Evaluation of the Integrated Waste Management Plan in the Administrative Unit of Larissa. Investigation of the impact on soil quality in the studied area.

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I. Evaluation of Actions and Objectives of the Municipal Waste Management Plan for the Municipality of Larissa

The Local Waste Management Plan of the Municipality of Larissa (LWMP 2015) prepared in 2015, a set series of quantitative and qualitative targets that the Municipality was called upon to achieve. Although the actions and targets could be described as difficult to implement, the Municipality of Larissa managed to implement several of them and reach a satisfactory level of achievement of the targets, even though the current situation falls short of the targets.

The FODSA PE Larissa is the institutionalized body of TA, which has the 7 Kallikratis Municipalities of Larissa as its members. It is responsible for: 1.The preparation of waste prevention - reduction programmes, 2. the achievement of quantitative targets preparing for reuse and recycling, in accordance with the PESDA, 3. The construction and operation of solid waste treatment facilities, 4. promoting actions and implementing projects that contribute to the circular economy (Bhatnagar, N.,2022).

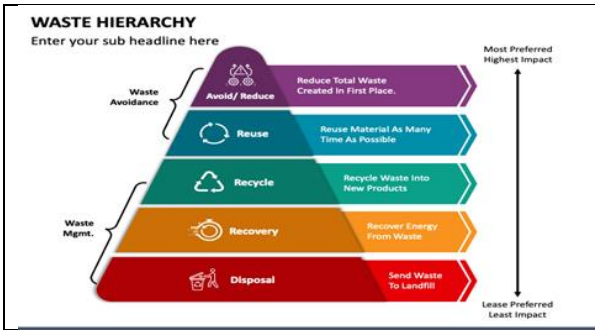

Figure 1: Waste Framework Directive,Europian Commission

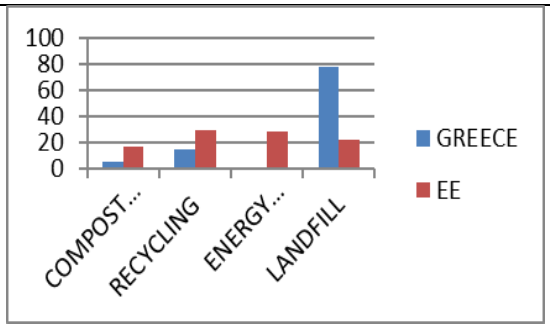

Figure 2: Quantities of MSW of the Municipality of Larissa that are taken to landfill, pesda.gr

From the inventory of the current situation:

- Most of the MSW (~85%) continues to be sent to landfills
- The rates of MSW, recovery and utilization of secondary products (~15%) and especially of bio-waste, remain low, mainly because the required MSW management infrastructure has not been built by the competent authorities.
- The total waste generation in 2020 showed an increasing trend (~2%) despite the relative stabilization between 2015-2020, which is due to an underestimation of the population of Larissa, which is estimated at around 200,000 inhabitants (Nanda & Berruti, 2021).
- The construction of facilities foreseen in the TAP (e.g. green spot, recycling corners) and the acquisition of new equipment is delayed due to underfunding.

The total recovery rate of biowaste and recyclables in the Municipality of Larissa is about 15% of the total amount of municipal waste generated, which is a significant deviation from the corresponding target of the TCDD (2015), as well as from the national targets. It is also noted that the low recovery rates of materials

such as primarily metals and secondarily other materials such as cardboard, do not fully correspond to the actual data, as a significant part of these materials is removed and resold by parallel systems not contracted with EOAN (informal recycling). (http://www.eedsa.gr/)

The Table below shows the quantities of MSW of the Municipality of Larissa, destined for landfill. As expected, mainly due to the lack of centralized management infrastructure, there is a significant deviation from the MSWDF target (2015). These quantities include the quantities of the Municipality's residual mixed waste destined for landfill and the residue of the MSW and bulky waste. However, there is a clear improvement after 2018.

Table 1: Quantities of MSW of the Municipality of Larissa sent for landfilling at the landfill - Target TSSD

	MSW production (tonnes)	**Final Disposal (tonnes)**	**%Final Disposal in total production**	**2015 MSW target (by 2020)**
2018	67.756	58.264	86,0%	22.813
2019	69.821	59.599	85,4%	20.073
2020	69.390	59.225	85,4%	17.444

The causes of the deviation of MSW management in the Municipality of Larissa from the set targets can be identified in the inability to implement the necessary central and local infrastructure and in the limited and sometimes incorrect participation of citizens in source separation activities, due to insufficient information about the direct and indirect benefits of recycling and reuse of waste (FodsaLarisas)

II. Impact of MSW management methods on soil quality

Soil quality involves many parameters that need to be taken into account in order to make a proper assessment of its levels (Golia et al.2021). Various indicators are used to assess soil quality. Soil quality indicators are physical, chemical and biological properties or processes and characteristics, which can be used to monitor changes in the soil (Aslanidis & Golia, 2022). The FODSA PE Larissa, based on the current relevant Decision of Approval of Environmental Conditions (AEPO), carries out quality control of solid waste, water, strangles both in the facilities of the landfill of PE Larissa and the SMA PE Larissa.

MSW leachate tests are mainly aimed at assessing the impact of the MSW on the load and pollution of the landfill site (impact assessment) and at assessing the compatibility of the MSW (compliance test) with the applicable legislation. All parameters determined during the study period are within the permitted limits

III. Conclusions

- The unsustainable management of waste endangers public health and contributes significantly to the pollution and destruction of the natural environment, in particular soil quality.
- Factors that make it difficult to achieve the sustainable management of MSW in the region of Larissa region are the absence of infrastructure, the scarce financial resources and the increased technological requirements for the implementation of alternative treatment methods.
- With regard to soil quality, the data from the 5-year study do not indicate any visual, physical, chemical or microbiological changes that could pose a risk to the environment, the soil, and the deeper layers.

IV. References

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