



Economic efficiency of sales of municipal solid waste based on the development of the regional market of certified secondary raw materials

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The development of civilization is accompanied by a continuous increase in the production of various types of waste, especially municipal solid waste (MSW). The problem of rational MSW management has become one of the most pressing global challenges [1].

The countries which joined the EU in the middle of the last century can serve as examples of establishing effective MSW management systems. Presently, the amount of recycled MSW in these countries is rather high: recycling constitutes – 30–40%; incineration – 30–50%; composting – 18–20%; the amount of MSW disposed of at a landfill has been reduced to 1–3%. All these factors made it possible to increase the MSW revenues in Germany 4.8 times over the last 25 years; in Sweden – 3.29 times; in Denmark – 2.76 times, and in the Netherlands – 3.06 times.

Based on the above data, a conclusion can be made about the expediency of implementing MSW management in Russia.

Thus, if we consider the creation of such a system for Saint Petersburg generating 1.82 million tons of MSW annually and recycling 40% of MSW, incinerating 35%, composting 23% and landfilling 2%, then an estimated revenue from the implementation of secondary raw materials can be determined:

$$C=M_1\times C_1+M_2\times C_2+M_3\times C_3-M_4\times C_4$$

where: M_1 – the mass of MSW realized by the allocation of secondary raw materials, M_2 – incineration, M_3 – composting, M_4 – landfill,

C_1 – specific revenue from the implementation of secondary raw materials, $C_1=1254$ ruble/tonne [2],

C_2 – MSW incineration, $C_2=850$ ruble/tonne [3],

C_3 – MSW composting, $C_3=400$ ruble/tonne [2],

C_4 – MSW disposal, $C_4=350$ ruble/tonne [2].

The amount of MSW in Saint Petersburg (million tons): secondary raw materials – 0,72, energy – 0,65, compost – 0,418, landfill – 0,032.

Then the revenue from the implementation of secondary raw materials per annual volume of MSW in Saint Petersburg will be:

$C = 902,288 + 535,5 + 165,6 - 12,6 = 1,590,788$ million rubles.

The specific revenue indicator for Saint Petersburg MSW per person is as follows:

$C_p = 1590,788 / 5,392992 = 294,9$ ruble/person.

In order to implement the considered option of a city-wide program, it is necessary to establish the following enterprises:

- processing of secondary raw materials – four plants with a capacity of 180 thousand tons each;
- MSW incineration – four plants with a capacity of 160 thousand tons each;
- MSW composting – two plants with a capacity of 207 thousand tons each;
- MSW disposal – two landfills with a capacity of 18 thousand tons each.

Conclusion

- The established systems of MSW management in European countries are highly economically efficient, processing 97–98% of the produced MSW.
- The creation of a similar MSW management system in Saint Petersburg will significantly improve the environmental conditions of the city and generate 1,590,788 million rubles in revenue annually.

References

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