THE IMPACT OF TRAFFIC INTENSIFICATION IN THE AREA OF VALEA LUI MIHAI SORTING PLANT UPON THE SPECIES AND HABITATS OF CONSERVATIVE INTEREST

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Abstract

The purpose of this study is assessing the impact of the project "Optimizing the Sorting and Composting Plant from Valea lui Mihai by the project SMID Bihor" on the habitats and species that have been the object of designating Natura 2000 sites ROSCI0020 Careiului Plain and with ROSPA0016 and Nir Plain- Ierului Valley. In the same time some measures are proposed to avoid, reduce and / or improve significantly the impact of biodiversity.

Key words: biodiversity, traffic, Natura 2000 site, impact

INTRODUCTION

Waste sorting-composting plant from Valea lui Mihai was built in 2008, due to a Phare CES project. The plant hasn't been put into operation till now.

The project includes an investment to serve 26,503 residents of town Valea lui Mihai and villages: Curtuişeni, Cherechiu, Sălacea, Şimian and Tarcea.

The land, where the investment was made, is located in the unincorporated area of town Valea lui Mihai in N-W direction towards the town at a distance of 2, 3 km from its inhabited area on the right side of the road 602 operating at a distance of 300 m from the place called "Water Mill".

Through this project it is needed to increase the amount of recyclable waste to be sorted, from 2100 t / year to 4,500 t / year by sorting recyclable waste collected from area 6 (town Valea lui Mihai and villages Săcueni, Curtuişeni, Cherechiu, Sălacea, Şimian and Tarcea).

Only the recyclable waste will be processed by sorting, in order to obtain recyclable fractions: paper, cardboard, PET, plastic, ferrous metals, nonferrous metals, glass, wood).

The need for the project is derived from increasingly pressing need to reduce the amount of finally disposed waste and to increase the amount of recovered waste.

MATERIAL AND METHODS

The land area covered by the plan overlaps with Natura 2000 site ROSCI 0020 Careiului Plain and with ROSPA0016 Nirului Plain – Ierului Valley.

The overlapping degree with Natura 2000 site, ROSCI 0020 Careiului Plain is 0.0052% and the degree of overlapping with site-ROSPA0016 Nirului Plain –Ierului Valley is 0.0032%.

The sorting-composting plant is located in the western part of the town Valea lui Mihai, in a portion that became atypical for the Pannonian dune habitat type due to significant human intervention.

During the time, in the area there were carried out reforestation with acacia to fix the dunes. This fact associated with the expansion of cultivated areas decreased the amount of land occupied by the Pannonian Dune habitat.

The objective is placed at the edge of a forest planted with acacia, under the administration of Bihor Forestry Directorate.

Access to the plant is on a municipal road, bordered to the north-west by a canal, with intermittent drainage, and in the south by areas of land intended to be communal pasture.

In the areas adjacent to the access road towards the plant there were not identified specimens of the species of conservation interest Corynephorus canescens, which characterizes the coenoses defining the Pannonian Dune habitat.

On the ditch from the right side of the road, some ruderal species can be found dominated by genres: *Urtica* sp., *Centaurea* sp., *Plantago* sp. On the pastures, only elements common to the vegetal associations can be found: *Achilleo-Festucetum pseudovinae* or association *Artemisio-Festucetum pseudovinae*. As a result of the anthropisation, composition some midsize thistles appear of vegetation, with the genera: *Eryngium* sp., *Xantium* sp., *Cirsium* sp.

The species of grasses that present a fodder-related interest belonging mainly to *Festuca* sp., *Carex* sp. and Trifolium genus (e.g. *Trifolium angulatum*).

The fauna observed during the survey is represented by the groups: reptiles: Podarcis *taurica*; birds: *Turdus merula*, *Sturnus vulgaris*, *Passer domestica*, *Streptopellia decaocto*, *Pica pica*, *Corvus cornix*, *Lanius minor*, *Coracias garrulus*; mammals: *Lepus europaeus*, *Capreolus capreolus*, *Canis vulpes*, *Erinaceus europeus*.

The pasture adjacent to the access road towards the plant presents a minor trophic interest for rapacious of the genus *Lanius* sp., but do not represent nesting space for the mentioned species.

All the afore-mentioned species nest in the trees, the forest bordering the objective could be a shelter to carry out this stage of their biological cycle.

The studied area is located in the vicinity of migration corridors 4 and 5, according to the map migration corridors (Berthold P., 2010) .The two corridors are traversed on their way to the pole by ducks, geese and other birds that do not use the dunes habitat as a characteristic habitat for nesting and feeding.

There were no habitats or species of conservation interest identified in this location.

During the operation of the sorting-composting plant at the proposed parameters, the concentration of combustion gases and particulates generated by transport will increase.

The pollutants specific to these sources are represented by particulate matter and sediments, combustion gases (NO_x,CO,SO_2, VOC).

The quantities of pollutants emitted into the atmosphere due to the movement of transport means depend on the performance indices of used motors: power, fuel consumption, capacity, age, level of equipment with devices to reduce pollution.

Thus, the lower the emission of pollutants, the more advanced the engine performance, the trend around the world being the manufacturing of engines with consumptions as low as possible per power unit and with a very restrictive control of emissions.

For emission estimates, we start from the premise that the average transport distance is 65729 km (the value resulting from the sum of all the distances traveled by the public transport in one year); the average fuel consumption is around 33l / 100 km.

The carried out dispersion studies show that outside the traffic areas, the concentrations of air pollutants are reduced substantially.

Thus, at 20 m outside the transport corridor, the concentrations are reduced with 50% and at more than 50 m the reduction is of 75%.

Along the transport corridor, the distribution of pollutants is considered uniform.

The means of transport are similar to mobile sources of pollution.

The machines moving on short distances can be considered as point sources of pollution.

RESULTS AND DISCUSSION

The average daily consumption of diesel for the point sources (tractor, forklift, loader) was estimated at 80 l / day.

The release of particulates into the atmosphere are variable, depending on the level of activity, the specific of operations and weather conditions.

The evaluation of pollutant mass flows resulted from the combustion of diesel within the engines of vehicles and equipment was performed according to the Order 192/2014, with an estimated average consumption of circa109 l diesel fuel/ day for 10 h / day.

The evaluation results are shown in table 1:

Table 1

Nature of pollutant	Daily emissions kg/day	Time emissions kg/h
NO_x	1.98	0.99
SO_2	0.007	0.03
Particulates	0.087	0.036
VOC	0.0003	0.00012
Cd	0.000000009	0.00000036

Methodology U.S. EPA MOBILE 6.2. APPENDIX C AP42 was used for the evaluation of emissions.

Calculation of particulate emissions for paved roads

$$E=k(s/12)^a(W/3)^b$$

Calculation of particulate emissions for unpaved roads

$$E=k*(s/12)^a(S/30)^d/(M/0,5)^c$$

Where:

- E- specific emission factor (lb/VMT)
- s- sludge content on the road surface (%)
- W- total weight of the vehicle (t)
- M- the relative humidity of the road surface (%)
- S- average speed (miles/h)(x1.61km/h)
- 1lb/VMT=281.9 g*VKT
- VKT-distanţa totală parcursă de vehicul pe drum

Table 2 contains the values of constants in the case of $PM_{2,5}$, $PM_{10,}$ TPM

Table 2

Constant	Unpaved roads			Paved roads		
	PM2.5	PM10	TPM	PM2.5	PM10	TPM
K(lb/VMT)	0.15	1.5	4.9	0.18	1.8	6.0
a	0.9	0.9	0.7	1	1	1
b	0.45	0.45	0.45	-	-	-
c	-	-	-	0.2	0.2	0.3
d	-	-	-	0.5	0.5	0.3

The number of trails to and from the sorting plant is shown in Table 3.

Table 3

Origin/ Destination	Incoming quantity	Capacity of vehicle	No. of routes	Paved road		Unpaved road		Outgoing quantity	Capacity of vehicle	No. of routes	Paved road		Unpaved road	
	(t)	(t)	(an)	Km /route	Km total	Km	Km total	(t)	(t)	(an)	Km /route	Km total	Km	Km total
Valea lui Mihai+neighboring localities	2000	6	333	15	4995	5	1665							
Săcuieni+ neighboring localities	2500	19	132	52	6864	5	660							
Capitalization								2400	24	100			5	500
Oradea Landfill								2100	9	233	160	37280	5	1165

The number of routes to and from the composting plant is shown in Table 4

Table 4

Origin/ Destination	Incoming quantity	Capacity of vehicle	No. of routes	Paved road		Unpaved road		Outgoing quantity	Capacity of vehicle	No. of routes	Paved road		Unpaved road	
	(t)	(t)	(year)	Km /route	Km total	Km	Km total	(t)	(t)	(an)	Km /route	Km total	Km	Km total
Valea lui Mihai+ neighboring localities	2200	5	440	15	6600	5	2200							
Valea lui Mihai								1000	5	200			5	1000
Oradea Landfill								200	5	40	160	6400	5	200

Number of km driven on paved roads is 58939 km

The number of km traveled on unpaved roads is 6790 km

Calculated average weight of vehicles with and without load is 21 t.

The average speed on paved roads is 60 km / h = 37,28mph

The average speed on unpaved roads is 10 km / h = 6.21 mph
Relative humidity of the paved road surface is considered 2%.
The content of sludge on the surface of the unpaved road is 13%.
The content of sludge on the surface of the paved road is 18%.
Calculation of particulate emissions PM on unpaved roads

$$E=k(s/12)^a(W/3)^b$$

$E_{PM2,5}$=108,92 g/km/year
E_{PM10}=1085,04 g/km/year
E_{TPM}=3250,93 g/km/year

Calculation of particulate (PM) emissions for driving on paved roads

$$E=k*(s/12)^a(S/30)^d/(M/0,5)^c$$

$E_{PM2,5}$=3,22 g/km/year
E_{PM10}=32,25 g/km/year
E_{TPM}=126 g/km/year

Total daily emission of TPM in terms of vehicles movement on paved roads (58939 km) is: E = 58.7 kg / day = 0.004 mg / m / s.

Total daily emission of TPM in terms of vehicles movement on unpaved roads (6790 km) is: E = 3.89 kg / day = 0.00075 mg / m / s.

According to US - EPA/AP - 42 assessments, the particles with diameter d> 100 μm are deposited in reduced time, the deposition area not exceeding 10 m from the road side or working front.

Particles with sizes between 30 μm and 100 μm are deposited to approx. 100 m from the side of the road.

The particles smaller than 30 μm, especially inhalable particles (IP -inhalable particulate) with sizes less than 15 μm and fine particles (FP) with a diameter less than 2.5 μm are deposited at distances greater than 100 m.

It is estimated that at distances greater than 100 m, the concentration of PM in the air will be 2-5 times lower than that registered at the limit of the access road and the particle sizes less than 30 μm (particulate matter).

Mass flows of gaseous pollutants emitted after the completion of all activities proposed under the project are shown in Table 5.

Table 5

Nature of pollutant	Daily emissions kg/day	Time emissions kg/h
NO_x	2.548	1.06
SO_2	0.084	0.035
Particulates	1.457	0.146
VOC	0.000392	0.00016
Cd	0.0000000112	0.00000047

The concentrations of gaseous pollutants generated in the ambient air as a result of the project will be ranging within the limits imposed by Order 104/2011.

The limit values are shown in table 6:

Table 6

Pollutant	CMA(μg/l)				
	Time limit value for human health protection	Daily limit value for human health protection	Annual limit value human health protection	Annual limit value for vegetation protection	Annual limit value for ecosystem protection
SO_2	350	125	-	-	20
NO_x	200	-	40	30	-
PM_{10}	50	-	20	-	-
Pb	-	-	0.5	-	-
CO	-	10000	-	-	-

The traffic on the site is due to:

- The traffic due to farms (45%);
- Traffic due to livestock farms (20%);
- The traffic due to the sorting-composting plant (25%);
- Other uses (10%).

Subject to the compliance with the imposed speed restrictions (average speed 10 km / h) air pollutant emissions comply with the CMA required by law, the impact on air as environmental factor is minimal.

CONCLUSIONS

As the plant site is in a strongly anthropised area, being no identified species belonging to the Pannonian Dune habitat type, but no other types of habitats present in the Standard form, the proposed activity generates no impact on them.

In the operating phase of the objective the following impacts on biodiversity may occur:

- proliferation of ruderal plant species specific to anthropogenic areas;
- proliferation of opportunistic species of animals: birds (crows), rodents, insects;
- change of the current structure of food chains with the emergence of new sources of food (especially for birds and rodents);
- ecosystem damage caused by the release of the greenhouse gases;
- significantly increase the amount of particulates modifies the photic regime with diminishing the intensity of the photosynthesis process.

The increase of traffic may also cause a negative direct impact on biodiversity because the increase of the noise level and vibration can be a disturbing factor for fauna.

To reduce the negative impact on biodiversity the adoption of the following measures are recommended:

- it will be required the limitation of the vehicles speed up to 10 km / h on road DE 602 , fact which will be highlighted on an indicator panel located at the entrance of the operation road ;
- maintenance and restoration of vegetation belts around the sorting and composting plant with local species adapted to the area;
- compliance with all the measures required by the Regulations of the two protected areas
- the working personnel will be informed on the overlapping of the sorting plant location with the protected areas and will be trained regarding the protected species and habitats of the site, respectively the necessary measures so as not to cause deliberate disturbance of the cycle of growth, reproduction, hibernation and migration of existing species;
- the technological process within the sorting plant will be managed so as not to encourage the proliferation of some opportunistic species.

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