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Waste-to-Energy in Jordan - Potential and Challenges

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Effective sustainable solid waste management is of great importance both for people's health and for environmental protection (Aljaradin and Kenneth 2012). In Jordan, insufficient financial resources, growing population, rapid urbanization, inadequate management and lacking of technical skills represent a serious environmental challenge confronting local government. At the same time, energy remains Jordan's top challenge for development. The energy needs to be produced in a sustainable way, preferably from renewable sources which have a minimum environmental impact. To face the future problems in waste management, as well as securing the demand of renewable energy, it is necessary to reuse the wasted resources in energy production. Jordan has definitely acknowledged that making affordable energy solutions available is critical to support industries, investment, and attain sustainable growth. One option is to use solid waste to generate electricity in centralized plants. Waste to energy options was recognized recently as an effective approach to improve recycling rates, reduce the dependence on fossil fuels, reduce the amount of materials sent to landfills and to avoid pollution.

According to recent statistics, Jordan population stands at around 9.5 million. The estimated municipal waste generated according to the last five years average production is around 3,086,075 ton/year. This huge amount of waste generated is not only a burden, but a potential resource for use in energy production. Considering the country average waste composition 40% is organic waste e.g. avoidable and unavoidable food waste (1,200,000 ton), 10 % are recyclable e.g. paper, plastic, glass, ferrous metals and aluminum (300,000 ton) and 50% are suitable for incineration e.g. garden and park waste, wood and textiles (1,500,000 ton) with high calorific value and energy potential (8.1 MJ/Kg) that is capable to produce electricity 340 kWh/ton waste. The high organic waste is suitable for methane gas capture technologies which is estimated 170 m³/ton waste. Today, there are many technologies available which makes it possible to utilize these energy potentials. The major alternatives conventional technologies for large scale waste management are incineration, landfilling and anaerobic digestion. These technologies are affordable, economical visible and associated with minimum environmental impact. The production of electricity is combined with greenhouse gas (GHG) emissions, according to the current energy situation (90% of the country energy produced from fossil fuel), the country emission factor is around 819 CO₂-_{eq}/kWh. However, the use of waste to energy solutions is considered to be a clean and definitely the amount of GHG emitted is a lot less than the gases generated by ordinary practices (open dumping and unsanitary landfills) (Aljaradin and Persson 2016). Construction of an incineration plant for electricity production is often a profitable system even though the installation cost is high since production of electricity often leads to a large economic gain. Landfill gas utilization avoids the release of untreated landfill gases into the atmosphere, and produces electricity to

sell commercially in an environmental friendly manner. However, landfilling is associated with methane production. Methane is a potent GHG, contributing 21 times more to global warming than carbon dioxide. Anaerobic digestion technology is another option. Anaerobic digestion not only decrease GHGs emission but also it is the best technology for treatment of high organic waste through converting the biodegradable fraction of the waste into high-quality renewable calorific gas. Currently, with the growing use of anaerobic technology for treating waste and wastewater, it is expected to become more economically competitive because of its enormous advantages e.g. reduction of pathogens, deactivation of weed seeds and production of sanitized compost. Sorting at the place of generation and recycling e.g. paper, plastic, glass and metals needed to be practiced at the country level or at least where these technologies implemented. Incinerated waste containing plastics (not sorted) releases carbon dioxide, toxic substances and heavy metals to the atmosphere and contributes thereby to climate change and to global warming. Waste management technologies offer enormous potentials as a renewable energy sources and to mitigate climate change. However, these technologies pose many challenges to the country and discussion makers. Currently, the waste sector is administrated by the government. Poor regulation and insufficient financial resources limiting the available options toward adapting these new technologies. Private investments and collaboration with the private sector is the key solution in this regard.

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