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Waste Management in Galați County

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Abstract: Galați County has begun the implementation of the circular economy through the major waste management project submitted for funding to the European Commission. The paper presents as a case study this project, financed through the Operational Program for Large Infrastructure, in which the circular economy is introduced and implemented as a concept. The project will implement an integrated waste management system in Galați County, which will have a significant positive impact on the environment, human health and quality of life, especially in terms of reducing surface water, soil and groundwater contamination, reducing air pollution, reduced climate impact, reduced hazards for the general public and improved quality of life.

Keywords: Green Waste; Recycling;

JEL Classification: Q55; Q57

1. General Considerations Regarding Waste Management

The term ‘waste’ refers to the unwanted materials or substances produced by human activity which has the potential to cause pollution when released into the environment, if causing a risk to human health, or exceeding the environmental carrying capacity. These materials or substances could be solid, liquid, gaseous or radioactive. However, what is considered by one industry as a waste may very well be a useful resource for another.

The collection of waste is an important step of the waste management cycle, because the collection of sorted waste that soon separates different kind of materials makes their reusing, recovering, and recycling easier and more efficient, reducing the amount of landfilled waste.

According to Bosman, the process towards development of an Integrated Waste Management (IWM) would entail the following steps (fig. 1):

- a) Establish the existing status (Status Quo) with regard to waste management, and determine any risks or impacts relating to current waste management practices;
- b) Set management objectives (Desired End State) to address these identified risks and impacts, and obtain confirmation from management, authorities and key stakeholders on the acceptability of the management objectives;
- c) Identify and evaluate waste management alternatives that could be taken to reach the management objectives, and that will address backlogs and shortfalls. This evaluation is conducted against a predetermined set of evaluation criteria, and includes a risk-assessment as

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outlined above from the perspective of Multi Criteria Decision Analysis (MCDA), and not merely a cost-benefit analysis (CBA) in order to determine and select the Best Practicable Environmental Option (BPEO);

- d) Summarise the actions for implementation of the BPEO for waste management into an IWMP, to be discussed with management, authorities, and key stakeholders prior to implementation. Such an IWMP should be specific and concise, and should clearly indicate actions, responsibilities, and timeframes;
- e) Implement the IWMP, evaluate performance and monitor impacts and improvements and Review the IWMP at regular intervals.

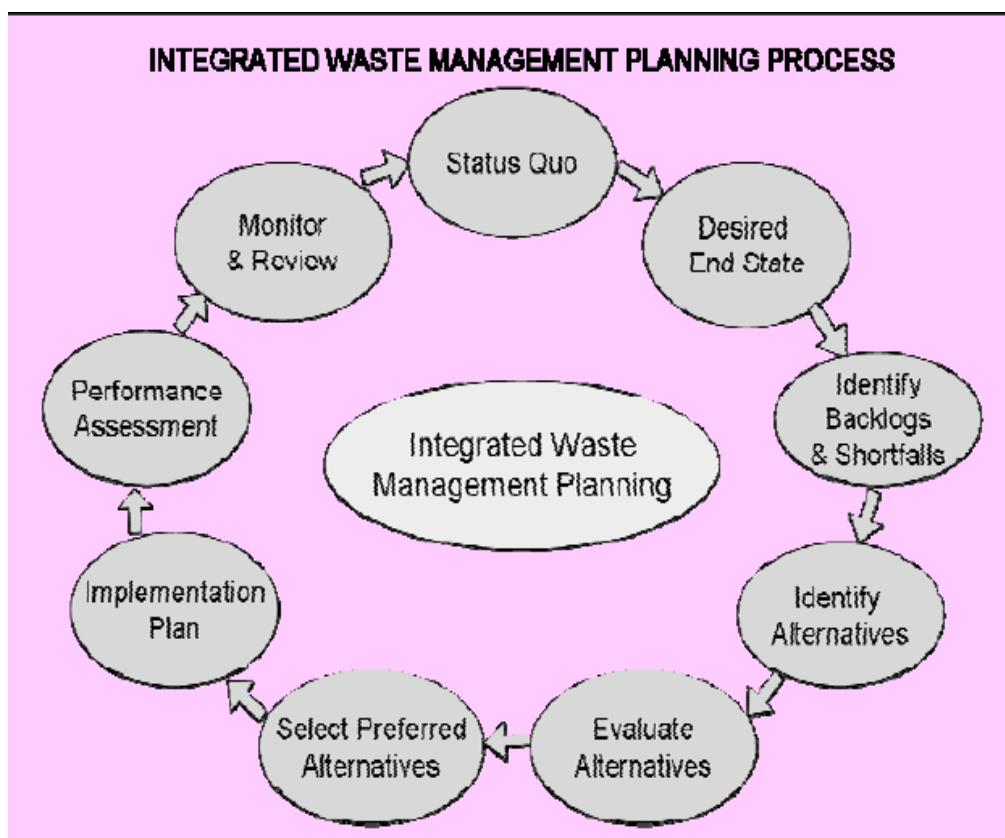


Figure 1. Integrated Waste Management Planning Process (IWMP)

(Source: Bosman C.)

It is important to mention that the waste management in the different municipalities, goes from the door-to-door model, to the waste containers model, corresponding on many occasions with the urban planning of each city (e.g. streets, avenues or construction density). Mention also the difference between a large and small city.

2. Circular Economy

The circular economy package, adopted by the European Commission in 2018, is intended to support the transition to a circular economy in the European Union. This package includes legislative proposals on waste, with long-term objectives for reducing waste disposal and increasing recycling and reuse.

Circular economy (CE) is known as a “closed loop” economy, in which the industrial and social

evolutionary concepts aim to achieve holistic sustainability goals in relation to a no waste philosophy. It aims for a regenerative system in which waste and input energy are minimized. This can be achieved through the (re)design of maintenance, repair, reuse, remanufacturing, refurbishing, and recycling. CE has attracted increasing research interest, with an almost exponential growth in publications.

The managerial conceptualization of CE is considered in the works of McDonough and Braungart, Stahel, and Lovins, according to De los Rios. Under the principles of CE, products and materials approaching their end-of-life stage can be regenerated or restored or replaced.

The diagram proposed by Velenturf (Fig. 2) broadens the scope of the circular economy and reshapes the conceptual space within which solutions can be developed for the optimal management of integrated resources from a whole-system perspective. The diagram for a circular economy is proposed based on integrated materials (consisting of mixed organic and inorganic materials) flowing through the biophysical environment and the production-consumption system, thereby revisiting the relationship with the environment and the theoretical boundaries of a circular economy.

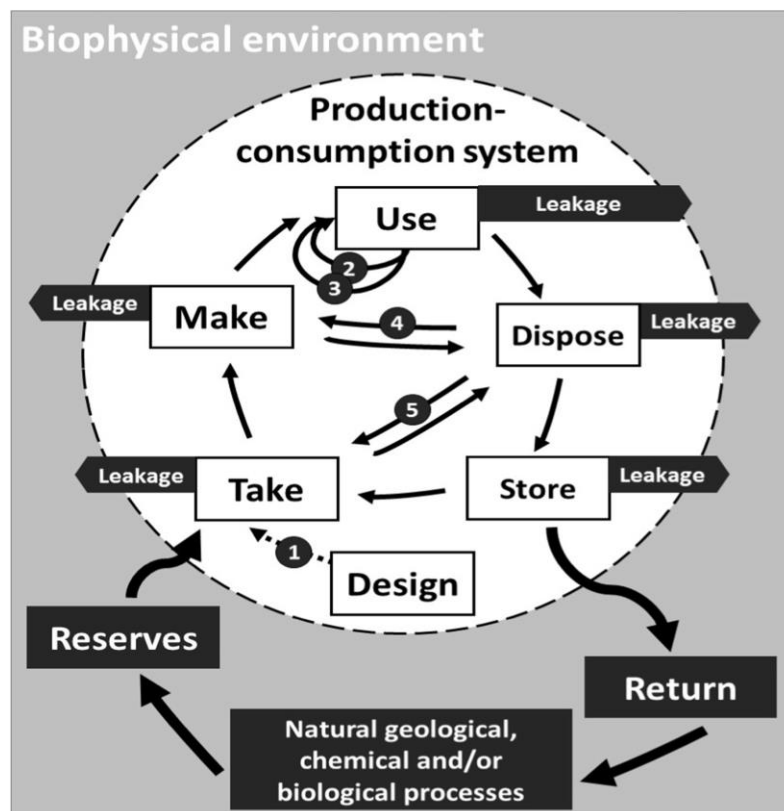


Figure 2. Integrated resource flow diagram for the circular economy¹

(Source: Velenturf A.P.M. et al.)

Circular economy has established itself as an academic subject and generated an optimistic wave of action in government, industry and across society. Concerns are raised, however, that the outcomes of these actions may not bring the aspired economic, social and environmental net-gains. To maintain the positive momentum, in the immediate future it is important to critically engage with the ability of

¹ Legend: Thick arrows are natural materials, thin arrows are industrial materials, dotted arrow is immaterial; [1] prevention by designing out all avoidable wastes, [2] shared consumption, [3] reuse and repair, [4] remanufacturing, [5] recycling.

circular economy approaches to contribute to sustainable development from a position of practical idealism where theory and implementation meet.

We could make a description of the evolution of waste, from the earliest times to the present, but we need to take attention on how the authorities had adapting their waste management system to respond to these changes.

3. Case Study

The objective of the project “**Integrated Waste Management System in Galati County**” is to construct and operate an integrated solid waste management project in Galati County, compliant with Romanian and European legislation, including the Circular Economy Package (CEP) adopted in June 2018. This project will also reduce the pollution of the environment in the county by establishing a functional and environmentally sound solid waste management system for all the municipalities. In this context, the present project includes separate collection, transfer, treatment and disposal of municipal waste.

The project includes five components:

- Component 1 – Separate collection, transport and transfer:
 - Collection equipment for mixed household waste;
 - Collection equipment and vehicles for separate collection of recyclable household waste;
 - Three transfer stations including transfer vehicles in Galati, Tecuci and Targu Bujor;
 - Two collection and temporary storage centres in Tecuci and Targu Bujor, on the same site as the transfer stations.
- Component 2 – Waste treatment:
 - Sorting plant in Valea Marului;
 - Composting plant in Tecuci;
 - Mechanical-biological treatment (MBT) plant with anaerobic digestion in Galati; a part of the anaerobic digestion installation will treat separately collected bio-waste.
- Component 3 – Disposal:
 - Landfill for non-hazardous waste in Valea Marului;
 - Closure of Tecuci dumpsite.
- Component 4 – Access roads:
 - Access roads to the waste facilities in Galati, Valea Marului, Tecuci and Targu Bujor;
- Component 5 – Service contracts.

The specific objectives and targets of the project are based on the national waste legislation, the National Waste Management Plan (NWMP) adopted in December 2017, the European legislation including the CEP:

- 100% population covered with collection service in 2021 (starting year for new delegation contract for collection and transport);
- Increase preparation for reuse and recycling of municipal waste:
 - 50% of total recyclable waste in 2021;

- 50% of total municipal waste in 2025;
 - 55% of total municipal waste in 2030;
 - 60% of total municipal waste in 2035.
- Reduction of biodegradable municipal waste going to landfill (in 2023, 35% of total amount of biodegradable waste produced in 1995).
 - Only treated municipal waste disposed of in landfills (treatment of municipal waste before landfilling in 2023).
 - Reduction of the amount of municipal waste disposed of in landfills (10% of total amount of municipal waste generated in 2040).
 - Separate collection of bulky waste and hazardous household waste in 2021.

In 2017, the population of Galati County generated 149,600 t of municipal waste, including 17,845 t that were not collected. The existing infrastructure is shown in Figure 3.

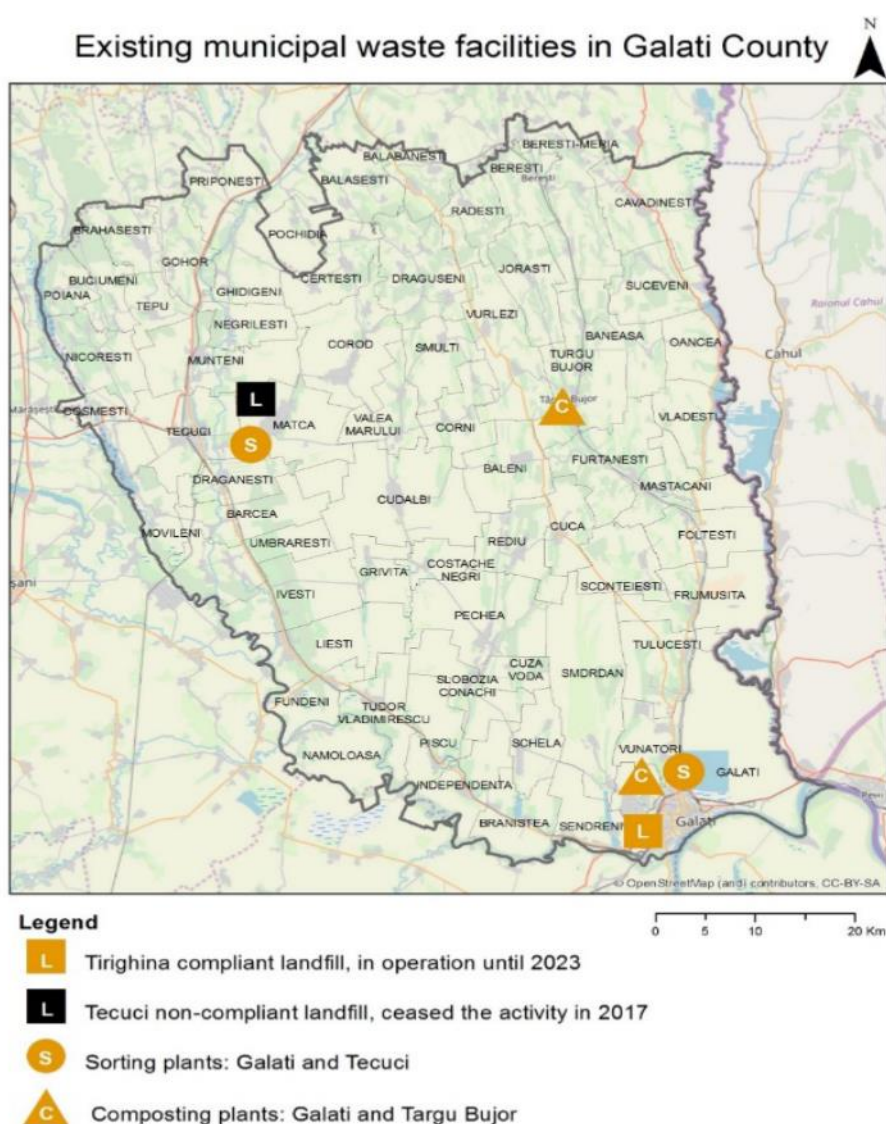


Figure 3. Existing Infrastructure

3.1. Option Analysis

The option analysis for the project comprises three components:

- Option analysis for integrated waste management activities (technical options): Collection and transport, Transfer, Sorting, Treatment of separately collected bio-waste, Treatment of mixed waste, Landfilling
- Option analysis for integrated waste management system (IWMS)
- Option analysis for the sites of the main investments.

Technical Options

Collection and Transport

The Feasibility Study analyses technical options for:

- Collection of mixed household waste: door-to-door in plastic bags; door-to-door in bins; bring system;
- Separate collection of recyclable waste: door-to-door for three fractions (paper and cardboard, plastic and metal, glass); collection points for three fractions (paper and cardboard, plastic and metal, glass); door-to-door for one fraction (paper, cardboard, plastic, metal) and collection points for glass; door-to-door for two fractions (paper and cardboard, plastic and metal) and collection points for glass;
- Separate collection of bio-waste: door-to-door; bring system;
- Separate collection of bulky waste: door-to-door; public amenity centres;
- Separate collection of hazardous household waste: specialised vehicles; public amenity centres.

Transfer

Options were with and without compaction, depending on the amount of waste to be transferred. The distances from the transfer stations to the waste management facilities (MBT or landfill) are between 62 and 85 km. The options selected are “with compaction” for the Galati and Tecuci stations and “without compaction” for the Targu Bujor transfer station. The Tecuci and Targu Bujor stations will transfer separately collected municipal waste (recyclables, bio-waste, and mixed waste) and the Galati station will transfer separately collected recyclable waste and residual waste from the MBT facility.

Sorting

Options included manual, automatic, and semi-automatic sorting. Manual sorting was selected based on technical, social, and environmental criteria, and based on the amount of separately collected recyclable waste to be sorted. The new sorting station will serve mainly the rural areas, as the two cities in the county (Galati and Tecuci) already have a sorting plant. The existing sorting stations do not have capacities to serve the entire county. Additionally, the existing operators are public operators who, according to the law (Law no. 51/2006), can serve only their respective public authorities.

Treatment of Separately Collected Bio-Waste

Options included composting (open windrow composting, windrow composting with membrane cover, and in-vessel composting) and anaerobic digestion (dry, semi-dry, and wet process). Considering the types of bio-waste to be separately collected, the options selected are composting for green waste and semi-dry anaerobic digestion for the other bio-waste. The main advantage of the semi-dry anaerobic digestion is that it ensures flexibility regarding the type of waste treated, including the bio-waste from mixed waste. The NWMP also recommends anaerobic digestion for recycling separately collected bio-waste in Galati County.

Treatment of Mixed Waste

Options are mechanical-biological treatment (MBT) and incineration. For MBT, three suboptions were analysed: aerobic biological treatment, anaerobic digestion, and bio-drying. The option selected is MBT with anaerobic digestion. As mentioned before, one advantage of the anaerobic digestion for bio-waste treatment is its flexibility regarding the type of waste treated.

Other important advantage is the saving in investment and operational cost because the plant will treat both bio-waste from mixed waste and separately collected bio-waste.

Landfilling

A landfill must comply with the national and European legislation. The Feasibility Study only considers options for leachate treatment: reverse osmosis, sequencing batch reactor, and membrane bioreactor. Considering the variation in leachate composition and flow, the option selected is reverse osmosis, which is the most flexible one.

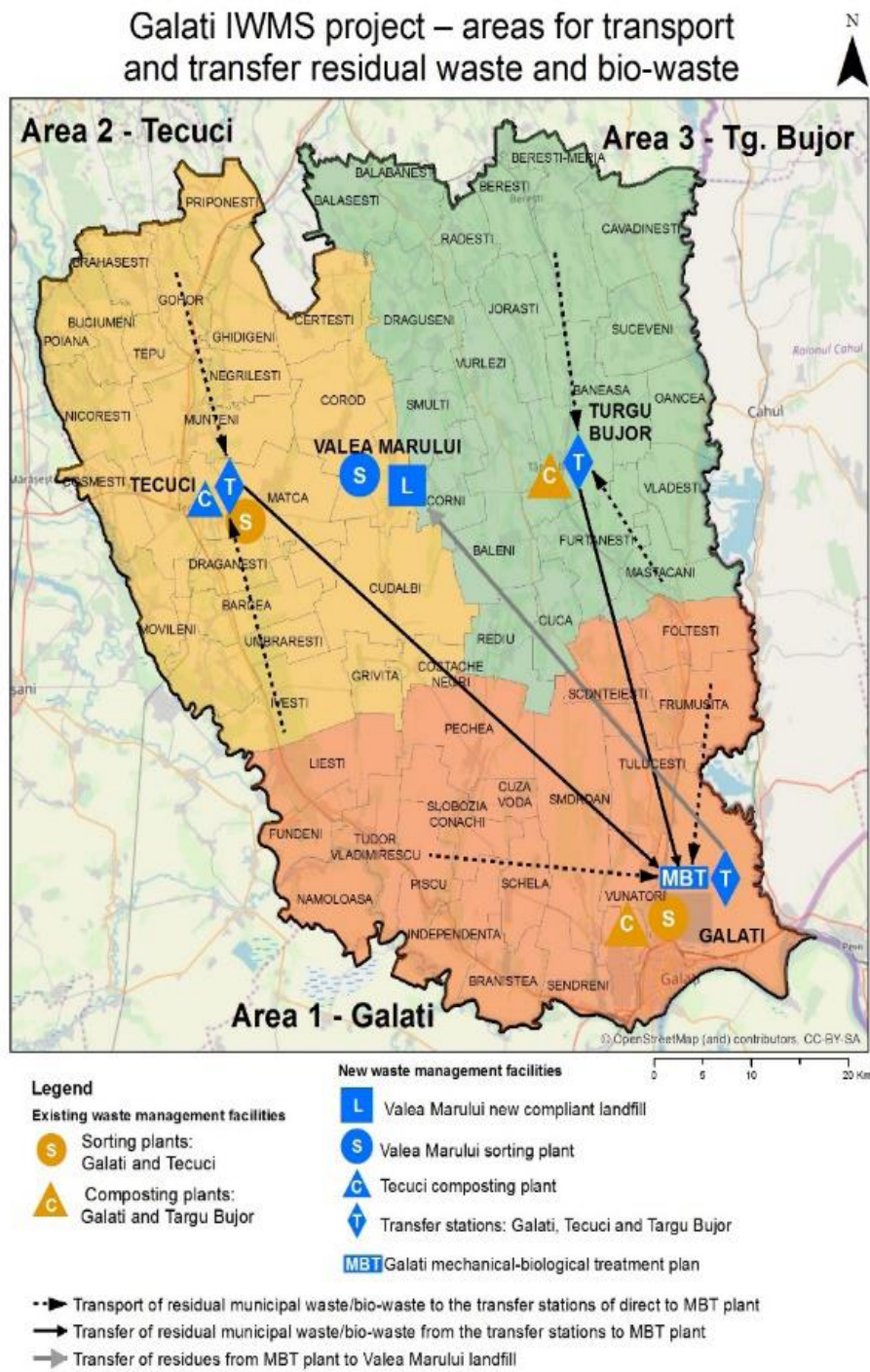


Figure 4. Waste Flows for the IWMS

Conclusion

The entire world is now concerned about the damage caused by man-made waste to the climate. The government is obliged by law to introduce a sustainable waste management system that ensures state-of-the-art technologies, innovation, and sufficient budgets to be allocated to authorities.

In addition, a good waste management integral system must have the following elements: Professionals and technics, founding (economical resources), and political will.

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