

Tourism Related Food Waste: What Opportunities and Challenges? [†]

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Abstract: Food waste is seen as a societal, economic, and environmental challenge threatening food security and causing natural resource overconsumption and nutrition losses. There is inequality in the distribution of food resources in the world and many countries have been suffering from hunger where others have excess food thrown away with waste. Indeed, the Food and Agriculture Organization estimates that we entered 2022 with 828 million hungry people whose majority are women and children suffering from malnutrition, wasting, and stunting. Moreover, the UNEP Food Waste Index 2021 indicated that nearly 931 million tonnes of food waste were produced in 2019 of which 61% originated from households, 26% from restaurants and food service, and 13% from retail. This, of course, hinders the achievement of the zero hunger goal by 2030. In this order, we analyze the main challenges and opportunities for using food waste released from touristic activities using an S-(Strength)-W (Weakness) O- (Opportunities) and T-(threats) analysis. The analysis shows that the challenges could be a source of creation of important opportunities while it is recommended to enhance the awareness of restaurants and business food owners about the impacts of the food waste increase on the economy and environment and the importance of waste selection and circular bio-economy concept adoption for the sustainable development of their businesses.

Keywords: tourism; food waste; SWOT analysis; SDGs; circular bio-economy

1. Introduction

Tourism plays an essential role in a country's economy. This sector is related to all vital sectors including transport, fishing, restauration, and business food [1]. Tourism activities are reported in many studies as the main source of pollutants, especially plastics [2–4]. During the hot season, food consumption increases causing more food waste that is already presenting in normal periods a societal challenge for many countries around the world [5] contributing to extreme pressures on natural resources such as energy, freshwater, and arable land [6] and increasing carbon waste.

In addition, the issue of food waste represents a moral and social equality problem as according to FAO, IFAD, UNICEF, WFP, and WHO (2022) report, nearly 828 million people were facing malnutrition in 2021 compared to 2020, and 2019 with more 46 million people and 150 million people respectively. So, many people in the world are food insecure which mean that they lack access to enough food for an active healthy life. This indeed, points out the issue of social equality and the need for moving in the right direction in good accordance with the sustainable development goals 2 and promoting food security and healthy diets.

Food waste is becoming a global issue facing worldwide countries which implies finding solutions allowing reduce the amount of generated food waste and avoiding natural resource overuse and overconsumption based on multi-objectives and strategic

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approaches. Accordingly, the periods known for overconsumption and misuse of natural resources must be given more attention and profoundly investigated. In the most popular travel countries, during the summertime production and consumption increase because of tourists visiting these countries causing more food waste. In addition, the high temperature may affect the food [7] as it can break down faster which may make it difficult for restaurants and food businesses to maintain the products safe and fresh contributing to more food waste.

The present study analyzes the main challenges and opportunities for using food waste released from touristic activities using an S-(Strength)-W (Weakness) O- (Opportunities) and T-(threats) analysis. In addition, the study examines the relationships between food waste and 17 sustainable development goals.

2. Methods and Materials

SWOT Analysis Description

SWOT analysis is used in the present study to analyze and discuss the strengths and weaknesses, opportunities, and threats for reusing food waste released from the tourism industry. This analytical method is known as the SWOT matrix used for business fields and widely used for natural resources management to help in decisions, strategies, and policy establishment. It has been used in several studies related to the tourism field [8–11].

3. Results

3.1. SWOT Analysis

3.1.1. Food Waste Use Strengths, Weaknesses, and Threats

Food waste presents major socio-economic and environmental issues for countries where the adoption of circular economy approaches remains the only solution that may help in mitigating the growing amount of food waste. Countries popular for tourism activities with important yearly visitors are supposed to be the most affected by waste, which may affect the country at different levels. The mismanagement of food waste and its continuous growth may affect the tourism sector itself and discourage tourists from spending their vacancies in a polluted country. Thus, the mismanagement of waste is a weakness that can be converted into a strength by creating opportunities and avoiding possible threats (Figure 1).

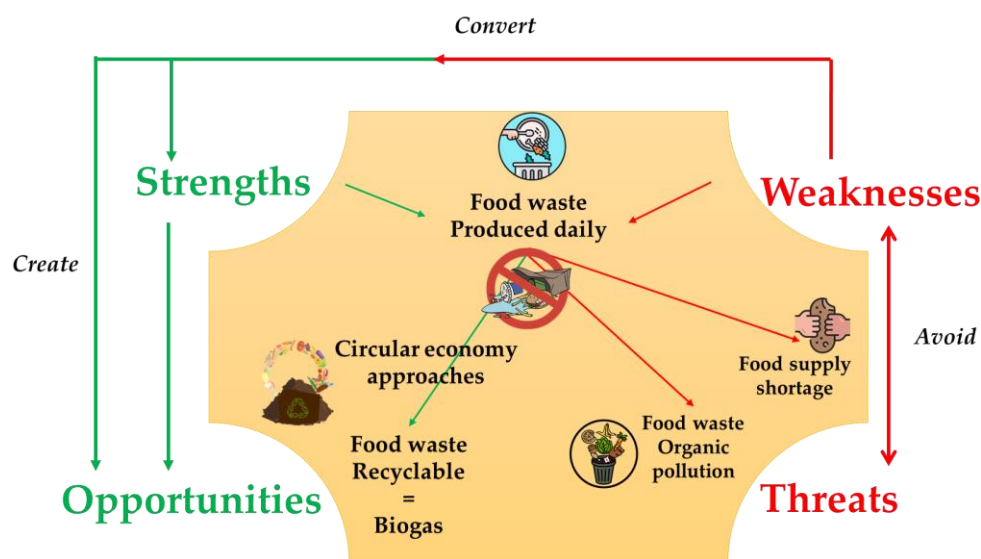


Figure 1. SWOT analysis applied to food waste.

3.1.2. Food Waste Use Opportunities and Challenges

Food waste is currently considered as a source that need to be exploited for energy and biogas production among other reuse purposes (Figure 2). Population all around the world are consuming natural resources mainly vegetables and fruits, which means a continuous production of food waste. Nevertheless, natural resources are not well distributed around the world because of different geographical, climatic, socio-economic, and sometimes political factors. In addition, the consumption rate varies also according to the abovementioned factors. These variations are the origin of the challenges the world is facing such as natural resources and food shortage resulting in inequality. Also, because of the unequal distribution of natural resources, the consumption rate varies where in some countries the food loss reaches high percentages resulting in food waste that needs to be managed and presenting a threat to the world food supply. In this sense, food waste must be taken as a serious issue that threatens life on the earth. Implementing policies and strategies that control the activities contributing to food loss and related waste increase such as the tourism industry is mandatory while developing a recycling system of released food waste remains necessary to achieve sustainability through converting this issue into an opportunity.



Figure 2. SWOT analysis of food waste versus solutions and mitigation and Food waste recycling benefits.

3.2. Food Waste Management

3.2.1. Food Waste and SDGs

The analysis of reusing and recycling food waste benefits shows that are all within the 17 sustainable development goals (Figure 2). Recycling food waste has many advantages for society as well as for the economy and environment. Food waste can be turned into solutions for many issues humans and the planet suffering from including energy, water scarcity, excessive use of chemical fertilizers, and waste landfilling. Thus, managing food waste adequately can help in delivering and achieving the 17 SDGs:

- **SDG 1 (No poverty), and SDG 2 (Zero hunger):** Reducing and Recycling food waste and avoiding food loss means more food available (SDG1&2).

- **SDG 3 (Good health):** An adequate storage of food would allow for maintaining good health for humans. The management and recycling of food waste would result in less organic pollution and decrease the potential risk of contamination.
- **SDG 4 (Quality education) and SDG5 (Gender equality):** Fresh and safe food is crucial for learning which needs money, so less wasting means less spending. Accordingly, managing food waste can help free up money for education and other household benefits.
- **SDG 6 (Clean water and sanitation):** Reducing food loss can reduce water rate exploitation (water saving). Managing food waste can help avoid possible organic contamination of groundwater when this waste is mismanaged and thrown out in open landfills.
- **SDG 7 (Affordable and clean energy):** Reducing wasting food would allow for saving energy while recycling food waste allows for the production of eco-friendly energy.
- **SDG 8 (Decent Work and economic growth):** Reducing food loss and recycling food waste would boost the economy and help create new job opportunities.
- **SDG 9 (Industry innovation and infrastructure) and SDG 11 (Sustainable cities and communities):** Recycling food waste allows different benefits including fostering innovation toward using this waste for different purposes including the textile industry (e.g., Ananas Anam). Reducing food waste means reducing landfill disposal costs for households and authorities which enables meeting sustainability goals (WRI, 2019).
- **SDG 10 (Reduce inequality):** There is inequality in the distribution of food resources in the world, Reducing food loss may help overcome this inequality and achieve the related goals “no poverty” & zero hunger”.
- **SDG 12 (Responsible consumption and production):** Controlling the consumption and production rate while avoiding more food loss because of human miscarrying and false assumptions of the needed food amount would ensure responsible consumption and production.
- **SDG 13 (Climate action):** Reducing and recycling food waste will ensure decreasing methane emissions (mainly released from rotted food in landfills) which is ranked as the most harmful GHG hanging around 25 years in the atmosphere.
- **SDG 14 (Life underwater):** Reducing food waste means reducing the amount of food waste reaching the sea and causing eutrophication and threatening life underwater. Maintaining food fresh and safe mainly seafood by restaurants and all food businesses means reducing the sea resources exploitation.
- **SDG 15 (Life on land):** Reducing food loss means less exploitation of land-based resources. Managing adequate food waste means avoiding potential organic contamination of soil and groundwater. Turning food waste into organic fertilizer means producing safe vegetables and fruits without chemical fertilizers.
- **SDG 16 (peace, justice, and strong institutions):** Food loss is one of the factors contributing to famine and its spread can create conflicts and instability, thus ending hunger would contribute to peace and stability.

3.2.2. Adoption of Circular Economy for Food Waste

Recycling food waste offers numerous social, environmental, and financial benefits. Unless, the three following steps (1) Avoid Food loss (2) Food waste management (3) Recycling food waste) are realized, the adoption of a circular economy (CE) remains unachievable. The promotion and application of the CE concept for food waste management relies upon adequately managing released food waste.

Figure 3 displays a mapping of CE six Rs linked to the food life cycle. The strategies (R0 prevent, R1, reduce R1 and reuse R2) concern consumers (commercials and households) and all actors that can extend the food product life span. R3, R4 and R5 are related to end of life food once it is wasted. Commercial including hotels and restaurants owners can prevent and reduce the food losses and waste by maintaining it fresh and safe which would allow sustainable production and consumption.

The strategy R2 (reuse) purpose is to slow down the food cycles [12] where it repose on reusing food mainly with nutritional value which suitable for human consumption such as restaurant leftovers or defective food for animals feed [13]. Both strategies, recycling and recovery are for closing loops [12]. Materials that can be recycled are those who losted their nutritional values so they can be recycle, for instance, into chips or sauces which calssified as nutrient recovery [14]. R4 is energy recovery from food waste such as biogas. R5 disposal is the least favorable strategy for food [15] either by landfilling or incineration without further resource mining.

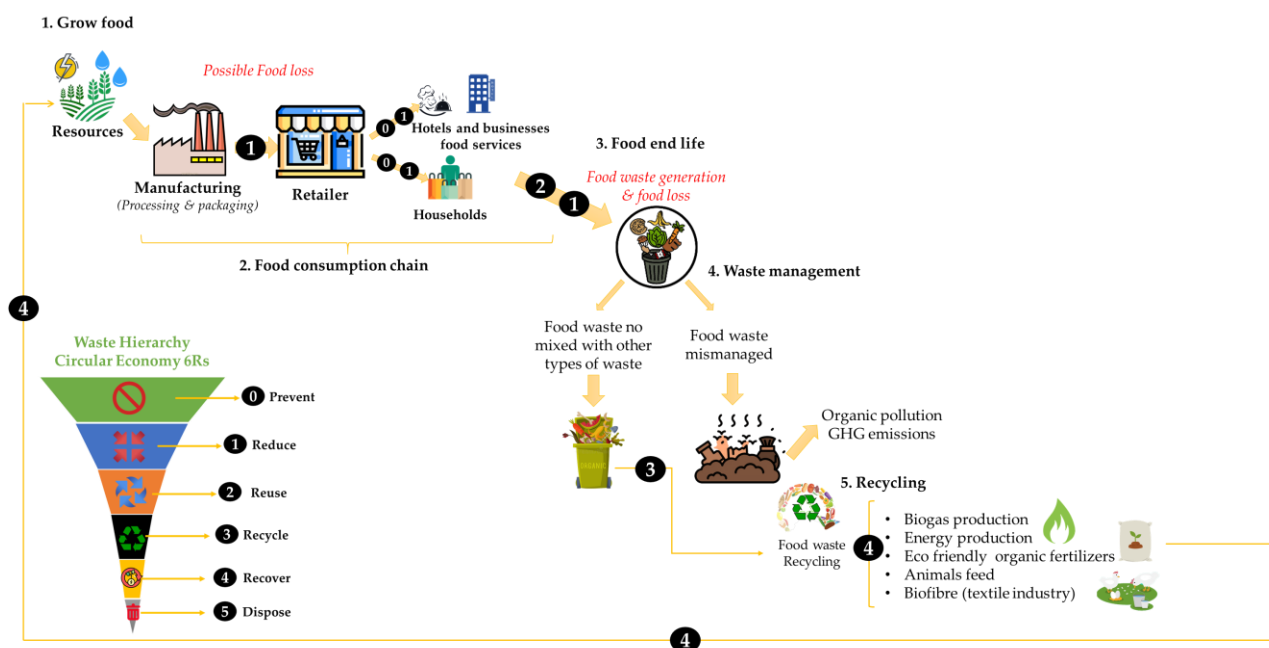


Figure 3. Mapping of CE six Rs linked to the food life cycle.

4. Discussion and Recommendations

The problem of food waste is complex and the key driver is the consumer behavior. The threats should be avoided and the weaknesses could be converted into strengths and then create opportunities. Indeed, the circular economy approach suggests food waste recycling as the main opportunity which can help achieving the 17 goals of sustainable development related to health, food equality, quality of education, clean water and sanitation, clean energy, economic growth, industry innovation, climate action, life underwaer and on land, peace and justice. Recycling not only reduces food waste but also produces goods such as biogas, organic fertilizers, animals feed and biofibre but before the recycling process, food waste should not be mixed with other types of waste. The recycling has also other advantages mainly saving water, reducing greenhouse gas emissions, conserving energy and saving money.

A range of interventions that can reduce food waste have been identified. These include strategies such as donating excess food to those in need and developing associations which play the role of intermediary between touristic institutions (restaurants, hotels...) and people in need. The collaborative work including improving planning, tracking and collaboration between the concerned institutions in the local area or in the country will help to create a sustainable and equitable food system for all.

5. Conclusions

The analysis of food waste released by tourism industry reuse shows that the first step toward mitigating the increase of food waste consists of making people aware of the effects of the food waste on the environment and on the climate and of the importance of

reducing their food purchases and the necessity of maintaining the food fresh and safe to avoid further food losses.

Recycling food waste is one of the best solutions but it won't solve its increase if businesses food services and households keep throwing food waste with inorganic waste which presents a key weakness against food waste management. The adoption of circular economy for food losses and waste required cooperation and coordination between different food system actors.

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