Measurement of Recyclable Raw Materials Trading for Circular Economy Implementation

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***Abstract*—In the context of resource scarcity and food energy security in the midst of increasing food demand, the circular economy (CE) is a promising strategy to address the sustainable use of resources. This article aims to propose measurement elements in raw materials with recyclable concepts in implementing CE in the food and beverage industry. However, the CE framework has not been adapted to the needs of the Food And Beverages Industry. This article attempts to address this gap by analyzing the range of available indicators to measure trade in recyclable raw materials, namely by looking at the difference between the value of exports and imports. Thus, the differences in the CE framework can theoretically be adapted to the production system in the Food And Beverages Industry. So that the implementation of CE can be implemented in accordance with its functions, strategies and principles in managing a business model that replaces the concept of "end of life" by recycling raw materials which aims to create a quality environment, economic prosperity and benefits for future generations.**

***Keywords*—Circular Economy Index, Food and Beverages Industry, Trade in Recyclable Raw Materials.**

I. INTRODUCTION

IN recent years, Circular Economics has become much discussed and considered as an alternative to the classic approach to sustainable development, namely "make-use-dispose" [1]. This is used by business people to position themselves better by adopting sustainable development values through the Circular Economy [2]. The implementation of sustainable development values will certainly provide an additional burden on economic actors in contributing to society and being more responsible for the environment.

Circular Economy (CE) has the potential to unlock the new way for solutions to the scarcity of non-renewable raw materials, pollution from the use of these materials, and inefficiency. CE indirectly encourages companies or business actors to use renewable (recycled) resources [3]. The existence of a circular economy does not only have an impact on companies or consumers in a narrow way but also plays a role in achieving the SDGs on the agenda of the United Nations in 2030 [4]. The good response related to this was realized at several points which regulate the practice of circular economics in the Ministerial Regulation (Permen) of State-Owned Enterprise (BUMN) Number PER-11/MBU/11/2020 which stipulates that companies, especially BUMN need to refer to the 5 main KPIs: economic and social value for the country, business model innovation, technology leadership, employee management, and increasing investment value [5].

Figure 1. Percentage of plastic waste in Surabaya.

The adoption of CE which is a solution to the scarcity of raw materials, environmental pollution, or resource inefficiency has become a major highlight when compared to the impact on the financial aspect. The existence of a broader life and interests make this more highlighted when compared to the financial impact that is only felt by the company. This can be seen from previous studies that discussed environmental aspects more than financial aspects so researchers have made efforts to develop environmental performance appraisal methods involved in the production process [6]. Figge and Hahn also state that the analysis related to environmental impacts as conceptualized and used so far is incomplete and one-sided to assess the optimal use of resources because it is still in load-oriented logic.

Regarding to this problem, the purpose of this paper is to provide an alternative calculation method in measuring the environmental impact of production activities, especially the sale or use of recycled raw materials where this assessment method not only focuses on the cost, but also the costs and benefits of the sales activity of recycled raw materials both import and export. Indicators related to recycled raw materials were adopted from research [7] which resulted in

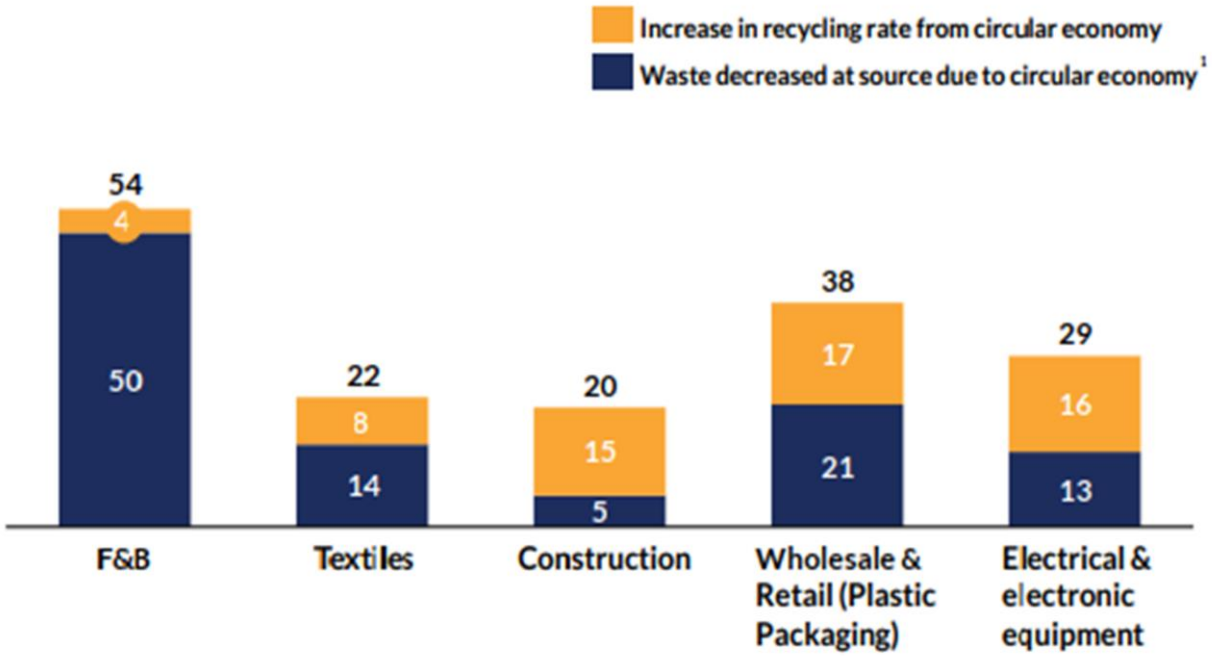

Figure 2. Implementation of community service activities in Fisherman Village.

10 CE measurement indicators in general for the entire industry.

Food and Beverage is an industry with the largest level of development in recent years [8]. A notable example can be seen in the city of Surabaya as the second largest city in Indonesia, packaging waste generated from food and beverage consumption can be seen in Figure 1[9].

The data shows that the percentage of plastic waste from food and beverage consumption in the city of Surabaya reaches more than 20% (Figure 2). It shows that the industry is a key player in waste production. Other data we can get from the Ministry of National Development Planning [10] based on an analysis of the success of implementing a circular economic strategy, it can reduce waste accumulation from the food and beverage industry significantly up to 50% and recycling waste processing which has experienced an increase of 4% by 2030.

The significant value in the Food and Beverage (F&B) industry is interesting to be the subject of this research, with the hope that the impact given in the application of CE can also be significant.

II. DEFINITION OF CIRCULAR ECONOMY AND INDICATOR CATEGORIES

The concept and discussion of the Circular Economy are still relatively new in the world of economics, yet the concept has been discussed in 1965 in an article [11] which stated that the earth has a unique system where reproduction is always constant, so there is a need for a cyclical ecological system to address shortages.

As explained in the introduction, what are the objectives and benefits of implementing CE, its implementation still requires support from policymakers. Because in reality, there is still a gap between the theory and the implementation of this circular economy. In Indonesia, one of the policies that support this is the BUMN Ministry (Permen) Number PER11/MBU/11/2020. Although it is not explained directly related to the implementation of the circular economy, the economic and social values become a bridge in this matter. The circular economy itself still has no specific regulation that regulates this matter both nationally and internationally, so its implementation is still fairly voluntary.

China was the first country to enact a specific law related to CE in 2008 followed by Germany and Japan [12–13]. However, regardless of the extent to which the adoption of the CE concept is generally agreed upon, several stakeholders, either researchers, policymakers, or business owners, have different interpretations of what can be described through the circular economy (CE) strategy [14]. In its development, despite the vague boundaries of CE, several researchers grouped measurements based on several indicators in various scales as a CE measurement tool [15]. Potting et al.[16] argue in their book that if the CE system is not completely closed, its circularity has both direct and indirect effects. So in terms of assessment, it can also be divided into direct and indirect indicators as applied Moraga [7] where out of 10 indicators there are 7 direct indicators and 3 indirect indicators. This paper focuses on one of the indirect indicators, namely trade in recyclable raw materials. Although it is an indirect indicator, raw materials are the main thing in the production process of a company, so it cannot be ruled out.

III. MEASUREMENT OF TRADE ON RECYCLED RAW MATERIALS

Recycling is one of the solid waste management strategies that consist of sorting, collecting, processing, distributing, and manufacturing used products/materials, and is the main

component of modern waste management and the third part of the waste processing hierarchy. Referring to the 5R hierarchy (Reduce, Reuse, Recycle, Refurbish, and Renew), Recycle is a process that can be applied to all industries including F&B. In the F&B industry, recycling activities occur when processing residual or waste raw materials [10]. A wide range of recycling opportunities exist across sectors, including biological nutrients and extracted or manufactured materials. For example, anaerobic digesters, which are operated in the city of Jambi in South Sumatra, the district of Malang in East Java, and the city of Bandung, process food waste and help extract biogas, used as fuel, and bio-slurry, used as fertilizer [17–18]. In 2015, the government began to be concerned with sustainable development (SDGs) initiated by the United Nations, so in the same year, regulations regarding Green Industrial Standards were issued [19]. However, the standard measurement is still within the scope of efficiency. Therefore, the expansion of measurements on CE, especially Trade in Recyclable Raw Materials can be a development in measuring the impact of recycled raw materials on companies, society, and the environment..

Referring to research Moraga [7], the indicator "Trade in Recyclable Raw Material" can be sub-indicated into two. Those are import and export transactions. Meanwhile, the list of raw materials that can be recycled is obtained from the List of CN-code, with the type that can be adapted to the industry in this research, namely Food and Beverage.

IV. RESEARCH METHOD

The method used to implement a circular economy (CE) in the Food and Beverages Industry is to collect primary and secondary data, through the calculation of raw materials in the form of using recycled raw materials for each type of waste and the discussion includes financial aspects in the form of costs and benefits of the sale of recycled raw materials.

A. Data Collection

Data collection is carried out on primary and secondary data. The primary data needed is data on the management of recycled raw materials in the food and beverage industry, namely PT Greenfields Indonesia by interviewing relevant parties who are responsible for implementing the management of exports and imports of raw materials and direct observations in the field. The secondary data required is the calculation of the costs and benefits of selling recycled raw materials, both import and export.

B. Raw Material Management Study

The study on the processing of recycled raw materials in the export and import trade is based on the amount of recycled waste by taking into account the total costs and benefits in the trade in recyclable raw materials used by the company. The study was conducted on the financial aspect. This study covers investment and operational costs used for trade in exports and imports of raw materials from the sale of products in the food and beverage industry.

V. DISCUSSION & RESULT

The circular economy is designed to utilize all goods that produce a product which can then be recycled in different forms. This design is in accordance with the sustainable economic goals of maintaining food energy security and overcoming the increasing waste problem in the world, especially in the Food and Beverages Industry.

Creating a model that reduces dependence on raw materials, by restoring the function of raw materials through the recycling process into the production chain, can provide benefits for the company because it avoids wasteful actions by using the circular economy concept.

A. Import Recyclable Raw Material

$$\text{IRRM} = \sum^{(selected\ Recyclable\ Product\ CN\ Code)}_{in\ import\ trade\ activity} \quad (1)$$

where*IRRM* isthe Import Recyclable Raw Material.

B. Export Recyclable Raw Material

The measurement of the value of the export trade in raw materials is carried out by calculating the export value of recycled raw materials in the export trade. With the following formula:

$$\text{IRRM} = \sum^{(selected\ Recyclable\ Product\ CN\ Code)}_{in\ export\ trade\ activity} \quad (2)$$

where *ERRM* isthe Export Recyclable Raw Material.

C. Measurement of Trade in Recyclable Raw Material

The measurement of raw materials is based on data on the use of recycled raw materials, both imported and exported, which is still aimed at the efficiency of the use of raw materials. The output of this research is to generate measurement indicators in trade in recyclable raw materials by taking into account financial studies that will have an impact on the company, society, and the environment. The measurement of raw materials includes the difference in the value of trade in recyclable raw materials for exports and imports. With the following formula:

$$\text{TRRM} = \sum ERRM - \sum IRRM \quad (3)$$

where *TRRM* is the Trade in Recyclable Raw Material.

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