

## Current Status and Future Challenges in the Municipal Waste Management

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The concept of waste management is relatively recent. Just a couple decades ago, individuals were responsible for discarding their waste. The discard was too primitive and uncontrolled whereby each one was dumping the waste carelessly into the environment without thinking about the consequences. It is well known that humans are the principal factor for breaking the ecological diversity balance. At the same time, people dislike waste but they deny being the main contributors to the problem. In addition to that, waste treatment management is always accompanied with risk. The risk won't only target workers involved directly in waste management, but even those who are living around. Our planet is hurtling toward urbanization; however parallel increase in municipal solid waste (MSW) is recorded (Fig. 1). The policies and solutions proposed by governmental and private sectors will always be in question if they don't take the health and safety issues of the biosphere into consideration. The conventional ways of treatment which includes disposal, reduction, recycling, segregation and modification has not developed that much over the past 200 years, at least not at the level of population growth development. The problem of waste disposal is not confined only to developing countries. Even so called "less developed" countries show an increase in the amount of solid waste production.

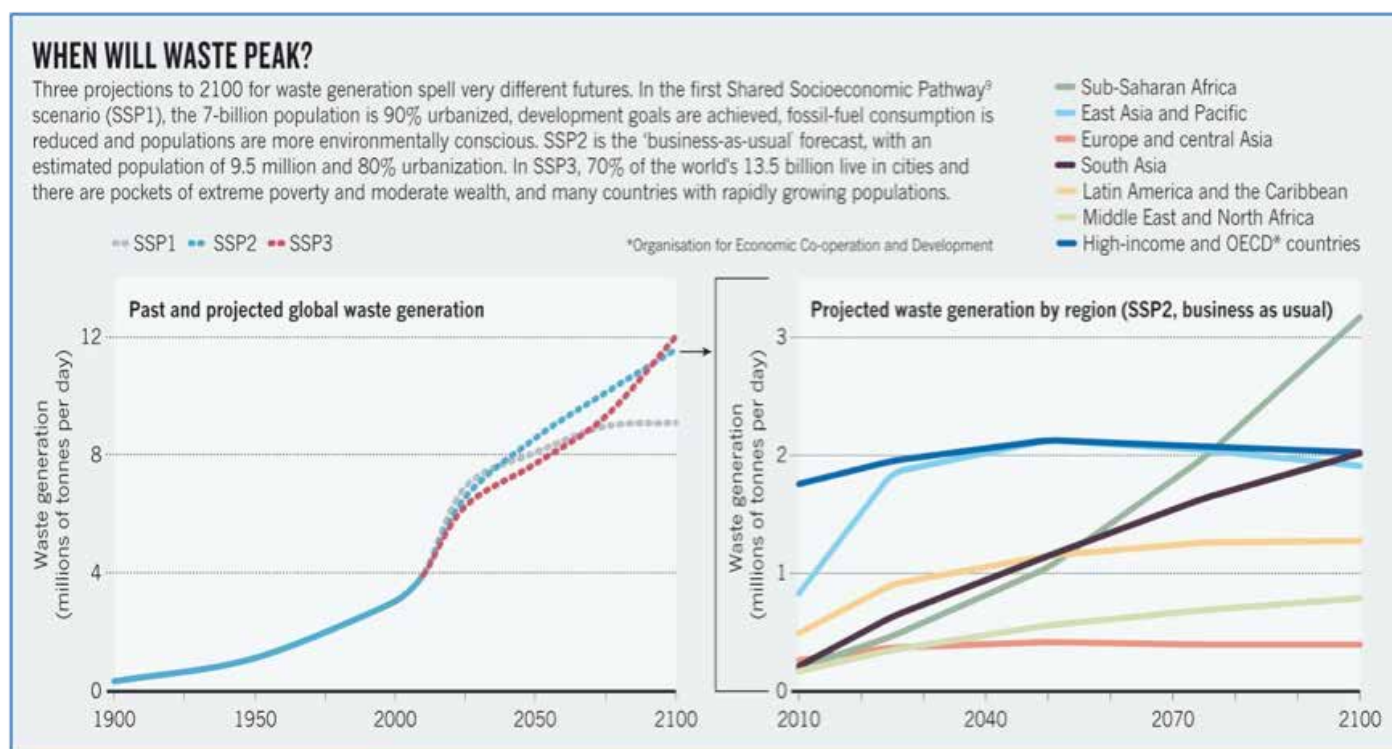
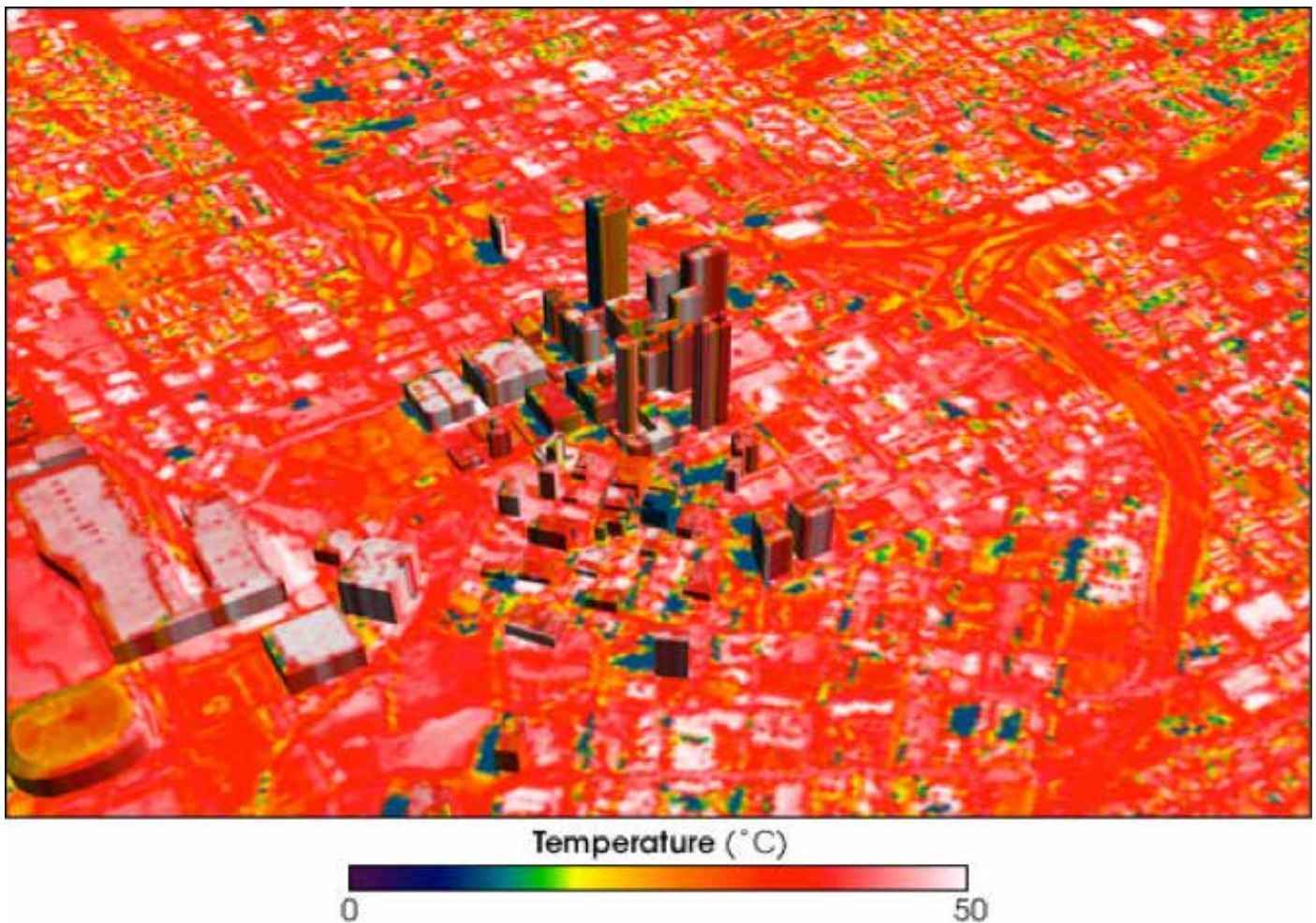


Fig.1: Daniel et al - Nature Oct. 2013

The puzzle is easy to be solved; there is more growth of urbanization in developing countries than in developed countries. The growth in urbanization in the developing countries is coupled with the growth of population living in urban areas. Hence, this will increase the domestic waste. On a global level, urbanization is causing the “Urban Island Effect” which is heating the environment causing agriculture to suffer, producing more waste, emission and pollution and finally creating global warming that will touch every single person on this planet (Image. A).



(Image. A): Atlanta, Georgia, showing temperature distribution, with blue showing cool temperatures, red warm and hot areas appear white. NASA - NASA

MSW includes the subset of materials referred to municipal solid waste plus other types of waste discarded by households; waste from restaurants and hotels and from commercial and industrial entities. Such MSW is considered to be problematic to the environment and public health if it not properly managed. Worldwide, a numerous quantity of hazardous / toxicant is produced. A pollutant or toxicant is defined as a substance that is present in the environment, at least in part as a result of an anthropogenic discharge from industrial, agricultural or domestic activities, and has a deleterious effect on living organisms. In general, a pollutant may cause an adverse effect on a living organism through (1) disruption or destruction of cellular structure; (2) direct chemical combination with a cell constituent and (3) its influence on enzyme function. It is very important here to mention that we know too little information about the health impact of these toxicants produced by human activities. The developed world produced huge amount of toxic material and toxic waste. However, they it has developed a new strategy to liberate its ecology systems from toxic wastes by shipping them overseas to developing countries against payment. The main public health concern here is that, the vast

majority of these developing nations are weak in terms of waste treatment. They have inadequate facilities and the lack of expertise for safe disposal. They have limited resources and fast falling apart infrastructure. Another related common problem is the absence of active and all-inclusive legislative frameworks governing the solid waste sector. This is a good example of the bad practice that may produce corruptions at different levels.

Solid wastes generated by developing countries are to a large extent decomposable and recyclable. Hence, there is an opportunity for socio- economic development with a rational usage of the resources (Fig. 2)

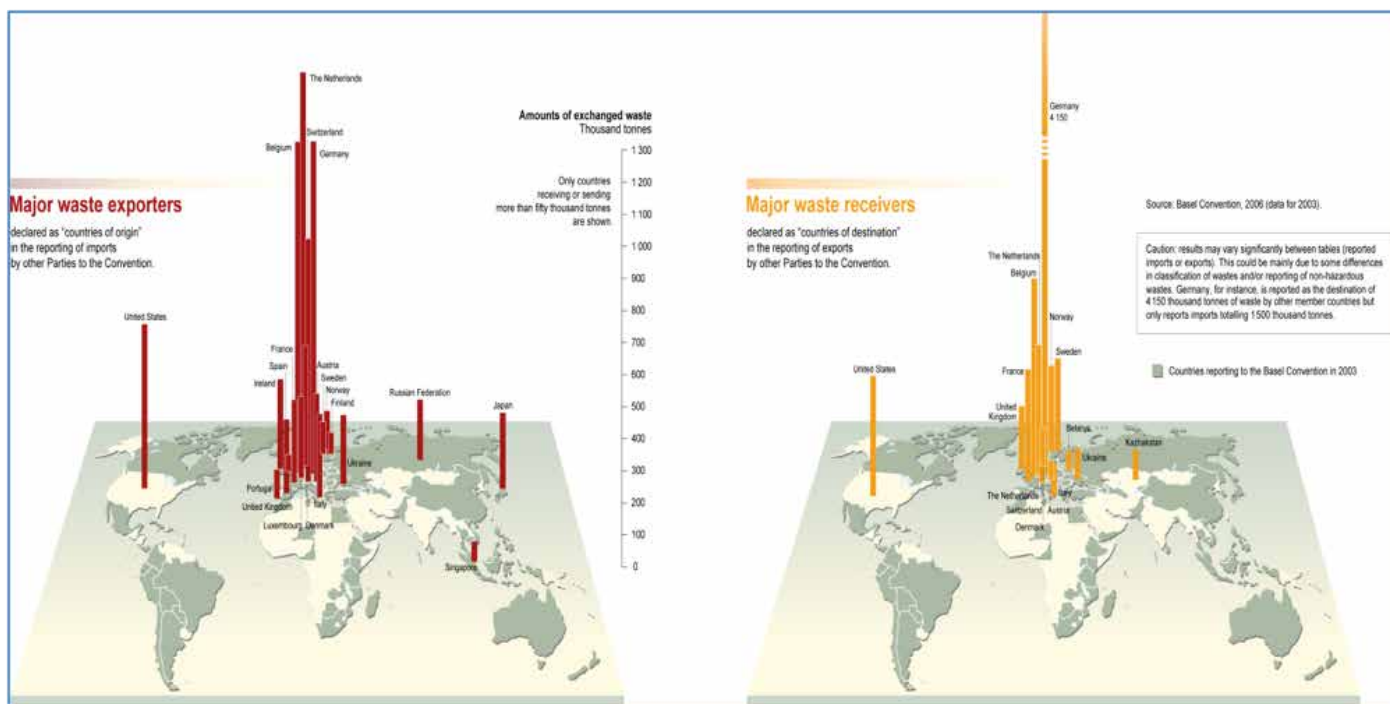


Fig.2: Major Toxic Waste Exporters and Major Toxic Waste Receiver

Municipal solid waste in the Middle East is made of organic fraction, paper, glass, plastics, metals and wood which can be managed by making use of recycling, composting and/or waste-to-energy technologies.

For example, Egypt with a 95 million of populations produces almost 75 % of its entire Municipal Solid Waste (MSW) in urban areas. Total estimated MSW for 2025 is expected to reach 33 million tons for a growth rate of 3.2% based on 2001 records. However, the collection processes and recycling could be more efficient. Likewise, the standing in many other developing countries (i.e. Syria, Lebanon) is not much different and need to be improved. In the GCC and in particular in Saudi Arabia, approximately 15 million tons of garbage is produced each year. With an approximate population of about 29 million, the country generates more than 15 million tons of solid waste per year. The per capita waste generation is estimated at 1.5 to 1.8 kg per person per day. Bahrain generates more than 1.5 million tons of municipal waste every year. Countries like Kuwait, Bahrain have a higher per capita waste generation rate, primarily because of high standard of living and lack of awareness about sustainable waste management practices. (Fig. 3).

## MWG - Tons- annual

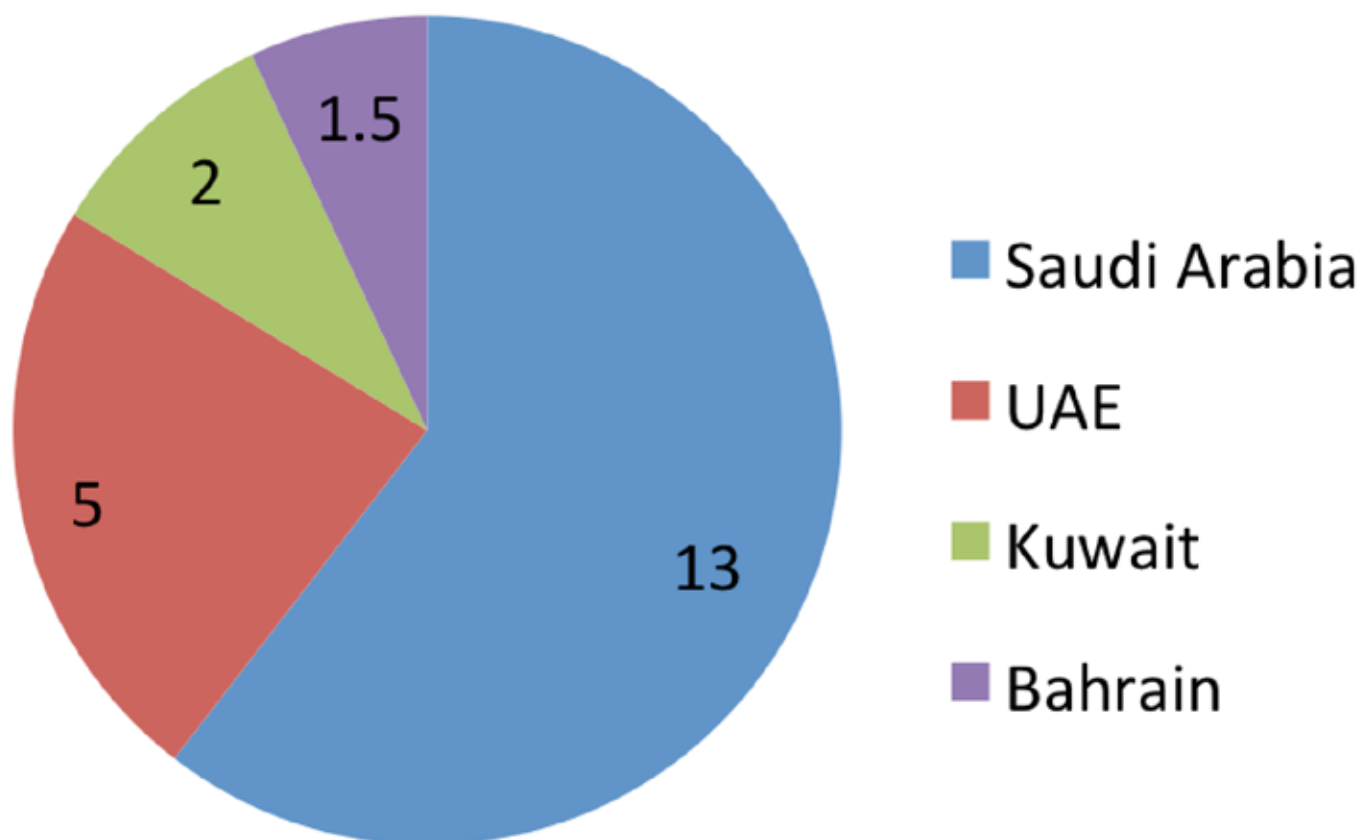


Fig.3 : Solid waste generated in different Gulf countries.

In the UAE in 2013, 11.8 million tons of non-hazardous solid waste was generated in Abu Dhabi, not including waste that was generated and discarded illegally. Out of the 2013 total, 27% was recycled, 3.9% was composted and 68.8% was sent to landfills or dump-sites. In Dubai, Waste Management Department in Dubai municipality compiled the “Dubai Integrated Waste Management Master Plan in 2012” with an aim to reduce the amount of waste being sent to the landfills to zero in 20 years by using an integrated and innovative approach.

To use municipal solid waste, different conventional technologies such as incineration, mass-burn and landfill gas capture have been used. At the landfill sites, the gas produced as an end product of microbes and natural decomposition of MSW. The gas will be collected and then after injected into internal combustion engines or gas turbines to generate heat and power.

It is obvious that the main problems facing developing countries are in modeling a sustainable solution for solid waste and the lack of adequate administrative and financial resources. However, it is worthy to state that there are no magic solutions that treat different dimensions of solid waste problems. The governmental sectors usually operate, observe and audit the entire process of solid waste management. Such management style will weaken market mechanisms and reduce the positive impact of competition. Another important weakness is the legislative framework which governs SWM and the enforcement of laws which needs to be probably implemented. Furthermore, well versed information/data is a problem for solid waste business in the region. In fact, there are many factors which make data harvesting from governmental authorities an issue. For instance, many solid waste departments work under the umbrella of governmental sector such as municipalities. A municipality is a governmental

body which deals with endless services. All – under – one – roof approach which lead to administrative complexity and less productivity. However, other unusual factors like civil war in some developing countries like Syria and Iraq should be considered as well when we are discussing solid management challenges in the region.

To conclude, the main objectives of any waste treatment procedures are to protect the health of the inhabitants, to promote an environmental friendly community, to control diseases, to produce cheaper energy and to develop sustainability. To meet these goals, sustainable solid waste management systems must be adopted fully by governmental authorities and incorporated by the private sector. Although in developing countries the quantity of solid waste generated in urban areas is low compared with industrialized countries, the MSW still remains inadequate. Therefore, the following roadmap should be used to have a healthier environment and an optimal waste management system:

1. Research is required concerning how environmental impact of solid waste can be controlled and how domestic waste can be successfully used.
2. Education and awareness, as waste management is affected mainly by consumer behavior
3. The endorsement of the “Waste Management Bill”, which will create an enabling environment for enforcement and will provide a legal framework within which environmental impact can be implemented
4. Development of waste management practice at all levels of government (i.e administration model, monitoring and enforcement of instruments and of illegal dumping).
5. Waste licensing and managing data ( local , regional or even global waste information system)
6. Waste management should be under separated management bodies to fasten the growth in this important service sector.
7. Implementing an integrated sustainable solid waste management approach which will mitigate any adverse impacts on the environment, natural resources, and the public health.

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