Implementing new concepts in waste management in tourist metropolitan areas

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Abstract. The urban waste in tourist cities needs comprehensive global research efforts and proceeded action as for metropolitan areas huge impact and load on waste management is generated. Waste management and resource conservation strategies are prepared in state-of-the-art level however implementation and future improvement of the current situation is crucial. Some examples in waste prevention and management for better tourism, waste and resource management are provided in the paper as outcomes from Horizon2020 project “Urban Strategies for Waste Management in Tourist Cities”. The policy and tools based on information gathered by scientists, municipal and NGOs experience (e.g. separation of bio-waste in catering industries, “sin-wastes” as from the bars, nightclubs and smoker places, reuse of unnecessary items that can serve for others and many more) are described. In addition, regulatory instruments (e.g. ban of plastic bags, reduction of allowed bio-waste in landfilling), economic instruments (taxes) and voluntary agreements (e.g. deposit systems; cleaning actions by volunteers) might be used to implement and elaborate the situation within environmental management and prevention practices in tourist metropolitan cities. Food waste prevention, beach and littoral management, special practices for festival waste and large amount specific waste generating facilities (e.g., entertainment industry, cruises etc.) are of high importance. The future outlook may be concentrated on digitalizing of waste flows and using the “big data” concept for better and smarter waste management.

1. Introduction

Tourism and recreation are considered as services, that interact in among “economy-culture-environment” schemes and may consider systemically influencing dimensions such as recreation and tourism per sei, industry and hospitality industry loads, social awareness, culture heritage values, food industry, waste management and many more. Hereby in this paper problems with tourism and recreation generated waste as well as waste minimization strategies will be described with examples given.

The tourism industry aside of positive outlooks unfortunately often have negative sides through posing detrimental consequences to environment due to unsustainable use of resources, increasing rates of landfilling as well as marine pollution due to, e.g., cruise ship industry and resources depleting activities through fishing industries. Tourism is booming with more than 1.3 billion international
visitors in 2017 and a growth rate of over 7% [1-3]. Hotels and other accommodation types buildings emit 150Mt of CO$_2$ (carbon dioxide) in 2014 [4], energy consumption will double by 2040 [5].

2. Food waste of hospitality industry
Worldwide 1.3 billion tons of food are lost or wasted annually along the food supply chain [6] providing about trillion dollars per year of losses, figure might be raised to 2.6 trillion considering hidden environmental costs [7]. Food waste problem is included in the United Nations Sustainable Development Goal 12, “Responsible Consumption and Production” aiming to diminish on half the “per capita global food waste at retail and consumer level and reduce food loss along production and supply chains by 2030” [8]. Still little is known about food waste at restaurant level, studies been made by [9-13], recent HORIZON2020 project “Urban Strategies for Waste Management in Tourist Cities” as well as Swedish Institute PECCEC and LASUWAMA projects tackled the weaknesses posed by food waste problem. The latter projects are providing various solutions for reuse and recycling as it is required by circular economy concept (see Tables 1-3).

Table 1. Innovative pilot good practices for waste minimization and prevention in tourist metropolitan and recreational areas. Food waste.

| Measure title                                      | Location                     | Description of the good practice                                                                                                                                                                                                 |
|---------------------------------------------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Food prevention at buffets and restaurants         | Lisbon, Portugal             | The campaign “Conscious consumption, Respect Environment” organized in Oeiras (Lisbon) on food waste prevention at buffets was based on consumer incentives to take on the meal tray only the amount of food strictly necessary to meet the nutritional needs and/or appetite. If at the end of the meal, the tray (soup, dessert and bread) is shown empty/without leftovers, the consumer received a poker chip equivalent to 10 g of non-perishable foods that are donated to charity institutions. The measure was proven to be an innovative solution to reduce the production of organic waste. |
| Collection points for used cooking oils            | Olleco, UK                   | At the “Le Manoir aux Quat’Saisons” hotel (Oxford, UK), UCO (incl. oils and butters from cooking) is being recycled using a local company called “Arrow Oil” that supplies Fat Bins (“Le Manoir” and “Arrow Oil” split the cost of purchasing the bins 50-50). These bins are stored in a separate outdoor refrigerated unit to stop unwanted smells, leakages and pests and are collected on a weekly basis. The fat is recycled into biofuel and “Arrow Oil” gives back to the hotel 25p per liter (back in 2012). The biofuel produced is then used to fuel the “Arrow Oils” transportation trucks. |
| Selective collection of bio-waste from restaurants and hotels | Lisbon, Portugal             | In Lisbon (Portugal), the municipality started in 2005 to selectively collect kitchen waste from restaurants, canteens and hotels via door-to-door collection schemes (bio-waste collection has not been provided to households yet). Afterwards, the bio-waste is sent to an anaerobic digestion plant managed by Valorsul. |
| Food tracking device                               | London, UK                   | In spring of 2014, the Sustainable Restaurant Association (SRA) in the UK started running the scheme “Food Save” to help hoteliers and restaurants understand and reduce their food waste. At the Bingham Hotel (London), as the pilot case, waste from preparation, spoilage and leftovers from the plates were separated and weighed for over a month in order to identify the sources of food waste. The “Food Save” team visited the hotel every week to review the results and identify actions for waste reduction (in collaboration with the kitchen staff). Once the trial was completed, the General Manager reported that the first challenge was to get staff on board, as changing habits and getting people to implement new activities can be complicated. But key to the success of the trial was to present the project to staff from the beginning, not only with an environmental message but also engaging staff in the business through their financial responsibility for reducing waste. He claimed that allowing staff to share in the success by
allocating part of the savings to a staff football tournament was very helpful to engage staff. As a result of this initiative, food waste weight was reduced by 30%, representing an annual reduction of 2.4 tones (and 6.5 tones including packaging). Moreover, £109 was saved in food waste costs per week, representing a saving of £7.581 annually.

| Food donation from restaurants and hotels to charities | Hotels Worldwide |
|------------------------------------------------------|------------------|
| The properties within Carlson Hotels Worldwide, Radisson Hotels & Resorts, Marriott International and Fairmont Hotels and Resorts donate untouched food from catering displays and trolleys to community projects such as homeless shelters, orphanages, homes for the elderly and drug rehabilitation centers, sometimes working through charitable organizations. |

3. Green waste in tourist areas

A low carbon economy is the new type of policy [14-15], tourism is the growing industry which also contributes in common amount. Already in 2009 World Economic Forum defined the strategy on “Towards a low carbon travel and tourism”, driving attention to decarbonisation of tourism [16]. Tourism and recreation is responsible for about 5% of emissions and grows annually about 3% [17]. Green waste might provide solutions for partial decarbonisation [18]. Landfilling of the green waste in tourism areas is not a sustainable solution, primarily composting is the issue [19-20]. However, composting has limits in demand [21]. The effective management of the green waste and implementation of bioenergy production should be considered as solution in circumstances of substantial amounts and increased demand in tourism centres and metropolitan regions. Hence this is a huge disputable on policies level, governmental intervention often is needed to promote green waste use in energy production. Calculations of the energy efficiency as well as emission schemes are to be provided for justification of bioenergy feasibility. Collection of green waste from tourist areas, parks, marshlands, branches from trees cut on streets every season etc. are to be valued as source for energy. Moreover, the littoral zone and beach wrack that is cleaned from coastal zones for tourist recreation place recoveries are important source. Combination with the previously mentioned above food waste from catering industries are on designing level in some projects funded by EU.

4. Marine debris in tourist areas

Marine debris and pollution of anthropogenic origin from coastal tourism loads as well as local recreation season inhabitants critically influence marine and coastal environments and have severely negative environmental and socioeconomic effects such as marine and coastal fauna animal death, impact on fishing, problem of illegal transport of exotic species, aesthetic deterioration, tourism declines that mutually interacts with social welfare that perpetually even worsen situation with environmental awareness; besides it is seriously affecting the health of human population. Recent studies have shown that some residues as micro plastics may adsorb contaminants present in the water and thus enter food chains destroying habitats of aquatic organisms and impacting their metabolism [22]. The origin of the litter in marine and coastal sediments as well as organisms (!) can be classified as terrestrial or marine. Hereby on may consider classification: 1) oil and gas platform and ship accidents waste; 2) materials of fishing activity, plus garbage dumped by sailboats, freighters and other vessels [23]; authors would consider by adding the 3) cruise industry waste and debris, plus ballast water. Terrestrial sources may include waste from household, commercial and industrial sewage, landfills, river drainage and surface runoff [24]; authors might add also “winter waste” with macro- and micro- elements that are used for snow and ice melting on road infrastructure, at railroads and airports. On top of that the lack of specific knowledge of tourists and relaxing people on beaches, when they dispose plastic cans, bottles of glass, cigarettes remains and other items.

The becoming of a region into a tourist and recreation destination causes changes in socio-spatial relationships, leading to deterioration of landscapes and environmental degradation. These aspects are intensively studied by UrbanWaste project in collaboration with Tourist Information Authority of the Nice Metropolitan Cote „dAzur.
Sustainable tourism considers mutual aspects for social and culture inclusive aspects, conservation questions and environment and quality of services for holistic long-term economic viability of tourism. It is vital in the process of planning and territory management [25-26]. Coastal management is to be organized in a way that focus on preventing the arrival of litter to the coastal environments through: 1) awareness and educational tools; 2) campaigns on a local or national scale for beach-cleaning activities; 3) strengthen legislative aspects on penalties, fees and recycling/reuse; 4) research and collaboration between different regions and stakeholders [27-28].

Tourist coastal cities with an inappropriate management of waste and litter tend to present more impact in exaggerated levels [29-31]. The coast of, e.g., Dubrovnik, Costa d’Azur, Jurmala in Latvia, Tenerife in Canaries, Palanga in Lithuania, Sochi in Russia Federation, Sydney Bondi Beach in Australia (and many other places) tend to be presenting sites where proper management in legislation is delivered however not always at peak seasons the waste management and recycling/reusing policies are working properly as amount of tourists and longer-term summer inhabitants put much higher load to the infrastructures than local residents might have.

Table 1 provides sustainable initiatives implemented as pilot cases in coastal areas within some of tourist metropolitan areas. These may be considered as pioneer studies and if successfully implemented be important part of environmental management for waste minimization and prevention in places with high recreational load.

5. Corporate social responsibility

Corporate social responsibility (CSR) is a sort of self-regulating business model providing values as social and environmental benefits for its stakeholders and the public. Through practicing it, also corporate citizenship is the term for cluster for companies that are conscious for the kind of impact they are having on all aspects including economic, social, and environmental. To engage means to “care and participate”. There is usually no legislative obligation for such actions however a lot of so called “sin industries” also are turning to CSR as they need to respond to the negative public image by doing beneficial things to either social sphere or environmental issues.

The hotels” and casinos” value and profitability in a large terms in metropolitan and tourism areas is raising by creating the side effects on environmental loads. CSR ideas and promotion via stakeholders is an effective tool that may improve social and environmental situation by indirect means, with that said, one is to reduce the impacts, but another thing is injection of CSR approach in all the business
network and supporting financially the problem solutions. Casinos in terms of the impacts of CSR on firm value and profitability are good examples on promotion of sustainable goals through implementation of environmental standards in management, guaranteeing quality control, recycling and even investing in CSR beneficiaries.

Table 2. Innovative pilot good practices for waste minimization and prevention in tourist metropolitan and recreational areas. Coastal zones.

| Measure title | Location | Description of the good practice |
|---------------|----------|----------------------------------|
| Substitution of disposable products in hotels | Sorrento, Italy | The Conca Park is a 205-room hotel in Sorrento (Italy) which proudly advertises its zero-waste achievement across their website. They undertook a number of initiatives to reduce their waste including replacing all single portion and disposable items, introduced water dispensers to reduce the use of bottled water, replaced a number of plastic items with recyclable or compostable materials and achieved over 80% recycled waste. |
| Promotion of tap water | Grand Canyon National Park, USA | After evaluating that plastic bottles represented 20% of the Grand Canyon’s waste stream and 30% of the park’s recyclables, the Grand Canyon National Park (USA) has banned the sale of water packaged in individual disposable containers including plastic bottles. Water bottle filling stations have been installed in the most frequented areas of the park, which provide spring water from the park. Reusable water bottles are also available on sell at the retail outlets off the park. In 2011, 23 American national parks had implemented such a measure. |
| Waste sorting in marinas | France | In France, the operation “I sail, I sort” aims at encouraging recreational sailors to sort their waste on board and dispose it on land, rather than dumping their waste in the sea. The operation is based on a communication campaign (using flyers and posters distributed to the sailors and displayed in the marinas) to provide the sailors with guidelines for a proper management of their waste. The communication campaign is completed with the provision of the sailing community with reusable sorting bags for the recycling waste and the installation of bags distributors for residual waste at marinas. Plastics Europe (European association of plastics producers) and ELIPSO (professional organization representing French plastics and flexible packaging) also took part in this initiative. Thanks to this partnership, the number of marinas involved in the operation could have been doubled. In 2016, 41 marinas participated, thus raising awareness of 191,000 recreational sailors. |
| Information on waste sorting for cruise ships | Copenhagen | Information dissemination activities and brochures delivered to the staff of cruise ships as well as instructions implemented in internal enterprise regulations regards environmental management principles. |
| Awareness campaign on marine litter | Tenerife, Canary Islands and Copenhagen, Denmark | The association Promemar (Proyectos Medioambientales Marinos), based in Tenerife, organizes sea and beach cleaning activities, awareness campaigns and educative program on marine litter and marine pollution. The waste collected during the cleaning activities are sorted, categorized, weighed and registered in the MARNOBA platform, in order to improve the knowledge about marine litter and to make evaluations. In Copenhagen, a company renting out kayaks set up the initiative of the “environmental kayak”. The company proposes people to use their “environmental kayak” for free, if they clean the harbor while kayaking. To do so, the kayak is equipped with a bucket and equipment for collecting waste. The collected waste is then weighted at the end. This initiative has been funded via a project for cultural activities around the harbor of Copenhagen. |
Table 3. Innovative pilot good practices for waste minimization and prevention in tourist metropolitan and recreational areas. Environmental management good examples of responsible reuse and sorting initiatives.

| Measure title                          | Location                      | Description of the good practice                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Doggy bags                            | Métropole Nice Côte d’Azur, France | Métropole Nice Côte d’Azur (URBAN-WASTE pilot case) together with the Nice Côte d’Azur Chamber of Commerce and Industry launched a project to tackle food waste in restaurant, as part of their waste prevention plan. Pre-diagnostics were realized in the restaurants located in the highlands and the coastline areas of the metropolis and aimed at evaluating the quantity and the type of waste produced. The waste sorting instructions were also reminded and the doggy operation to reduce food waste was promoted. The voluntary establishments were given waste prevention kit and proposed to participate in an initiative. The kit were composed of food containers for leftover, plastic bags to carry the food containers and bottles. One kit costs 1.36€. Around 80 restaurants now have been given the doggy bag kit and use it by proposing to their customers to take back home their leftovers. |
| On-site composting in tourist establishment | Métropole Nice Côte d’Azur, France | The French Metropole “Nice Côte d’Azur” (MNCA) delivers composters on request to local businesses, public catering services households and local authorities. Moreover, within the partnership with the chamber of commerce and industry (CCI and MNCA) and the European project MED3R, several restaurants and catering services started to separate bio-waste and implement on-site composting at the end of 2014/beginning of 2015. |
| Partnerships between hotels and charities for reuse initiatives | Spain and Scotland | Some examples of organizations specialized in recovering functional electronic equipment which is obsolete but can be reused for social purposes are “Fundación Doctor Trueta” (Spain) and “Asociación TxT Tecnología para todos” of the Catalan University (Spain).[1] As to furniture and white goods, the Tayside Furniture Project (Scotland) collects unwanted quality furniture and passes the items to needy families in the area. |
| Reuse initiative in camping sites      | France                        | As part of plan to reduce waste produced by tourists, 5 municipalities in Vendée (West of France) have decided to implement measures aiming at reducing waste produced by tourism. After implementing a “give box” in a public area as a pilot test, the municipalities have promoted this measure to the camping sites located in their area. 25 camping sites were voluntary to install “give boxes” for promoting reuse initiatives among tourists. The “give boxes” have been made with recycled wood by a social inclusion association. |
| Communication campaign on reuse through swap markets | Copenhagen, Denmark | The City of Copenhagen (Denmark) allows citizens and businesses to reuse materials and products by expanding swapping options at the local recycling hubs and civic amenity sites. In this sense, the municipality guides citizens wishing to establish swapping facilities in their courtyards. Surveys have shown that if 150 courtyards would establish swapping facilities, 85 tones of waste would be saved, besides the municipality would save costs for collection and treatment of the items. Another survey showed that 98% of the city’s citizens found that it is fine if other people reused items they had discarded. As an example, the URBAN-WASTE project organized in April 2017 (through the Municipality of Copenhagen) the 1st Community of Practices (CoP) event together with a swap market at the City Hall Square. More than 2,000 people participated which translated into 3,000 kgs of swapped stuff. |
| Waste sorting in hotel rooms           | Lisbon, Portugal              | The Neya Hotel in Lisbon has successfully implemented a waste sorting system in the 76 rooms of the hotel. Every room includes a bin for separation of residual waste, glass, paper and packaging (plastic and metal) fractions. This measure was implemented immediately after the hotel opened in 2011. |
| Recycling                             | Copenhagen                    | In Copenhagen, the municipality has included recycling advisors within the
### advisors for tourist establishments

Denmark

Services provided to tourist establishments. In the last 3 years, advisors have visited over 2,000 companies (incl. hotels, restaurants and shops) and contributed to recycling nearly 20,000 tons. This service consists of cooperation with newly started businesses, collaboration with the branch organizations, and intensified efforts on supervision and enforcement, among others.

### Sorting bins in public and touristic places

Copenhagen, Lisbon, Florence

To facilitate the recycling of packaging materials (such as plastic bottles and cans) that are included in the Danish deposit-refund system, the City of Copenhagen, together with Dansk Return System (organization in charge of the Danish deposit-refund system) and NGOs, has designed a new model of street bins. This design allows to discard plastic bottles and cans on the outside of the bin on “deposit-shelf”, so that people in need can collect them and earn some money through the deposit-refund system. This new system had the purpose to dignify the collection of refundable packaging by avoiding that people need to go through the waste to find the refundable packaging. Such bins have been implemented in different parts of the city of Copenhagen. In cities such as the URBAN-WASTE pilot cases Lisbon and Florence, the waste is collected through a bring banks system in the historical center. Thus, sorting containers are available for everyone in public areas of the city, enabling not only citizens but also tourists to sort their waste.

### Waste sorting instructions in foreign languages

Finland and France

Some municipalities, such as Keltakangas in Finland, have translated their waste sorting instructions in foreign languages and published leaflets that can easily be spread. Métropole Nice Côte d’Azur, in France, is currently doing so by translating the waste instructions in English, Spanish and Italian. The translated leaflets will be made available at the tourists offices and disseminated to the owners of tourist accommodations registered by the tourist offices.

### Pocket boxes and ashtrays against litter

Copenhagen, Denmark

As part of the summer initiatives to keep Copenhagen clean, tourists can borrow ashtray at the beach to avoid the littering of cigarette butts in the sand. Moreover, pocket ashtrays are distributed by local shops within the city, to avoid littering in the street. To motivate citizens and visitors to participate and make efforts to keep the city clean, the City of Copenhagen launched a competition which consists in sharing pictures of oneself helping cleaning the streets of Copenhagen.

### Eco-event guidelines

Denmark and France

In the City of Copenhagen (Denmark), an initiative about “less disposable cups” has been in place since 1998, promoting the use of recyclable cups for all kinds of beverages served within the Tivoli amusement park. Thanks to this measure, which could be applied in festivals and campsites, cups are returned to vending machines that return the deposit to the guests. The cups are washed and sent into circulation again.

As other local authorities in several countries, the URBAN-WASTE partner Métropole Nice Côte d’Azur (France) has made an “eco-event charter”, which is integrated to the local waste prevention plan. The charter includes actions such as waste prevention, waste sorting and recycling. It also includes actions on eco-responsible suppliers and eco-friendly purchasing. Awareness raising is also part of the charter principles. The local music event “Nice Jazz Festival” applies the principles of this charter during the festival’s organization.
Figure 2. Casino tourism is nowadays more important force that encompasses all environmental impacts as those attract millions of people every year. This leads to development of corporate social responsible strategies that is a wider concept than environmental management per se. Special place for tourist photography’s at Montecarlo casino, Monaco.

Casino tourism is a new research area focusing on gambling desire in visiting casinos or as visiting attractions. Contemporary casinos nowadays are available for tourists and leisure gamblers less everyday players. This is mainly due to digitization and on-line possibilities of gambling nowadays. Wong and Rosenbaum (2012) [32] were the first to propose casino tourism in Macau and identified several major motivational factors: 1) entertainment and novelty; 2) leisure and free-time spending; 3) casino sightseeing, socializations. Many casinos are turned into complex retail and entertainment places that may be considered directly as tourism destinations with all derived environmental management problems addressed [32-34]. Casinos are that, e.g., in Europe are keeping tourists afloat in places like French Riviera (Montecarlo), capitals and tourist cities where the gaming is not limited in EU. The same approach of CSR can be devoted while analysing the cruise ship industry, large cultural events (festivals) as well as, so called, “sin industry” actors that work in fields of entertainment: bars, producers of alcohol drinks, nightclubs. CSR in this case corporate responsibility for having implemented additional environmental standards per se, as, e.g., load from cruise industry as well as festivals and large sport events is huge at momentum level, some of these actors show the will to invest in environmentally and socially sound and responsible way.

6. Conclusions
Waste prevention, reuse and recycling are challenges in general environmental as well as waste management, that local, regional policy makers in tourist cities and metropolises have to face. The consumption pattern and the overall structure of the population is radically changing through the seasons and this amends significant pressure on the waste management system. Tourists come to destinations with a variety of cultural and waste habits and practices, and must adjust to local waste prevention and sorting activities quickly. Municipalities that suffer from overloading tourist impact to the environment shall adapt their management strategies and there is the room also for implementing the corporate social responsibility additionally to well known social awareness, education and regulative means. Implementing the social responsibility in various levels might be combined in future with digitalizing of waste flows and using the “big data” concept for better and smarter waste management.
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