CHAPTER I
INTRODUCTION

1.1. Background information

In this 21st century, organic waste, especially food waste, has become one of the notorious problems that needed to be paid full attention. This type of organic waste has brought various impacts not only on the environment but also on the economic and social realm. Environmentally, the carbon footprint of wasted food is estimated at 3.3 gigatons; in other words, if food waste were a country, it would be ranked as the third world's largest greenhouse gas emitter behind the US and China. The direct economic cost of food wastage of agricultural products (excluding fish and seafood), based on producer prices only, is about 750 billion USD, equivalent to Switzerland's GDP(Gustavsson et al., 2011).

According to the report of the Food and Agriculture Organization of the United Nations(Gustavsson et al., 2011), it is estimated that one-third of the food produced from the farmer's gate to the consumers is lost and waste along the supply chain. More food is wasted at the consumption phase. This accounts for the amount of food produced in the world for human consumption every year; approximately 1.3 billion tons are getting lost or wasted. This includes 45% of all fruit and vegetables, 35% of fish and seafood, 30% of cereals, 20% of dairy products, and 20% of meat.

On the other hand, Chronic hunger is on the rise globally, increasing from an estimated 777 million in 2015 to 815 million people in 2016 (Gustavsson et al., 2011), which is contrary to the unprecedented situation of food wastage; it is indicated that something is wrong, that food systems do not function as they should. Therefore, these calls for attention to how we manage our food products from the production level up to the consumption level.

The debate on food waste is globally categorized into two strata, namely developed and developing countries; the former is deemed a high level of food wastage at the consumption phase. The latter is considered the food loss occurs highly in the production phase. The United States of America, considered as one of the biggest food wasters, disposing approximately of 277kg of food per person yearly while the

United Kingdom (UK) threw away avoidable food waste equal to £13billion per year (The Guardian (online) 2019). At the same instant, we cannot dwell on this notion that only developed countries are responsible for food waste at the consumption phase but also developing countries should be given equally important attention on food waste at this level, (The Jakarta Globe (online) 2019), reported that according to Economist Intelligence Unit(EIU), Indonesia as one among of these countries(developing countries) had become the second-largest food wasters behind Saudi Arabia which is estimated to dispose approximately of 300kg of food per person yearly which surpasses the quantity of food waste with the so-called developed countries. This problem is specifically sensitive in countries like Indonesia. Millions of people are still suffering from malnutrition and poverty; 11 per cent of the population lives below the poverty line, and 7.6 per cent of the 260 million populations suffer from malnutrition. According to UNICEF's flagship report of 2019 based in Indonesia, *The State of the World's Children* reported that in 2018, nearly 3 in 10 children under five years of age were stunted while 1 in 10 was wasted. A fifth of primary school-aged children are overweight or obese(UNICEF,2019).

Semarang is one of Indonesia's major cities; it is the capital city and main shipping port of central java province. According to the study which surveyed in 2015, it is reported that the waste generated in the entire city of Semarang is estimated to be around 4999 m^3 with a total weight of around 920 ton every day. Another survey was done in 2017 to examine the average composition of waste brought at the landfills; the results showed that food waste (36%) dominates the majority of waste, followed by plastic (16%) and garden (13%) waste (Lokahita, 2019).

On the other hand, Universities are regarded as mini-cities or towns because they occupy large spaces and consist of a reasonable population size, which undertakes various on-campus activities and the surrounding environment (Alshuwaikhat & Abubakar, 2008). These activities conducted within universities have potential impacts on the environment. Among the environmental problems in universities includes food waste, although this problem can easily be noted (Cerutti et al., 2017).

Higher education institutions or Universities consist of a community of people who possess expertise and knowledge to transform and change behaviour that imposes significant adverse impacts on the environment (Bailey et al., 2015). Universities are considered to have moral and ethical responsibilities in their actions to demonstrate practical examples that lead to sustainability (Mtutu & Thondhlana, 2016), which can be used to shape the surrounding communities (Wilkie et al., 2015).

Diponegoro University (UNDIP) is one of the largest state universities in Indonesia, and it is found in the city of Semarang in Central java. Since the establishment of the new campus of UNDIP located in Tembalang, there is the rapid increase in the number of populations within and around the campus; this influx of people who are attracted to live at proximity to campus is due to different pull and push factors from their place of origin to their new destination, including University students, workers, and business owners and others who are the sole beneficiary of the presence of this campus. As the number of various activities increased within the campus, lead to the amount of waste generated increases significantly. According to the study (Smyth et al., 2010) contended, one of the biggest challenges facing higher education institutions (Universities) to achieve Sustainable Institutional Development is the amount of solid waste generated.

UNDIP is estimated to generate 50 m^3/day amounts of solid waste, contributing up to 1% of the solid waste generated in Semarang. The composition of solid waste generated at UNDIP includes organic, non-organic, and residue. The organic waste generated from UNDIP consist of 40% of food waste (Utama et al., 2018). It is imperative to understand that higher institutions like UNDIP contribute a possible amount of food waste and loss. Students are deemed to advocate promoting food waste prevention and reduction practices to achieve proper and desirable use of the scarce resources available for sustainability. Several studies agreed that students would significantly influence the future state of the environment, making the incorporation and institutionalization of sustainability issues into education highly

relevant (Lozano, 2006; Waas et al., 2010; Wright, 2007; Zilahy et al., 2009). Thus, there is a need for understanding the level of awareness of food waste problems among students at the university and their behaviour or attitude towards food wastage to ensure that they become architectural tools and advocate for preventing and minimizing food waste problems through dissemination and transformation of knowledge and skills acquired in these Higher Learning Institutions to the community.

Early studies have been associated food waste behaviour with gender; it is essential to consider when assessing food waste. The study of (Qi & Roe, 2016) pointed out that women are more likely to feel guilt when throwing away food items. Some studies agreed that women are way less likely to waste food products than men (Barr, 2007; Visschers et al.2016).On the other hand, some studies have been suggesting some confounding arguments concerning food waste behaviour this can be revealed by the study of (Silvennoinen et al., 2014), which based on food waste behaviour, found that single women tend to produce more waste as compared to single men or couples. Some studies suggest that both young males and females tend to produce the same amount of food waste regarding their waste behaviour (Principato et al., 2015). The study of Koivupuro et al., (2012) reported that households, where women or both men and women are responsible for grocery shopping, tend to generate more food waste than households where Men tend to assume grocery shopping responsibility. These studies have provided a sound-able reason to critically consider the impact of factors such as gender when assessing students' awareness and behaviour toward food waste problems in university setting to understand their concern on the matter in question and their honest reaction towards the food wastage situation.

According to some early studies, argue that consumers of a young age usually tend to waste more than older consumers (Lyndhurst et al., 2007). This theory gives a kick-off to select university students to research food waste problems to reflect what was researched before based on the existing theory. It is essential to engage University students regarding the fact that knowledgeable individuals are more

likely to engage in waste reduction behaviour (Abeliotis et al., 2014; Neff et al., 2015; Barr, 2007).

It is important to understand that the food waste problem cannot be demonstrated by considering a single set of behaviour. It involves a combination of several reasons and multifaceted behaviour that tend to maximize or minimize the probability of food being wasted. Prior studies agreed on the fact that food waste is a complex behaviour and there is no single framework to explain this concept as a whole (Quested et al., 2013; Papargyropoulou et al., 2014). However, some studies suggest several things to consider when developing a model for analysing food waste behaviour such as the context in which particular behaviour occurs, individuals' awareness of Food Waste, Individual attitudes towards food waste, individual habits, the Subjective norms, and perceived behavioural control (Quested et al.,2013; Mondéjar-Jiménez, J.A., et al,2016). By considering suggestions existed from previous literature, this study deployed a Theory of Planned Behaviour (TPB) introduced by (Ajzen,1991) to develop a conceptual framework model that contains different constructs or variables to be used to elaborate various concepts and relationships existing under the current study. The Partial Least Square Structural Equation Modelling (PLS-SEM) approach was adopted and applied for this study as it referred by previous works of literature to be used for analysing waste behaviour and consumer behaviour in different contexts (Mondéjar-Jiménez, J.A., et al,2016).

1.2. Statement of the problem
Diponegoro University contains a complex system for solid waste management, the waste generated in UNDIP is said to contribute 1% of the entire waste generated in the city of Semarang(Utama et al., 2018). The composition of waste includes both organic and non-organic waste and at least 40% of the waste generated from this institution contain food waste (Utama et al., 2018). Under this circumstance entails that UNDIP as an Institution plays a significant role in contributing to the amount of food waste generated within the city. Therefore, realizing the impacts of food waste and food loss, this study calls for attention to examine students' awareness

and knowledge on food waste problems and its consequences and their behaviour towards food waste by employing the framework of the Theory of Planned Behaviour (TPB) as a baseline to reflect different speculations established under this study.

1.3. Research Objectives

The general objective of this research is to assess the awareness and knowledge of university students concerning food waste problems and its impacts and their behaviour towards food waste. Specifically, this research aims to focus on the following objectives;

1. To identify if and to what extent students' awareness (Environment and Social, Economic) on food waste problems and its impact can affect their intention and behaviour towards Food Waste.

2. To determine if the student's Intention to avoid or reduce food waste could act as a mediator in the relationships between each component of TPB and food waste behaviour, by means of mediation analysis.

3. To determine if students' gender has a significant influence on all the constructs in the TPB.

4. To establish and evaluate the Importance of performance Matrix Analysis (IPMA) to identify construct with high/low level of importance and high/low level of performance between exogenous and endogenous latent construct in the model.

1.3.1 Research questions

1. To what extent does the students' awareness of food waste problems and its impact affect their intention and behaviour toward food waste?

2. Can the students' intention to avoid or reduce food waste act as a mediator in the relationships between each component of TPB, by means of mediation analysis?

3. Does students gender contribute any significant influence(difference)across all the constructs of the TPB?

4. What are the constructs with high/low level of importance-performance between exogenous and endogenous latent constructs in the TPB model?

1.4. Research hypothesis

H_1 = Student's awareness of the food waste problem and its impact has no influence on their intentions to avoid food waste and positive correct behaviour towards food waste.

H_2 = Direct relationship between each component in the extended model of TPB is not mediated by students' intention to avoid or reduce food waste.

H_3 = Student's gender (male and female) has no significant influence across all the construct of the TPB (i.e., concern of FW, Moral attitude, subjective norms, Perceived behaviour control, awareness consequences (environmental and social, economic), Intention and food waste behaviour).

1.5. Significance of the research

1.The study can promote and raise awareness among university students through changing their behaviours and attitudes toward food waste and wastage, and used as the tool to promote prevention and reduction of food wastes in Higher learning institutions.

2. The study provides some lucrative insights through suggestions of improvement of existing policies and regulations concerning food waste management particularly in a university setting to prevent and minimize food waste problems in higher learning institutions.

3.The study provides room for other researchers by offering the knowledge based on this area of concern which assures those who are interested especially to research on organic waste to be supplied with full of information available in this study.

4.This study enables other readers who are non-researchers to obtain the information which can be published in different sources such as blogs, magazine, online news and others sources which intend to disseminate information to the public for educational purposes.

1.6. Scope and limitations of the study

This study mainly focuses on the assessment of the university students' awareness of the food waste problem and its impacts and their behaviour towards food waste. The study goes beyond to explore if students' awareness would have any impacts on their intention and behaviour towards food waste and also identify different relationships existing between classical variables in the Theory of Planned

Behaviour (TPB) and the hypothesized relationship in this current study. The study involved participants from three faculties with three different study programs from the undergraduate studies in the University of Diponegoro enrolled from the academic year 2019/2020. The limitation of this study is that it involved only students from three faculties and excludes students from other faculties and programs, Universities staff and other associate workers.