms participating in environmental management continues to increase, but the majority firms focus on limited environmental management, as shown in Table 1.2.

Table 1.2 Firm's Participation in *PROPER* Program

Year	Total member of *PROPER*	Number of companies based on *PROPER* Performance				
		Gold	Green	Blue	Red	Black
		BC	BC	C	LC	NC
2011-2012	1312	12	119	771	331	79
2012-2013	1792	12	113	1039	611	17
2013-2014	1891	9	121	1224	516	21
2014-2015	2076	12	108	1406	529	21
2015-2016	1895	12	172	1422	284	5
2016-2017	1786	19	150	1486	130	1
2017-2018	1872	20	155	1454	241	2

Source: Indonesia-Ministry of Environmental and Forestry, 2012-2018a

Note:
BC: Beyond compliance
C: Compliant/limited
LC: Less compliant
NC: Not compliant

The limited participation in environmental management not only produces a less significant effect on improving environmental performance but also fails to produce the expected efficiencies. The Ministry of Environment and Forestry's report reveals that efficiencies and green innovation are only produced by firms that carry out environmental management within a broad scope or beyond the practice required by regulations. Efficiencies and green innovation data are shown in Table 1.3.

Table 1.3 Efficiencies and green innovation from beyond environmental management practices from 2015 to 2018

Environmental management practices	Year			
	2015	2016	2017	2018
non-B3 waste reduction	9,419,229 ton	3,245,604 ton	11,557,439 ton	6.829.428 Ton
B3 waste reduction	4,786,034 ton	6,444,846 ton	13,610,719 ton	16.344.704 Ton
Water efficiency	533,128,233 m^3	447,463,288 m^3	492,4087,329 m^3	540,448,997 m^3
Energy efficiency	919,098,110 Giga Joule	249,808,268 Giga Joule	230,619,485 Giga Joule	273,613,028 Giga Joule
Greenhouse gas emission reduction	48,076,583 ton CO_2,Eq	75,663,410 ton CO_2, Eq	33,262,184 ton CO_2, Eq	38,021,962 CO_2,Eq
Green Innovation	150	260	401	542

Source: Indonesia-Ministry of Environmental and Forestry, 2017, 2018a

Firm participation in environmental management system (EMS) can be done formally, by adopting ISO 14001 standards initiated by official institutions such as the International Organization for Standardization, or informally, by adopting self-designed environmental management standards. Choosing formal EMS or informal EMS brings different consequences on firm financial. Adopting a formal EMS requires more resources investment, such as money, technology, knowledge and skills, and time than adopting an informal EMS (Darnall and Sides, 2008; Delmas, 2002). Former studies showed, although the cost is higher, formal EMS adoption result in greater firm ability to acquire profit and environmental benefits than informal EMS adoption (Arimura et al., 2016; Nguyen and Hens, 2015). Rebuttal is conveyed because some evidence

demonstrated that ISO 14001 adoption is not always linear with firm performance improvement, profitability and/or environmental performance (Aravind and Christmann, 2011; Gomez and Rodriguez, 2011; Zobel, 2013). Responding to differences in results, several studies have suggested the use of mediator and /or moderator variables to test the relationship of the above variables (Henri and Journeault, 2008).

An environmental management system provides systematic guidance for minimizing environmental impacts because it contains environmental procedures, policies, programs, targets, and objectives. Therefore, the firm's initiative in conducting green innovation is associated with the adoption of an environmental management system. However, different types of EMS taken will have different impacts on green innovation (Rondinelli and Vastag, 2000).

Data from the Ministry of Environment and Forestry shows that the number of green innovations has continued to increase (Table 1.2), but the number is still relatively small because it is only carried out by beyond compliance firms. Therefore, the green innovation carried out has not been optimal in reducing environmental impacts and resulting in the expected cost savings.

Skilled employees play an important role in the successful strategy implementation. Training facilitates firm to improve skill, competence, knowledge, and behaviour of the employee that contribute to firm productivity (Marimuthu, Arokiasamy, and Ismail, 2009). EMS implementation requires skilled personnel to identify targeted environmental issues, prepare plans, implement work programs, monitor, and evaluate program implementation and compare results with environmental targets. Therefore, the adoption of EMS is always associated with the implementation of training. Conducting training is one of the requirements that must be met by firm that

adopt formal EMS (Darnall, Henriques, and Sadorsky, 2008; Delmas, 2001). Previous study showed that the differences in adopting EMS will affect firm initiative in conducting training (Delmas and Peckovic, 2012; Govindarajulu and Daily, 2004; Perez, Amichai-Hamburger, and Shterental, 2009)

Corresponding to environmental quality problems faced by Indonesia, low firm's participation in environmental management, green innovation and training as well differences in previous result studies, be a main reason why this study is conducted. In contrast to previous studies, this study examines the effect of environmental management system adoption on firm performance, which is proxied by profitability and environmental performance, using green innovation, training and environmental performance as mediator variables. In previous studies, the relationships among these variables were more often tested directly.

This research was conducted in Indonesia by involving manufacturing firms as a unit of analysis. The data in this study were collected through documentation techniques by accessing several institutional websites such as the Indonesia Stock Exchange, the Ministry of Environment and Forestry and the Ministry of State-Owned Enterprises, as well as the websites of targeted firms. The data used is secondary data that consist of firm participation in the adoption of environmental management systems obtained from annual reports, environmental performance data obtained from firm performance rating assessment programs in environmental management *(PROPER)* report that published by government, firm profitability data obtained from financial reports, green innovation data obtained from annual reports or sustainability reports, and training data obtained from annual reports or sustainability reports. Data analysis was performed using PLS-SEM software Warp-PLS version 7.0. This software provides some advantages such as, compatible to analyse data in formative and reflective forms, suitable to test indirect

relationships through mediator and/or moderator variables and fit for analysing data with ratio, interval, ordinal and categorical scales.

1.3 Problem statements

The population growth followed by increased firm number triggers the declining of environmental quality. The production process, packaging, and product distribution of manufacturing firms result in air pollution, water pollution, waste, emission, and soil pollution. Study showed that the environmental quality influenced by agglomeration of industry. Most of Indonesian manufacturing industry is concentrated in Java Island and environmental quality of six provinces of the Java Island is lower than other islands. It needs further study to obtain evidence that the manufacturing firm growth impact on environmental quality in six provinces of Java Island.

Increasing stakeholder concern on environmental issues trigger firm to take up environmental management practices. Achieving sustainability business needs to synchronize profit objective and environmental protection objective. Environmental management system adoption, conduct green innovation and conduct training are the effective strategy to improve environmental performance and firm's competitiveness. However, to adopt those strategies firm should allocate large resources investment. This influence firm decision whether involved in boarder or limited environmental management practices. Indonesian government initiative launched environmental management regulation to invite more firm participation showed success but it less maximum in reducing environmental impacts caused by firm operation. Limited participation of majority participant has not significant impact on reduce environmental burdens, cost reductions and improved green innovation. The evidence shows firm decision whether involve in boarder and limited formal EMS or informal EMS generate

different impact on environmental performance, firm's profitability, green innovation, and training. The evidence also shows the direct relationship among still vague, then some scholars proposed to use mediator or moderator variables to connect those variables. Therefore, it is deemed necessary to conduct further studies to confirm the proposals submitted.

1.4 Research questions

1. To what extent the manufacturing impact on environmental quality?
2. What is the role of environmental performance in mediating the relationship between environmental management system adoption and firm profitability?
3. To what extent green innovation's role in mediating the relationship between environmental management system adoption and environmental performance?
4. How is the role of environmental performance in mediating the relationship between green innovation and firm profitability?
5. How is the role of training in mediating the relationship between environmental management system adoption and environmental performance?

1.5 Research objectives

1. To analyze the impact of the manufacturing industry on environmental quality.
2. To analyze the role of environmental performance in mediating the relationship between environmental management systems and firm profitability.
3. To analyze the role of green innovation in mediating the relationship between environmental management systems and environmental performance.
4. To analyze the role of environmental performance in mediating the relationship between green innovation and firm profitability.

5. To analyze the role of training in mediating the relationship between environmental management systems and environmental performance.

1.6 The significance of the study

The significance contribution of study on academic, this study was conducted to estimate the impact of manufacturing industry on environmental quality that proxied by comprehensive indicator, environmental quality index. This indicator is infrequently used in the previous study. The environmental index is a comprehensive indicator that be able to capture boarder aspects of the ecosystems (Almeida, Cruz, Barata, and García-Sánchez, 2017). The environmental quality formed by many factors, such as air, water, and solid waste pollution, among other factors, as well as environmental pollution control and environmental pollution per unit area, therefore environmental quality and cannot simply replaced by single pollutant (Zhou and Li, 2020b).

The study applied indirect test to investigate the relationship between environmental management system and firm's performance (environmental performance and firm profitability). The indirect test is performed to follow up the recommendation of (Henri and Journeault, 2008). Other than that, the indirect test applied to produce evidence that optimal firm's performance can be attained by synergizing environmental management system adoption, conduct green innovation and conduct training. Another contribution, this study investigates the different impact of formal environmental management system and informal management system adoption on environmental performance, firm profitability, green innovation, and training that is hardly found in Indonesia context. Data analysis was performed using PLS-SEM software Warp-PLS version 7.0. PLS-SEM provides some advantages such as compatible for small sample data, applicable to analyse variable with formative and

reflective indicators, suitable to test indirect relationships using mediator and/or moderator variables and fit for all measurement scale. PLS-SEM also does not require data to be normally distributed (Latan and Ghozali Imam, 2016).

The practical contribution, the study is expected firm to adopt formal and boarder environmental management system, substantive green innovation and conduct environmental training to achieve better firm performance. This study is also expected the government to formulate regulation that force manufacturing firm intensively use renewable energy, provide wastewater treatment plant, and divert investment target to outside Java Island. Government is also expected to amend the article 5 of regulation No 3/2014 on firm rating assessment program in environmental management to encourage compliant firm increase their firm performance.

1.7 The Limitation of Study

This study uses Warp-PLS software to analyze panel regression data (objective 1). Although Warp-PLS is compatible to process panel data, this software has limitations that it can only be used to process pooled ordinary least squares (OLS) which assumes constant coefficients over time and individuals, this assumption is not realistic because each province has different characteristics. Consequently, the results of data analysis for objective 1 cannot describe how industrial manufacturing influences environmental quality in each province. The use of informal EMS firms as a dominant sample result in small effect of environmental management system on environmental performance, green innovation, training and firm's profitability. The use of training cost for general training as an indicator of training can cause its effect on environmental performance bias. The study only focuses on some manufacturing firms in Indonesia that selected based on some criteria, using cross section data in 2017, the number of

samples is very limited. This limitation may affect the results of the study. The study also focuses on the indirect relationship not on the direct relationship.

1.8 Operational Definition

This part presents variable operational definition of the study. The variables consist of firm profitability, environmental performance, environmental management systems, green innovation, and training.

Firm Performance

Firm performance is divided into, financial performance and non-financial performance. Financial performance is associated with financial achievements, whilst non-financial performance is identified with social performance and environmental performance. This study proxies firm performance with firm profitability and environmental performance.

Firm Profitability

Profitability is the firm's ability in generating profits. In general, profit is defined as the difference between accrual-based revenue and accrual-based expenses incurred in generating income for a certain period such as quarterly or one year (Pfeifer, Haskins, and Conroy, 2004). Profit reflects the efficiency level of the firm in minimizing the costs incurred to reduce environmental impacts. In addition, profit also presents the firm's effectiveness in achieving its goals, which is reflected in the firm's ability in producing sales or revenue. Some previous studies use several indicators as proxies of firm profitability such as, return on assets (ROA), return on investment (ROI) or profit margin. In this study, firm profitability proxied by net profit margin (NPM), ratio between net sales and profit after tax, the ratio shows the ability of a firm in generating profit from sales.

Environmental Performance

Klassen and McLaughlin (1996) defined environmental performance as an evaluating tool to assess how successful a firm is in reducing its impact on the environment. Environmental performance could be resulted from emission reduction, pollution prevention and recycling processes (Hart and Ahuja, 1996). Previous studies used different indicators in measuring environmental performance such as, the quantity of waste produced (Iwata and Okada, 2011; Sarkis and Dijkshoorn, 2007; Sharma and Henriques, 2005) waste management, self-reporting of managers (Claver-Cortés, Molina-Azorín, Pereira-Moliner, and López-Gamero, 2007), energy alleviation, water reduction, waste abatement and reduction of material packaging, recycling or reuse, toxic waste pollution emissions (Burgos-Jiménez et al., 2013), electricity index (Friedrich, Pillay, and Buckley, 2007), total material requirements (Baboulet and Lenzen, 2010a), greenhouse gas emissions (Psaraftis and Kontovas, 2010), and toxic waste released (Patten, 2002).

In this study, environmental performance assessed by firm's compliance level in firm performance rating in environmental management *(PROPER)* prepared by Indonesia Ministry of Environment. According to level of compliance, firm divided in two types, beyond compliance firm and compliant firm. Dummy applied to distinguished two types of firms, 1 for beyond compliance firm and 0 for compliant firm. The performance of compliant firm refers to article 5 paragraph 1, whilst beyond compliance firm performance accord to article 6 of Regulation No.3/2014.

Manufacturing industry

Manufacturing industry is an economic activity which process basic goods mechanically, chemicals, or manually into final or intermediate goods, and or that goods of less value to higher value and nature closer to the end user. The activities also include services for manufacturing and assembling. (Indonesia's Central Statistics Agency, 2017). In this study, manufacturing industry evaluated by its contribution on Gross Domestic Regional Product (GDRP). The contribution stated in constant price.

Environmental quality

According to European Environmental Agency (2004) Environmental quality is a general term that can refer to: various characteristics such as purity or pollution of air and water, noise, access to open spaces, and the visual effects of buildings, and the potential effects that these characteristics may have on physical and mental health. Environmental quality proxied by Environmental Quality Index (EQI). The Environmental Quality Index is a sum of the air quality index, water quality index and land cover quality index.

The water quality index is evaluated based on monitoring the result of river water quality. Monitoring is carried out based on parameters including Total Suspended Solid (TSS), Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Phosphate, Faecal Coli, and Total Coliform. Air quality monitoring indexes were carried out in transportation, residential, industrial and commercial areas in 150 districts /cities, and which focused on the parameters of Sulphur Dioxide (SO_2) and Nitrogen Dioxide (NO_2). The land cover quality index was calculated by summing up the land cover index, forest performance index, land cover condition index, water body conservation index and the habitat condition index. The index value of land cover quality is influenced by several factors including land clearing

activities, forest and /or land fires, illegal logging, forest and/or land rehabilitation activities, coastal area rehabilitation, post-mining land restoration activities, and restoration of hazardous and toxic waste of contaminated land (Ministry of Environment and Forestry, 2018)

Environmental Management System

Melnyk et al., (2003) defines an environmental management system that is part of the management system that includes the organizational structure, planning of various activities, practices, procedures, processes and resources for the development, implementation, achievement, assessment and maintenance of environmental policies. Molina-azorín, Tarí, Claver-, and López-gamero (2009) revealed environmental management involves the technical and organizational activities undertaken by firms to reduce environmental impacts and minimize their impact on the natural environment. This study deploys an environmental management system that adopted by firm as formal and/or informal. Formal EMS refers to the ISO 14001 certificate and informal EMS regard to EMS constructs by firm internally. According to types of EMS adopted, this study differentiate firm into two categories, formal EMS adopter and informal EMS adopter. Dummy used to differentiate firm, 1 for formal EMS adopter and 0 for informal EMS adopter.

Green Innovation

Rennings (2000) defines eco-innovation as the process of developing new ideas, process and product behaviors that contributed in reducing environmental burdens or achieving environmental sustainability targets. Porter and Linde (1995) stated that eco-innovation includes the design of products and services, marketing and promotion of environmentally friendly. While Arundel and Kemp (2009) defines eco-innovation as a process, technology, new product or modified by a company to prevent or overcome

environmental damage. Almost the same definition is expressed by Przychodzen and Przychodzen (2015), eco-innovations include new ways of organizing firms aimed at increasing eco-efficiency in existing operations through technological and non-technological changes. Referring to the definitions above, it can be concluded that eco-innovation is intended to minimize environmental impacts through the application and development of new or existing ideas, techniques, processes and products. A more specific definition is presented by Chen, Lai, and Wen (2006), he mentioned green innovation refers to product and process innovation related to environmental activities such as material savings, per unit cost savings, emissions reductions and recycling.

Many indicators used to measure green innovation or eco-innovation such end-of-pipe technology and research and development expenditure (Inoue, Arimura, & Nakano, 2013; Kesidou & Demirel, 2012), less toxic materials usage, improve and design environmentally friendly packaging for existing products, product life cycle improvement, recycle using eco-labelling, less energy usage such as, water, electricity, gas, gasoline (fuel) during production/use/disposal, recycling, reuse, and remanufacturing the use of materials with clean technology (Ar, 2012), and number of patent (Aguilera-caracuel & Ortiz-de-mandojana, 2013). According to Indonesia Ministry of Environment, green innovation should denote the novelty elements that have a positive impact on the environment quantitatively, result in cost savings and increase the value of the changes. In this study green innovation assessed by energy efficiency, decrease emissions, water savings, utilization of hazardous and non-hazardous waste, and protection of biodiversity. According to initiated green innovation, this study firms classified into group; score 1 given to innovator company and score 0 for non-innovator company.

Training

Referring to Sohel & Schroeder (2003), the training program focusing on education and increasing firm employees knowledge that directed to overcome firm's obstacles. By having knowledge, employees can understand how the environment can influence and be influenced by their tasks and decisions. Training can stimulate employees to work more effectively, develop interpersonal contacts that help employees engage in the transfer of knowledge and encourage innovation ideas that can increase productivity. This study used to the total of training cost. The information about total training cost provided on sustainability report. However, because of some firms do not publish sustainability report, it is difficult to find the information. To handle this problem, this study divides firm into two groups, firms that held training and mention the total training cost classified in two groups. Score 1 for firm that conducted training and mentioned total training cost, 0 for firm that do not established and mentioned the total training cost.

1.9 Organization of the Study

This thesis is divided in six chapters. The first chapter provides information about the background of the study, problem statements, research questions, research objectives, research contribution, the limitation of research, operational definition, organization of the study and chapter summary. In the following chapter will be presented the information about the background of the study. Whereas, literature reviews, empirical reviews and research gaps are presented in chapter three. Research methodology will be explained in chapter four. Chapter five focuses on the results and discussion and the last chapter presents the conclusion of the study.

1.10 Chapter Summary

There are some important points in this chapter. On the background of study, explained firm's dilemma in running their operation between focus on profit maximization without concern on environmental issues and employees' development or integrate it in daily operation with consequences allocated additional costs or ignoring those issues with firm sustainability threated. Mentioned that limited participation in environmental management are less significant impact on environmental performance, cost reduction and green innovation. Displayed contradiction result of previous studies.

In the next section, it is presented a problem statement which is a summary of the background of the study. Research questions and research objectives depict what are the problems of the research that should be solved, there are four research questions and research objectives. From the significance of the study, there are three contributions, literature contribution, methodological contribution and practical contributions

CHAPTER 2

BACKGROUND OF STUDY IN INDONESIA

2.1 Introduction

This chapter explains population and manufacturing industry growth and Java's manufacturing contribution on Gross Domestic Product, Indonesia environmental quality, environmental quality in Java, environmental quality deterioration and its drivers including industrial activities, environmental degradation and its impact, environmental management systems and environmental performance assessment), firms performance, firm's innovation and employees performance. At the end, conclusions will be given.

2.2 Population and Manufacturing Industry in Indonesia

The population and industrial growth have had a major impact on the decline in environmental quality in Indonesia. The Indonesia population can be seen in Figure 2.1.

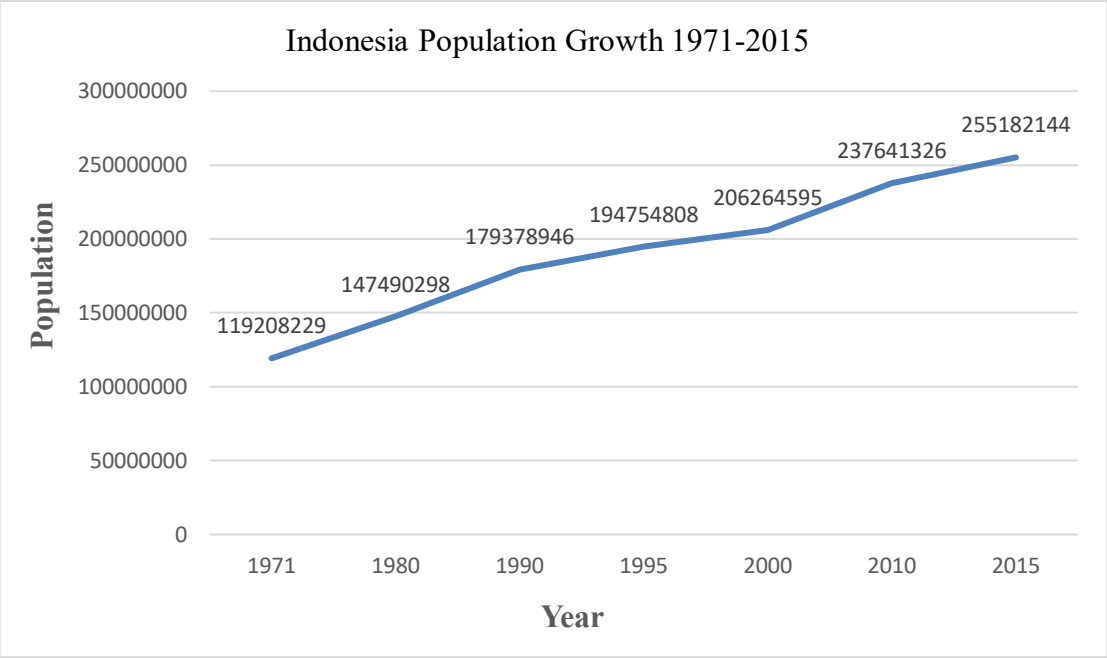

Figure 2.1 Indonesia Population Growth 1971-2015
Source: BPS-Statistics Indonesia, 2018

The Statistical Central Agency revealed that it is about 57% of Indonesian population stay in Java Island. The industrial activity, especially large and medium manufacturing firms' growth, also delivers negative side impact on environment. The number of large and medium manufacturing firms in Indonesia and Java Island presented on Table 2.1.

Table 2.1 The Number of Large-Medium Firms in Indonesia and Java Island 2010-2015 (unit)

Year	Jakarta	West Java	Central Java	Yogya	East Java	Banten	Java	Indonesia	%
2010	1588	6029	3887	400	-	1620	13542	23345	58%
2011	1451	5861	3850	407	6288	1583	19440	23370	83.18
2012	1410	6052	3736	391	6370	1595	19554	23592	82.88
2013	1242	6457	3666	322	6226	1674	19587	23698	82.65
2014	1240	6633	3851	339	6473	1720	20256	24.529	82.57
2015	1323	6874	4378	351	6967	1862	21755	26.322	82.64

Source: BPS-Statistics Indonesia, 2014, 2017

Table 2.1 shows that the number of large and medium firm nationally tend to increase for six (2010-2015) years. The Table 1 indicates that 82% manufacturing firm run their operation in Java.

2.3 The contribution of Java Island on Gross Domestic Product (GDP)

Table 2.2 shows that Java Island contribution on Gross Domestic Product continues to increase year by year compared to other islands, and the Java's contribution is very significant compared to other islands.

Table 2.2 The contribution of Java Island to Gross Domestic Product

Year	Java Island (percent)	Other Island (percent)
2010	58.06	41.94
2011	57.59	42.41
2012	57.6	43.1
2013	57.06	42.94
2014	57.39	42.61
2015	58.33	41.67
2016	58.52	41.48
2017	58.49	41.51
2018	58.50	41.50
2019	58.81	41.19
2020	58.75	41.25

Source: BPS-Statistics of East Java Province, 2018

Table 2.3 points that nearly two-thirds of the Gross Domestic Product from the business sector comes from the contribution of manufacturing companies in Java.

Table 2.3 Contribution of Java Manufacturing Firms to GDP (percent)

Year	Java	Other islands
2011	73.41	26.59
2012	73.07	26.93
2013	72.78	27.22
2014	72.64	27.36
2015	71.03	28.97
2016	71.77	28.23

Source: Indonesia- The Ministry of Industry, 2016

2.4 National Environmental Quality and Provinces in Indonesia

According to environmental performance index (EPI) published by Yale University, Indonesia's environmental performance left far behind compared to other ASEAN member countries such as Singapore, Malaysia, Brunei Darussalam, and Thailand. In 2018, Indonesia's environmental performance ranks 133 in the world. Meanwhile, Singapore, Brunei Darussalam, Malaysia and Philippines position lower than Indonesia. The Indonesia environmental performance ratings among ASEAN countries is presented on Table 2.4.

Table 2.4 Environmental Performance of ASEAN Countries

Country	EPI Rank			
	2010	2014	2016	2018
Indonesia	134	112	107	133
Malaysia	54	51	63	75
Philippines	51	114	66	82
Singapore	28	4	14	49
Thailand	67	78	91	121
Laos	80	127	153	153
Myanmar	110	-	148	138
Brunei Darussalam	72	37	98	53
Viet Nam	85	136	131	132
Cambodia	148	145	146	150
Timor-Leste	-	132	138	125

Source: Yale Center for Environmental Law & Policy, 2010, 2014, 2016, 2018

Nationally, the Indonesian environmental quality index for five years (2013-2017) was "fair good" (see Table 2.5) with an average score above 60 (Figure 2.2). The index of