WASTE MANAGEMENT IN AVIATION– RECYCLING IS NOT ENOUGH

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Abstract
Due to the environmental challenges associated with the strong growth of plastic waste worldwide new grounds have to be broken. In public belief plastic is considered a practical, hygienic material that could be recycled into new plastic after use. However, disposed plastic is not recycled for the most part but is landfilled or used for waste-to-energy. Especially, the outcome of landfill is pollution and marine litter. Based on the plastic waste in the ocean, the problem of microplastic gains in importance.
Through tourism – a critical factor – a growth of plastic waste can be registered, e. g. especially air traffic is highly dependent on efficient and easily disposed material. Plastic is the product of choice. Exemplified on a closer examination of one airline makes already almost 45 millions passengers, whose meals and beverages come with plastic. So, aviation includes substantial waste-saving potential throughout different alternatives to avoid plastic. The authors show the actual situation and demonstrate ways to reduce plastic waste in the context of economic efficiency. The conclusion bears the most eco-friendly alternative for air traffic and gives an outlook on further research.

Key words: *Sustainable tourism, Green Economy, Waste Management, Ecotourism, Sustainable aviation, plastic pollution.*

JEL Classification: *Q53, G56*

I. INTRODUCTION

Today sustainability has evolved to the new megatrend besides its already important impact on the environment. By following and maintaining the actual development of the global economy the probability of a destruction of the ecological system will rise. On the other hand an economic growth in order to fulfill the needs of an increasing world population cannot be dismissed. Green Economy as a combination between economy and ecology "results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities" (UNEP, 2012a, p.4) and provides economic growth "within planetary boundaries" (UNEP, 2012a, p.4).

The term Green Economy "was first used in 1989 in a report from Pearce et al. whose theoretical approach expands on that of on environmental economics" (Cortés, 2015, p.3). Although the definition is not new the United Nations Environmental Programme (UNEP) introduced it in line with the Green Economy Initiative (GEI) in 2012. Since then, the term "Green Economy" is part of international political agendas and economic strategies. Objectives of the Green Economy are among others the conservation of biological diversity, efficiency of ecosystems, climate protection, reducing the use of non-renewable resources, increasing resource efficiency, eco-friendly tourism and development of a proper waste management (UNEP, 2012b). This publication deals with the objective of a proper waste management.

Due to European Commission's directives on waste and national regulations e.g. in Germany, waste management includes all activities required to manage waste. Managing waste is hierarchically divided in

prevention of waste, recycling of waste, disposal of waste or other actions (European Commission, 2008; Bundesministerium der Justiz und für Verbraucherschutz, 2012). Although the "waste hierarchy gives a clear preference to recycling over energy recovery and disposal of waste in landfills" (Gandenberger et all, 2014, p.1), the avoidance of waste is the first priority.

Waste is defined as "any material that is discarded, rejected, unwanted, surplus or abandoned by its owner" (Productivity Commission, 2006, p.353). This research focuses on plastic waste, a material out of synthetic polymer on the basis of crude oil and natural gasoline (Worldwatch Institute, 2015).

New proposals regarding to the legislation on waste "towards a circular economy" (http://ec.europa.eu/environment/circular-economy/index_en.htm) shall increase recycling rates and decrease landfill by 2030. The proposal concentrates on municipal and packaging waste, the authors try to enlarge the issue to tourism and connect the Green Economy objectives to waste management and eco-tourism.

Tourism is a growing market within the EU: Both income earnings from international tourists (+152,14 percent) and spending from EU citizens for tourism (118,15 percent) have increased disproportionately high between 2010 and 2015 (eurostat, 2017). Tourism includes different fields e.g. accommodation, transportation and entertainment. The authors concentrate on transportation with a focus on air traffic as 81,6 million air passengers travelled abroad by plane in Germany in 2014. As Destatis declared in 2015 the previous peak of 2013 was increased by 3,4 percent and thereby, the number of passengers rose to a new peak. The growth trend in international air travel already determined in 2010 continued. The research examines possibilities to reduce plastic waste in aviation considering economic aspects and feasibility.

II. WASTE MANAGEMENT IN AVIATION

Due to safety regulations and efficient procedures plastic packaging has become very important and common for catering during flights. Meals are served in plastic bowls with plastic cutlery and drinks come with plastic cups in the economy class. Plastic throwaway packing is easier to handle in comparison to reusable packages, as it can be disposed instead of being separated from trash and cleaned. This ecologically not beneficial procedure leads to an enormous volume of waste.

An example for illustration purposes is the global airline Emirates, which serves 156 airports in 83 countries providing commercial air transportation services (The Emirates Group, 2017). In the timeframe between 1st April 2016 and 31st March 2017 Emirates transported 56,1 million passengers, a further increase of passenger volume is expected as a continuing upward trend can be deducted from Fig. 1.

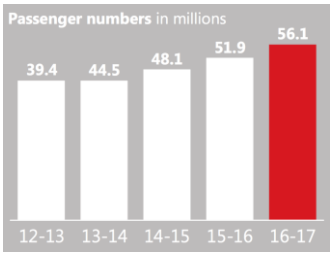

Figure 1: Passenger numbers (2012-2017)

Air services providers organize in-flight catering, e.g. dnata as a part of the Emirates umbrella organization is one of the world's largest providers. Corresponding to the rising number of passengers the amount of in-flight meals has doubled within the above-mentioned timeframe as shown in Fig. 2 (The Emirates Group, 2017).

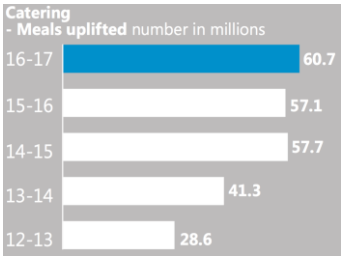

Figure 2: In-flight meals (2012-2017)

In addition to meals passengers get beverages during the flight. Regarding to the amount of drinks, no

data is available. Therefore, the authors estimate conservatively one potable per person per flight. This testing shall include passengers having more than one and passengers refusing drinks. This offers the enormous amount of 56,1 million beverages in the economy, business and first class, although business and first class passengers get their drinks in non-disposable cups. The authors estimate a ratio between economy and business plus first class 80 percent to 20 percent. This makes 44,88 million beverages served in plastic cups at Emirates. It must be pointed out, that other large airlines are operating as well like American Airlines, Air France, Lufthansa what multiplies the number of plastic cups.

Due to waste management waste should be avoided at first priority. If that is not possible, waste should be recycled (European Commission, 2008; Bundesministerium der Justiz und für Verbraucherschutz, 2012). Due to several publications plastic waste in the ocean has become a real problem and global challenge as plastic waste is not able to decompose in comparison to other material (Lippelt, 2017; UNEP, 2016; Umweltbundesamt, 2010). In order to pick this challenge the authors examine ways to avoid plastic waste in aviation. For the sake of simplification the authors focus on disposable plastic cups, as this item could make a huge difference.

The first way to avoid plastic cups is to refuse them, which is not practical as most beverages are served from bigger packages. Refusing the cups is feasible if the drinks are already in cans or small bottles e.g. beer or soft drinks. This would be the most uncomfortable alternative for passengers and the authors estimate that the willingness to refuse plastic drops at the expense of beverage selection.

Another potential to eliminate disposable plastic cups are refillable container like glass or dual-use plastic cups. Glass is estimated as more raised in comparison to plastic. It could be used multiple times and afterwards recycled. But weight of goods plays an important role in aviation. Glass is considerably heavier than plastic, which could lead to problems with the cargo weight. Furthermore, broken glasses imply a risk of injury and inefficiency during serving. Besides, early cullet means loss of money. From an economic point of view glass containers are more expensive than disposables, and beyond that, cost of cleaning has to be included, too. The question is, how many disposable plastic cups could be replaced by glass, as glass is resistant against frequent cleaning processes and how frequently has a glass container to be used to amortize the investment of higher asset cost. Dual-use plastic cups are not as raised as glass, but lead to cheaper initial cost and less weight. However, cleaning cost must be included. For this alternative, too, it has to be examined, how many disposable plastic cups can be replaced. In comparison to glass, plastic is not as robust, the plastic surface will become rough over time and therefore, must be replaced earlier than glass. After use, further albeit less plastic waste will be produced, therefore dual-use plastic is not an adequate alternative.

The next alternative is paper, which is to be disposed after usage. Although paper is a non-returnable package it gives the competitive edge of being not only recyclable but also compostable. Paper cups are not heavier than plastic cups and not more expensive. In addition, paper cups could be printed with the airline's logo. So, paper cups could easily replace plastic without any disadvantages. The only point for which reason paper cups are not used could the appearance as paper seems cheaper than a clear plastic cup.

Besides paper cups, single-use bio plastics are clear plastic alike cups in appearance, but not made from fossil oil but renewable biomass sources. Renewable recourses are cornstarch or cellulose. Bio plastic is hardly distinguishable from "real" plastic and supplemental biodegradable but with regard to price bio plastic is slightly more expensive. Biodegradation is possible only under industrial conditions, which are not in common. Therefore, the opportunity of normal composting like organic waste is not provided.

The last opportunity to reduce plastic waste is plastic cups from recyclate. Paper and glass can be recycled into high-grade products. This is already possible for the plastic material polyethylene terephthalate (PET). Recyclate is plastic made completely from consumer waste (Ecoplast, 2017). The difference between recyclate and recycling is the result: Recycled products are processed inferiorly into plastic articles of daily use. Afterwards a reuse is not possible anymore and the plastic will end in waste-to-energy (Recyclat-Initiative, 2017). Recyclate facilitate transparent high-quality plastic complying the "food grade" requirements and the opportunity of being processed to recyclate afterwards. Recyclate cups make sense, as they offer the same features as normal plastic cups, but more expensive and they require to be disposed, where the processing into new recyclate is possible, which makes the alternative impracticable as this could only be guaranteed in Germany.

III. CONCLUSION

Air traffic offers lots of waste saving potential as the case study with plastic cups applies to plastic-packed blankets and headphones as well as plastic-wrapped snacks and meals. Nowadays, lots of alternatives to plastic are available on the market, though not all alternatives are suitable yet. Airlines are dependent on weight and efficiency. Notably, the disposal of waste poses a global challenge, as waste has to be removed after arrival. For

taking waste back no space or weight is available on board the aircraft. So, disposal takes place on every departure airport, even if it's located in an area without proper waste management, where the waste will end up in landfill and possibly in the ocean. Bio and recyclate plastics are innovative alternatives, but no practical options for air traffic at the status quo.

To elaborate on this point focusing on marine litter and plastic pollution paper cups would be the product of choice. It would not last as long as plastic in the environment and offers an excellent recycling rate. It suits every disposal area irrespective of awareness from proper waste management and causes lass damage to marine environment.

In further research the authors examine the process and the cost of airport waste management in Germany. An interesting question to what extend disposal cost could be reduced by "eco-friendly" waste. Furthermore, the alternatives will be compared regarding to the price. Additionally, a poll will be asking the economy class passengers' willingness to resign comfort in order to reduce waste.

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