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THE ENVIRONMENTAL ACCOUNTING: A LITERATURE REVIEW AND FUTURE DIRECTION

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ABSTRACT

The aim of this article is to track the trending topics in the field study of environmental accounting research. The data was analyzed by using the library study method. The data was collected from scopus database by searching the systematic keyword that related with the environmental accounting literature on the search engine. This study found that the article that discussed about the environmental accounting was various and mostly concern on the issue about carbon accounting, water accounting, and biodiversity accounting as well as the measurement stages of extinction accounting. The author also found there was some theory which fit with the environmental accounting research that mainly discussed about the evolution of modern accounting and business methods that now more concerned with the social and environmental accounting. This research had implication for the accounting thinkers as well as the accounting and economic students, because the author did not only discuss about the literature review of environmental accounting but also the future direction of the environmental accounting that could become a new novelty for the future study.

Keywords: *Environmental Accounting; Carbon Accounting; Extinction Accounting.*

ABSTRAK

Artikel ini bertujuan untuk melacak trending topik dalam studi lapangan penelitian akuntansi lingkungan. Data dianalisis dengan menggunakan metode studi kepustakaan. Data dikumpulkan dari database scopus dengan mencari kata kunci sistematik yang berhubungan dengan literatur akuntansi lingkungan di search engine. Studi ini menemukan bahwa artikel yang membahas tentang akuntansi

lingkungan sangat beragam dan sebagian besar membahas tentang akuntansi karbon, akuntansi air, dan akuntansi keanekaragaman hayati serta tahapan pengukuran akuntansi untuk satwa yang dilindungi dan hampir punah. Penulis juga menemukan beberapa teori yang sesuai dengan penelitian akuntansi lingkungan, terutama yang membahas tentang evolusi akuntansi modern dan metode bisnis yang sekarang lebih memperhatikan akuntansi sosial dan lingkungan. Penelitian ini memiliki implikasi bagi para pemikir akuntansi serta mahasiswa akuntansi dan ekonomi, karena penulis tidak hanya membahas tentang kajian literatur akuntansi lingkungan, tetapi juga membahas peluang kebaruan dalam penelitian akuntansi lingkungan yang dapat menjadi novelty bagi penelitian dimasa yang akan datang.

Kata kunci: Akuntansi Lingkungan; Akuntansi Karbon; Akuntansi Satwa Langka.

INTRODUCTION

Generally, the study about environmental accounting examines the account that related with environmental disclosure as well as the impact of environmental performance on company performance. But the study that specifically discuss literature review of environmental accounting for various environmental impacts remains infrequently to be addressed. The topic about environmental accounting was very interesting to be highlighted because of its unique account that embedded in the corporate activity. This account usually reflected on the business cycle and operational activity that could impact the changing on the environmental. As instance, the production of oil palm in Sumatra and Kalimantan supplied 30 percent of the world's vegetable oil and at the same time also contributed to global carbon budgets as well as the deforestation of the forest land. In the environmental accounting concept and practice, this carbon budgets as well as the deforested land should be analyzed, calculated, reported and the company should replace this bad impact with environmental cost as much as the carbon budgets and the deforested land. This means that the company should replace the bad influence that occurred in the environment because of their corporate activity.

Furthermore, corporate activity did not only contribute to the increase of the carbon level and deforestation but also contributed to the other harm environmental effect. For instance, about 90 percent of marine fish are now overfished. Almost about 20 percent of corals are gone, and the half was severely threatened. About half of the agricultural land suffered from deterioration as well as desertification and also some toxic chemicals could be found in each of us (Speth, 2008). The ozone layer was depleted, the global warming and disrupting climate had been severely happen, and this phenomenon increases the melting of the ice field, along with the decreasing of the freshwater. This immense scale of environmental problem should be overcome by the corporate. The company should be responsible for minimizing the environmental impact that created by their entity. To decrease the environmental impact, the company should calculate and estimate the environmental cost in a period. Then, the author offered an Environmental Accounting concept and practice which fit with the nature of modern corporate as one of the solutions for decreasing the environmental cost and impact.

Environmental accounting is a field of study which analyze and identifies, measures as well as disclose the resource that had been used by the enterprise which impact the environment (Deegan, 2013). The environmental accounting research is mostly concerned with how firms account is used to disclose the environmental impact and to investigate the environmental impact on the firms. There were several articles that examined the integration of environmental accounting with a

sustainability development framework (Burritt & Tingey-holyoak 2012; Booth, 2018). The other research also examined the material flow cast, carbon accounting, and environmental accountability. The other topics were discussed about water and carbon accounting (Bowen et al., 2011). The information about how the corporate disclose their social and environmental responsibility in the account for environmental impact was also studied by the scientist in their work of study. This study aimed to track the trending topics in the field study of environmental accounting research, as well as to provide a structured overview of environmental accounting research and to draw conclusion for the future research. In this study the author demonstrate the library study method in analysing the historical and current trend research in order to get the new direction of the future research. This article had immense implication for the corporate because this article offered various stages and accounts that could be used by the company in calculating and projecting their environmental cost. In addition, this article also beneficial for the Economic as well as Accounting students, because this article showed and also provided information about the steps in doing the journal review in order to gain extant reviews on environmental accounting within particular journal.

RESEARCH METHODS

The method of this research was library study which had been conducted in order to get more data about the Environmental Accounting research. The method generally follows the literature review guidelines by (Sekaran, 2019) and the author review it by manual process. First, the author identified the papers that had been collected which consist of various topics which related with the scope study of environmental accounting. Second the author classifies the discussion in order to detect the content of the research. This method is implemented in order to gain more insight or a substantial body of knowledge accounting for various environmental impacts.

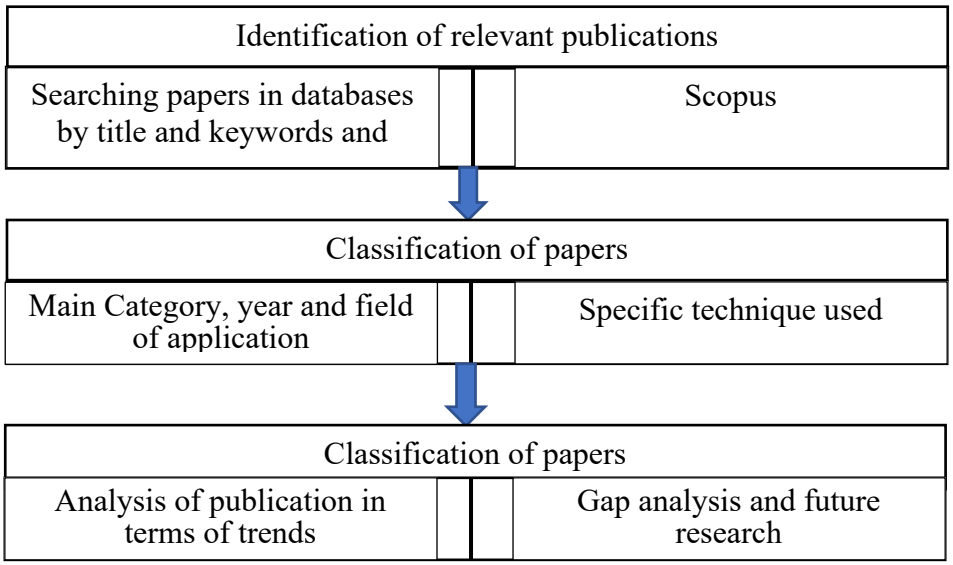
The identification of study topics by using library study is important for understanding historical developments, current trends as well as the chance for future research (Chung & Molson, 2018). The most common approach in detecting the topics was the use of manual literature review which aims to detect the research studies, summarize the evidence, and draw the conclusion for future studies. This paper discuss the evidence as well as historical study in the field of accounting environmental studies from 20 past academic work from year 2011 to 2020 in order to draw the direction of the future research in this field of study based upon the burst “hot” topic.

The research methodology (the stages of the literature review) was explained in the figure 1. The first step that has been done was collecting literature from international publications from scopus database that published in English language between 2011 to 2020. The author searched the titles based upon the keywords with the following terms, such as environmental accounting, sustainability performance, and the evolution of environmental accounting. While this keyword brings a high number of papers, many papers are disregarded as their year of publication is under the 2011. The result reached 20 papers of publication, and then the author divided the article in some clusters in terms of publication year, subject and main object. Almost all of the paper discussed environmental accounting in the different fields such as accounting for energy, water accounting, sustainability reporting and manufacturing. After reading the past academic work, then the author found some literature that seems relevant with this study. The aim of this study was not to

examine the correlation or causality of a model, but it was aim to discuss further about the environmental accounting current research, trends, and the direction of the future study. The literature review method assist the researchers to achieve the objective of the study, because by used this method the author can analyze a high number of paper and also could help the researchers found the gap in the issue as well as assist the author in finding a new novelty for future research.

Figure 1

The Stages of the Literature Review Method



Source: (Buyuzkozkan and Yagmur, 2018)

RESULTS AND DISCUSSION

The first country that pays attention deeply to the issue about environmental account was Norwegian in the 1970s, which concerned about the availability of natural resources on earth, which would be decreased year by year. Then, they developed the accounting method to record the use of natural resources, as instance forest, fisheries, energy and also land. In the 1980s, the account of air pollutant emissions were developed which related with the energy account (Qian & Burritt, 2008).

The Netherland was the second country which concerned about this issue, the man whose name Roefie Hueting discussed about the degradation and depletion of environmental assets that comes from business activity in his academic work. After The Netherland, France was the third country which adopted this account especially in the 1980s. This country developed more complex account that combined between the natural, culture as well as historical resources (Qian & Burritt, 2008). Then in the middle on 1990s, United Nations and the World Bank conducted workshops which had outcome such as publication of paper that became literature resources in the filed study of environmental accounting.

In the 1993 the UN developed integrated economic and environmental account that offered five aspect that might be chosen, which discussed about, (1) issues about environmental is important; (2) disaggregation of environmental-

related monetary flows and assets within the conventional SNA; (3) physical accounts that track the movement of materials between environment and economy, which includes natural resources use, as well as waste (discharge of residual); (4) the value of non-marketed environmental services such as watershed protection.

The explanation above mainly concern about environmental account in the national account, but when the environmental accounting was modified from the system national account to the account that fit with the nature of modern corporate, it will be slightly different. The forms of environmental accounting consist of three forms, (a.) Environmental accounting management; (b.) Environmental Financial Accounting; (c.) Environmental national accounting. The discussion in this study focus on the environmental financial accounting which rooted from the financial accounting. Environmental financial accounting focuses on the reporting environmental liability cost and other significant environmental costs. The purpose of environmental accounting consist of several points such as to meet the regulatory requirement, to clean up the pollution that already exist in the environment, to promote the philanthropy of the company, to control over operational and material efficiency and to control the over increases in cost for raw materials, waste management, and also potential liability.

The scope of environmental accounting is very wide which includes corporate level, national level and international level. The example of the implementation of EA in the corporate was reflected by investment activity, in this aspect the corporate made investment in order to minimize the losses of the environment which include providing the devices or equipment which are environmentally friendly. Secondly, it was reflected also by calculating the degradation and destruction of soil, loss biodiversity, air pollution, water pollution, problem of solid waste, as well as coastal and marine pollution. Thirdly, the depletion of nonrenewable natural resources and fourth the deforestation and land use, this last damage was very hard to measure due to a particular industry (Qian & Burritt, 2008).

Land Soil account was the opening and closing stocks that consist of land area over which ownership right are enforce, this account include also land underlying building and works, agricultural land, forest and other wooded land, recreational land, and associated surface water, and other open land and areas of artificial watercourses. Soil degradation refers to the changes of the soil and therefore could be treated as depletion of soil. In economic term, soil degradation was the change of land quality due to the loss of top soil. Soil was considered as a renewable resource, as it possesses recuperative capacities that allow some erosion to be sustained without productivity losses.

The next account was subsoil asset accounts which refer to the opening and closing stocks of subsoil assets, such as the reserves of the mineral deposit which located on the below or the earth's surface, that are economically exploitable, given current technology and relative prices. This asset consists of coal, oil, natural gas reserves, and metallic as well as nonmetallic mineral reserves. The third account was forest accounts that include all economic function such as the provision of timber, bark, fibers, fruits, and other forest product that are commercially exploitable. All the elements of the forest accounts are calculated in volume or weight (cubic meters or tons of biomass).

The first article which interested to be reviewed was an article from Carlson et al., (2012) which discussed and studied about the increasing of carbon emission

level in Kalimantan forest that caused by oil palm plantations. This research found that 30 percent of world vegetable oil production came from oil palm product. The cultivation method of this plant used the conversion method which converted the forest to the land covered with oil palm plantation. The productions of this oil contribute to the increasing of global carbon budgets. Oil palms also contribute to the deforestation of forest in Sumatra and Kalimantan. Then Carlson et al., (2012) found a solution that the accounting for past and potential emissions from plantation expansion were very important to be estimated. The accounting method in estimated the carbon and emission in the field of oil palm plantation encompasses sixth steps; land cover classification and validation, land cover validation, oil palm identification, land cover change projections, carbon bookkeeping model and sensitivity analysis and avoided emissions and export tax revenues.

The second article was an article from Chung & Molson, (2018) which discussed about social and environment accounting (SEA). This study used a literature review method and they found a chance of novel and future direction of environmental accounting which can be measured by corporate social performance (CSP), corporate social disclosure (CSD) as well as corporate financial performance (CFP). The usage of this aspect mainly used by public corporate or a large corporation.

According to Chung & Molson, (2018) the integration of CSR and CSP and CSF and also this aspect can be expanded in creating the mediating and moderating effect. The moderating and mediating effect from CSR activities consist of size, level of diversification, R and D, advertising, government sales, consumer income, as well as industry life cycle. Then, they stated also that the relation between CSR activities and corporate performance need to be examined, especially the business environment variables such as management strategy, organization structure and management control system variable.

Chung & Molson, (2018) also explained about the shareholder theory, stakeholder theory, institutional theory, contingency theory, resources based theory, Porter's hypothesis, legitimacy theory, signaling theory as well as structuration theory are the theories that might be used in examined the environmental accounting variables, especially CSR, CSF and CSD. The CSP indices and proxies could measure the corporate social performance (CSP) variables, the disclosure volume, reporting qualities proxies, and types of media or communication could measure the corporate social disclosure (CSD) variables, the market indicators as well as financial statements items could measure the corporate financial performance (CSP) variables.

The next article was an article from Burritt & Tingey-holyoak (2012) that discussed about the role of academic to fill the gap between the knowledge generation and the knowledge practice in the issue of environmental accounting practice especially about carbon accounting. Burritt & Tingey-holyoak (2012) compare the knowledge and the practice of environmental accounting instruments that used in firms and they found that the knowledge instruments of environmental accounting was ABC analysis, Eco efficiency analysis, Environmental shareholder value, substance flow accounting, sustainable investment appraisal, sustainable product line analysis. On the other hand, the applied instruments were cost accounting, emissions reporting, integrated reporting, sustainability reporting, emissions trading, emissions accounting, material flow cast accounting, sustainability reporting, environmental accounting, social accounting,

sustainability audit, sustainability audit, sustainability budgeting, sustainability indicators, and triple bottom line reporting.

The fourth article written by Burritt & Christ, (2017) discussed about the conceptual discussions about the need for monetary information in corporate water accounting. In some region in the world the freshwater resources are facing an Armageddon situation. In 2030 the demand of freshwater is predicted will exceed to 40%. Corporation are dependent on freshwater to produce their product. This article insisted that the human activity effect the water supplies, such as industrial water waste releases. The sectors that used high intensive of water was high tech company, power supplier, agriculture, forestry, mining, food and drink, and pharmaceutical. The physical indicators which can be used in measuring the water accounting was corporate disclosure about water supply, management and conservation, regulation, exploration drilling, and non-specific water disclosure.

The issue about carbon accounting has been examined by Bowen et al., (2011) and both of this academician insisted that the carbon accounting system must be based on the measurement which materially accurate, consistent over space and time and also incorporates data uncertainty. Bowen and Wittneben (2011) used Focus Group Discussion on their study, and invited the participant from several Europe Countries and the implication of their research had been contributed to the guidance to the policymakers especially in recognizing the cost-benefits of the policy and reporting mechanism, as well as ensure the reduction of actual greenhouse gas emissions.

Buyukozkan and Karbulut (2018) discussed about environment accounting based upon the sustainability performance evaluation. Their article was aim to provide a structure overview of sustainability performance evaluation from several literature. They collected 128 articles from 2007 to 2018. Their article stimulate researchers' intention to establish practically applicable sustainability, leading more sustainable business practices, because the method of the study was using library study, hence it collect and analyses a variety of literature study about environmental accounting from several different countries and year. After analysing the literature study Buyukozkan and Karbulut (2018) found some data and compare 4 model of system performance evaluation (SPE). Each of model system had strengths and weakness. Then, from this several beneficial data, researchers could find the future direction of environmental accounting research and measurement, they can choose which SPE model that fit with their variable and research conceptual framework.

The next article was an article from Betti et al., (2018) that discussed about the relationship between investor materiality and the sustainable development goals. Betti et al., (2018) adapted the concept of materiality by SASB (sustainability accounting standard board) that are financially fit with the investors, and also its effect the financial performance. The SASB could be measured by several general issue category, such as firstly environment which could be seen in the level of GHG emissions, air quality, energy management, fuel management, water and wastewater management, waste and hazardous materials management, biodiversity impact; the second Social capital which includes human rights and community relations, access and affordability, customer welfare, data security and customer privacy, fair disclosure and labeling, fair marketing and advertising; the third human capital which encompasses labor relations, fair labor practices, employee health safety and wellbeing, diversity and inclusion, compensation and benefits, and recruitment development and retention; the fourth Business model and

innovation which consist of lifecycle impacts of product and services, environmental social impacts on assets and operation, product packaging, and product quality and safety; the last was leadership and governance which measured by systemic risk management, accident and safety management, business ethics and transparency of payments, competitive behavior, regulatory capture and political influence, materials sourcing, and supply chain management. The contribution of the paper was providing guidance to the private sectors by mapping the material issues that could create value to the shareholder.

An interesting topic comes from an article from Atkins and Maroun (2018) which discussed about accounting extinction, this accounting had a function to calculate how big the company impact on the extinction of animal. Since, there were many extinct animal that did not exist on the earth because of the deforestation activity, then account the ecological crisis was determined essential as well. Atkins and Maroun (2018) offered some stages of guidance on perspective content of disclosure that could become a narrative, estimating financial or pictorial which could be seen on the table 2. According to Atkins and Maroun (2018) a company that provide an extinction account needs to inform about the species affected by its operations and provide an explanation of the link between its activities and the risk of extinction. The report could consist of quantitative and qualitative information such as number of species, population size, affected areas, and the cost environmental damages that already exist because of the corporate operation.

The next article was article from Adler et al., (2017) that examined about the reporting practice in Australian mining companies during the period of United Nations decade on biodiversity. They found that the large company was statistically significant increase their biodiversity disclosure and the smaller company did not show significant improve. This finding reflected that the larger company had bigger responsibility than the smaller company. The researchers also suggest that the biodiversity disclosure should be embedded in the voluntary disclosure. The other industry such as electronics industry had been examined by Alrazi et al., (2016) which bring up the topic about the environmental disclosures of the electricity generation industry: a global perspective. The study used comprehensive disclosure indices to measure the quality of emissions in 205 Electricity Company in 35 countries. This study found that the electricity industry responsible for a high number of greenhouse emissions impact. Another analytical journal comes from Baker & Modell, (2019) that offered new concept about corporate social responsibility. But this new model only offered the qualitative information about corporate social responsibility and did not offer any performativity model for environmental accounting. Meanwhile Baker & Modell, (2019) only offered a critical thinking about the CSR practice, the other researcher such as Broadstock et al., (2018) offered an analytical study about the relation between voluntary disclosure, greenhouse gas emissions, and the firm performance in 350 listed company in UK. This study found that the emissions report did not influence the firm performance. This finding reflected that there was a gap between this finding with the theory. Because theoretically the voluntary disclosure usually impact the firm performance, but in this study the result showed that there had been a non-linier relationship between both of these variables.

Furthermore, Palareti et al., (2016) examined about how the environmental disclosure which embedded on the corporate social responsibility reporting influence the investor decisions. This study found that the CSR information could

encourage the investor willingness in investing their capital. A study from (Freeman & Groom, 2013) discussed about the environmental accounting, specifically about the biodiversity which combined between the ecosystem damages with the discount rate. The study found that the environmental accounting approach was very sensitive for the biodiversity conservation. The issue regarding the greenhouse and gas emissions was explored by Hollindale et al., (2019) that examined the woman on boards variables as well as greenhouse disclosure. The study found that the female leaders related with high quality of GHG emissions report.

Luo (2019) examined about the relationship between level of voluntary carbon disclosure and carbon emissions performance which used 500 samples of global company, then the study proof that there was negative relationship between carbon disclosure and carbon emissions performance, which in line with legitimacy theory. Marrone et al., (2020) examined about environmental accounting with the literature review approach and in this study Marrone conclude that the managers tend to disclose beneficial information about green investment in order to get positive reaction from the investors. Matsumura et al., (2014) explained the topic about the firm value effects on the carbon emissions and carbon disclosure. In this article, Matsumura et al., (2014) get result that the firm value effect the managers decision in disclose the carbon emission report. The last article comes from Rimmel & Jonäll, (2013) that explored about Biodiversity reporting in Sweden which used mix method and Rimmel & Jonäll, (2013) found that only few of the samples that provide information about the biodiversity reporting. The company that disclose about the biodiversity record was several companies that classified as low-risk Company.

The literature review that had been discussed above explained about the environmental accounting impacts for various industries. The majority of the articles in the literature review was chosen because its topic related with the environmental accounting issues, and towards those various papers the authors could draw a new idea about the environmental accounting method that could be beneficial for the future study. Based upon some discussions and literature review above, then the author found 9 Environmental Accounting Method (EAM) and each model had the strengths and weaknesses.

Table 1
Literature Review

Author	Types of Reviewed Papers	Subject/Case Study
Buyuzkozkan, and Yagmur, (2018)	Literature Review	N/A
Karim, Lacina, and Rutledge, (2015)	Analytical	Go Public Company (Electronic Company, petroleum industry, and chemical industry)
Carlson et al., (2012)	Analytical	Palm Oil Company
Chung & Molson, (2018)	Conceptual	All Audited Company
Burritt & Tingey-holyoak (2012)	Conceptual	N/A

Burritt & Christ, (2017	Conceptual	Water Supplier Company
Bowen et al., (2011)	Conceptual	N/A
Betti et al., (2018)	Conceptual	Public Company
Atkins and Maroun (2018)	Conceptual	Agricultural Company and Mining Industry
Adler et al., (2017)	Analytical	Mining Companies
Alrazi et al., (2016)	Analytical	Electricity Companies
Baker & Modell, (2019)	Conceptual	N/A
Broadstock et al., (2018)	Analytical	Listed/Public Company
Palareti et al., (2016)	Analytical	N/A
Freeman & Groom, (2013)	Analytical	Forestry
Hollindale et al., (2019)	Analytical	Listed Company
Luo, (2019)	Analytical	Listed Company
Marrone et al.,(2020)	Literature Review	N/A
Matsumura et al., (2014)	Analytical	Listed Company
Rimmel & Jonäll, (2013)	Analytical	Listed Company
Matsumura et al., (2014)	Analytical	Listed Company

Source: Scopus Data Process 2022

Table 2
Comparison of Mostly used EAM in the Industry

EAM	Strengths	Weaknesses
System performance evaluation	• Detecting 4 System Performance • Global acceptance across industries • Introduction the new criteria and indicators	• The use of single SPE does not fit all context, methods and tools. • The accounting and assessment framework need to be customizable

Environmental Disclosure on the Annual Report	• Used Financial Statement footnotes • Could be Implemented in the public company	• Do not fit with unaudited company
Measuring the Deforested Land By using Landsat Satellite Image	• Beneficial for the agricultural company • Could Project the future damage	• Need model for a carbon bookkeeping model.
Corporate Social Disclosure, Corporate Social Performance, and Corporate Financial Performance	• Fit with large company	• Less of tangible valuation framework
Extinction Account	• Fit with agricultural and mining industry • Consist of quantitative and qualitative data about species, population size, affected areas	• Highly descriptive disclosure
Comprehensive Disclosure Indices	• Fit with Electricity Company	• Could Measure the comprehensive environmental disclosure
Corporate Social Responsibility	• Disclose about the cost of social responsibility	• Do not disclose about the environmental account in detailed
Full Cost Accounting for measuring the biodiversity	• Meet the triple bottom line concept	• The biodiversity object tend to be calculated under-value

Data Process 2022

Table one showed about the author, types of the articles and subject of the study. Based upon this data it can be concluded that the study that used literature review method were only two papers, and the majority of the papers used the analytical method. Based upon the 20 papers that had been reviewed, the author found 9 Environmental Accounting Method (EAM) that fit with different types of industries. In this study, the author also found that the different characteristics and the distinguish business process of each corporate created different environmental cost which could effect the environmental disclosure as well. As instance, the environmental account in mining industry is different with the environmental account in the hospital, or chemical industry, this phenomenon appeared because the waste that created by the company is different as well.

CONCLUSION

Environmental accounting articles remain widely dispersed in terms of approach, technique as well as the measurement method. This various aspects rooted from the form of the environmental cost which is created by the company. This paper aim to frame a new direction for the future study for accounting students and thinker, mainly about environmental accounting issue.This paper suggests various issues, concepts, theories and also measurement method about environmental accounting. Reviewing a publication demanded a fast reading technic and broad analysis as well as the fast ability in understanding the measurement method. In order to get a novelty of research, a researcher should pay attention on the gap of study which can be found in the past research. Some aspects that should be highlighted were the relevant topic, the introduction part, the methodology of the research as well as the recommendation and result of the study.

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