Some Aspects Regarding the Waste Pollution of Rivers in Romania

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Abstract: The issue of the plastic waste, PET bottles, food packing dump that is carried by the flowing waters in Romania is older and still rigorous. Causes are represented by the irresponsible throwing, in the environment, of wastes by the local inhabitants, tourists, and sometimes, paradoxically, by some of the authorities. Considering that these wastes pollute the areas in the rivers' proximity, some reservoirs, the riverbed of the Danube and that most of the reach the Black Sea, things seem to be more stringent. A significant part of the plastic is turned into micro particles which are spread in the environment, ending swallowed by humans and animals, leading to serious effects on the health. Economic losses generated by dump accumulation in tourism or from the problems generated against hydroelectric plants are also significant. Moreover, in some cases, it might lead to cross-border problems, as waste reaches the territories of neighboring states through flowing waters, especially due to flash floods and floods. Solving these issues involves more aspects, from the awareness of the causes of some citizens' irresponsible behavior to finding solutions and involving all the responsible factors.

Keywords: PET pollution; plastic waste; rivers pollution

Introduction

Floods are very frequent on the Romanian territory, generated abundant precipitations or by the sudden melting of snow, alongside a disgraceful, unattractive aspect, which joins the flooding process: huge volumes of dump, waste, are transported by the water of the rivers that overpass their riverbeds. The phenomenon is not an exception, as it covers all the regions in Romania. We will try to outline

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several considerations, a short radiography of it. Sometimes, this phenomenon generates even problems, cross-border issues, as it has frequently happened between Romania and Hungary, but also between Hungary and Ukraine, showing that it is not a national phenomenon.

Describing the Problem

In Romania, many rivers, excepting the water and sediments, are transportation methods of different types of waste. In many places, subsequently to the returning of the river to its normal riverbed (flowing in its minor riverbed) these wastes remain as a proof in the major riverbed or beyond it. One can also notice, right on the bottom of the riverbed, many examples of different types of waste.

Wondering what is the origin of this high volume of waste and which is the major component of the transported waste, it is sufficient to take a journey, to take a walk on the shores of many rivers, irrespective of the area, to see that they are deposited close to the rivers, generally in the major riverbed, as significant mountains with a predominant human origin (from the households), but sometimes, much more rarely, also industrial origin, especially plastic bottles (abbreviated PET = polyethylene terephthalate). From this perspective, we can assume that we mare meeting the European trend, namely that, according to a report issued in 2019 by Green Report (https://www.green-report.ro), PET bottles are plastic wastes which are mostly met in the European flowing waters. The second and third places belong to food packaging and cigarettes stubs.

A more revealing and comprehensive image is the one issued by Earth watch Institute, where one can notice a more complex ranking of these wastes (Tab. 1).

This is a bad aspect, not only from the esthetic perspective, but also due to the fact that approximately 80% of this waste reaches, in the end, the seas and the oceans (htpps://www.green-report.ro), thus representing a wake-up call. This is the explanation for the fact that we can find large plastic islands in the oceans, which are even on the map. The largest deposit is *The Great Pacific Garbage Patch*, between Hawaii and California (Fig. 1), which weighs more than 80.000 tones, on a surface of approximately 1.6 million square kilometers (https://theoceancleanup.com).

The issue is that the same phenomenon is also met, on a smaller scale, in the Atalntic Ocean, the Mediterranean Sea and the Black Sea.

Moreover, some touristic areas, which are full of plastics, waste, either the mountain area or the Danube Delta or the sea shores are totally unattractive for tourists.

Figure 1. Top Five Largest Waste Islands Concentrations in the Planetary Ocean (#1 = The Great Pacific Garbage Patch)
Source: https://theoceancleanup.com

Table 1. The Top Ten Most Prevalent Macroplastics in European Freshwater Environments

RANK	PLASTIC CATEGORY	PERCENTAGE OF ALL IDENTIFIABLE PLASTIC LITTER ITEMS FOUND IN THE FRESHWATER ENVIRONMENT*	TOP ACTION CONSUMERS CAN TAKE
1	Plastic bottles	14%	Use a reusable water bottle (of any type)
2	Food wrappers	12%	Correct disposal of food wrappers
3	Cigarette butts	9%	Correct disposal of cigarette butts
4	Food takeaway containers	6%	Use a reusable takeaway container of any type, preferably one you already own
5	Cotton bud sticks	5%	Use cotton buds with paper sticks
6	Cups	4%	Use a reusable plastic cup (for all takeaway drinks eg coffee, juices, smoothies)
7	Sanitary items	3%	Do not flush wet wipes, tampons or sanitary pads
8	Smoking-related packaging	2%	Correct disposal of smoking-related packaging
9	Plastic straws, stirrers and cutlery	1%	Use reusable cutlery when getting takeaway food or for stirring drinks
10	Plastic bags	1%	Use a reusable bag (of any type)

Source: https://earthwatch.org

Below, we provide several relevant images from touristic locations in Romania (Fig. 2), contaminated with such waste.

In turn, the Danube, the most international river in the world (Dorobăț, 2012; http://www.danubeparks.org), as a tributary river of the Black Sea, transports, on a daily basis, in the Black Sea, 4,2 tons of plastic, namely approximately 1533 tons per year; "Mai Mult Verde" Association, through its representative, claims, within an interview, that the volume would be much higher, as there are unpredicted phenomena, such as flash floods, which bring along, in rivers, in the Danube and finally in the sea, additional waste volumes (https://romanialibera.ro).

Dump causes problems not only for the touristic sector, but it also affects hydroelectric power plants, whose employees must gather the waste from the reservoirs, as such significant volumes might endanger the proper functioning; to this extent, we can provide examples from 2018, on the Izvorul Muntelui Lake, after the flash flood from June 30th – July 1st, when the waters of Bistrița River have spilled, in the lake, especially plastic and vegetal waste, which have gathered in the area of the Izvorul Muntelui Dam; Hidroelectrica Company estimated that they have collected approximately 200 tons of wood material, 45 tons of plastics and 10 tons of other types of waste (https://www.hidroelectrica.ro).

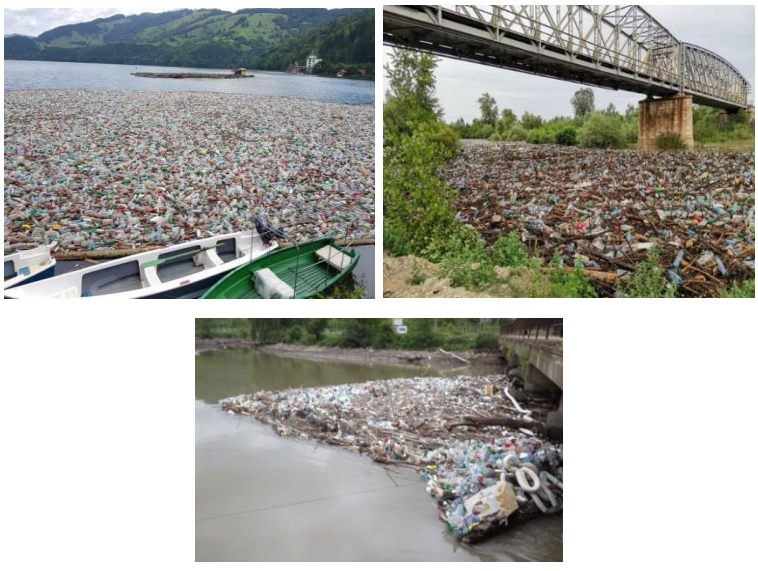

Figure 2. a. Izvorul Muntelui Lake ; b. Riverbed of Olteț River; c. Waste gathered on the shore of the Danube, Orșova

Source: a. https://adevarul.ro.; b. https://www.green-report.ro.; c. https://www.radiooltenia.ro.

We continue with images with garbage dumps from other less touristy areas (Fig. 3).

Probably the most dangerous effect of randomly throwing plastics is their discomposure. Many plastic materials, for example, do not deteriorate; they practically break themselves in smaller and smaller pieces (https://www.nationalgeographic.org). Particles less than 5 mm are named microplastics (https://www.mcsuk.org), but they can get even smaller, up to microns, making them impossible to be stopped by the (human or animal) organism.

This issue should make citizens the most aware; plastic spreading in the environment.

Figure 3. Garbage Dumps on the Doamnei River Banks
a, b. predominant PET and plastics; c. layer of older garbage, deposited at a flood, covered with grassy soil; d. PET, plastic and pieces of broken asbestos-cement boards
Source: L. Dorobăț

Approximately 80% of the microplastics in the seas and oceans originate in the river flows (https://www.salmon-trout.org; https://www.mcsuk.org), but, until they reach the ocean, plastic particles are persistent in the water or the rivers and are directly or indirectly consumed by humans, through fish or other products' consumption.

In order to make a clearer image on how much microplastic we swallow without realizing, we attach Fig. 4, which displays this aspect in a comparative manner, showing that we swallow, on a weekly basis, the plastic equivalent of a credit card.

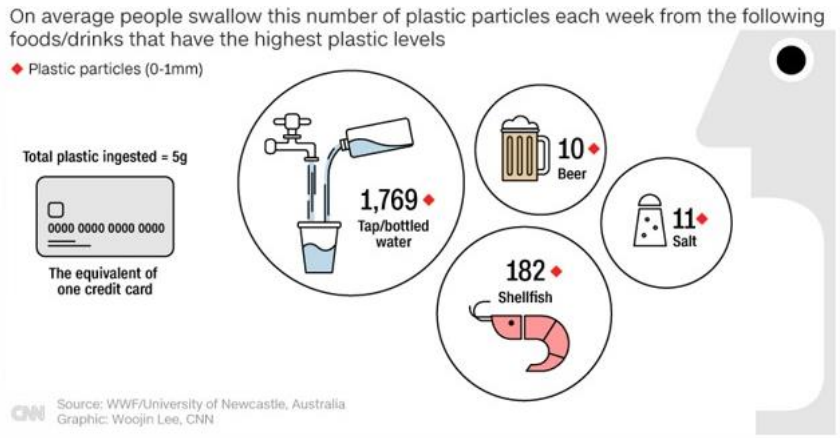

Figure 4. Global Average Weekly Consumption
Source: https://www.green-report.ro

An in depth study issued in the prestigious Environmental Science and Technology shows that "for the USA population, the annual microplastic consumption varies between 39000 and 52000 particles, depending on the gender and age. These estimations grow up to 74000 and 121000 when inhaling is considered; moreover, individuals that satisfy their recommended water needing only through bottled resources can swallow 90000 additional microplastics per year, compared to the 4000 of the ones that drink water from the kitchen sink" (Cox et al., 2019). We strongly tend to believe that the situation in Romania is not different. We have mentioned some of the above consequences of irresponsible random throwing of waste in the environment.

We have provided several effects of plastics thrown in the nature in order to realize the seriousness of this fact's consequences.

Causes of this Behavior of a Part of the Population and Suggestions Regarding the Change of Such Behavior

First of all, irrespective of how disturbing it might be, we must notice that, generally, the lack of education, and especially of the environmental education, represents a main cause. Practically, depositing waste in the proximity of waters (Dorobăț &

Udroiu, 2015) reflects a deeply rooted mentality in the case of certain individuals, according to which you must not care about of more than you own, as the rest does not even count; depositing the waste upstream, hoping that the water would come and carry it away, cleaning the area, simply reflects an egoistic mentality, of carelessness against the downstream neighbors, which would have to firstly support the consequences of the upstream living individuals' behavior.

Changing mentality is a high inertia behavior, but it can speed up, through education, the awareness of the effects of randomly throwing waste, but also by implementing some significantly discouraging fines, not only in theory how it now happens.

Though long-lasting, educating the youth and also the adults regarding the environmental responsibility is the real solution that might lead to behavioral and mentality changes. It has already been implemented in schools, as part of some NGO's programs, the mass media also frequently approaching these issues. Considering that, in Romania, the Romanian Orthodox Church still has a significant influence on some citizens, we believe that it might also get involved in the shaping of some individuals' behavior and awareness regarding the fact that the nature, the environment must be protected and that people are responsible for it. Definitely, according to religious beliefs, man must take care of what divinity gave him and it is a shame to mock it, depriving future generations of natural resources.

Second, another issue that might lead to depositing waste in the environment is the lack of a waste collection system or its defective functioning. Here, the responsibility of local authorities reaches highest levels, namely the implementation of a coherent sorting and collection system of waste, with bearable costs for the citizens. If certain citizens' categories lack sufficient funds, we consider that a system of grants might be developed. Environmental costs (though generally supported by others and not by that local community where the randomly thrown dump comes from) are higher than the cost of the subsidy. County or even national authorities might also get involved, if a poor community is not able to sustainably manage its dump, with no impact on the environment.

Third, we believe that the penalties system of those who throw waste in the nature is not functional at all, being very inefficient. Moreover, sometimes, even local authorities are involved in illegal waste depositing, as even mayors give orders regarding the throwing of wastes in water, covering them lately with soil, as it happened in Comana, Giurgiu County, in the proximity of the Comana Natural Park, which was presented in the media many times (https://stirileprotv.ro).

Another case, in Dărmănești Bacău County, where dump was pushed using excavators in the waters of Uz River. (https://zdbc.ro).

There should also exist a higher degree of collaboration between the authorities regarding the inning of the areas, the identification of polluters so that they would be sanctioned. Sometimes, authorities' work is foiled by others' inactivity. For example, in Mehedinți County, an example of collaboration lack between the city hall and Romanian Waters is represented by Cujmir River, where the local inhabitants, claiming (for good reason or not?) that they do not have where to deposit the waste, have thrown it in a nearby river, without being sanctioned by the Environmental Guard or by the Municipality, as local authorities assumed that it is hard to catch the responsible individuals in flagrante delicto. On the other side, there are three national organisms in charge of the environment, with county subsidiaries: the Ministry of the Environment, Waters, Forests, the ANPM (National Agency for Environmental Protection) and the GNM (National Environmental Guard). We wonder, in such cases, which is their activity and especially, how could the ones responsible for the environmental protection be sanctioned. Maybe an Environmental Police should be created, at national level, with superior duties which should only be responsible of the environmental felonies.

Another aspect does not approach the sanctioning, but the stimulation of the behavior of not irresponsibly throwing, but recycling. We mean that a very efficient national system should be created, functional friendly, stimulating, versatile, for the packings' valuation, of plastic waste, PET bottles, metal, glass. Large and small shops, municipalities, other local authorities, producers (especially food producers) packed in PET , other plastic materials, glass, paper or metal should be included in the implementation of the system.

We consider that, by keeping a significant warranty from the buyer when buying a product packed in PET/metal/glass/paper, he would be stimulated to return that packing and receive his money back. In order for the system to function, it should have an universal feature, namely that the returning of the money should be made in any store, irrespective of the place of the buying and not just in the store where the product was bought from, as long as the receipt is presented. The refund shouldn't consist of strictly money, but also as a voucher the buyer could use in the respective store.

We consider that the tax should cost 0.25 euro/packing, quite significant so that it would discourage the random depositing of the packing in nature and encourage its return.

Moreover, we believe that the packing should be accepted as irrespective of their shape after consumption; conditioning their acceptance as washed, cleaned or missing etiquettes would totally reduce the stimulus.

Of course, there might be some opposition of the industry, in some cases of reusable packing, such as glasses. It is more comfortable, as producer, to use PET containers in favor of the glass ones or single use recipients, compared to the glasses, which would require the acquisition of some washing, hygiene installations etc.

Nowadays (summer of 2020), there are some legislative initiatives of some parliamentary political parties which desire the optimization of the recycling and packing taxation system. A simple law does not solve the situation and a complex national system should be implemented, with mandatory producers', sellers', distributors' national and local authorities' collaboration as a mandatory condition of success.

We have the model of some European countries that have more experience that we could apply.

The situation is urgent, as it is unacceptable that, at the beginning of the XXIth century, between European states, cross-border problems regarding the rivers' pollution with dump to exist. It is as mandatory as possible that the long term environmental health and, as a last resort, of the citizens to be very important.

Conclusions

We notice that there is a high pollution degree of the flowing waters, but also of some lakes, as well as of the Black Sea with PET bottles, other types of plastic, metal recipients, other food packing.

It is generated by an unfriendly, irresponsive behavior of citizens against the environment.

The causes of this behavior are multiple (education, lack of local authorities' involvement, of the authorities responsible for the sanctioning of the guilty individuals, deficient stimulation system of collecting/recycling the packages,

defections regarding the inter institutional collaboration against the environment etc.).

The reparation of this behavior is urgent, as there are some cross-border problems.

There are longer-term or immediate solutions regarding the correction of the problems regarding the river pollution with dump. Some of them are coercive, punitive: the significant increase of the penalties' amounts, both for the guilty citizens and also of the irresponsible authorities; the creation of an Environmental Police; the clear identification and duties' and responsibilities' allocation between various state institutions or between them and the local authorities in terms of the river polluting issue, so that they would not be able to foist the responsibility from one to another.

The implementation of a stimulating, flexible system for the collection of dump, especially of the plastic packing, PET bottles, metal, cardboard etc, which would determine the citizen to get involved in the recycling process and give up on the irresponsible behavior.

The permanent monitoring of the environmental quality and the collaboration between the local, national and European authorities, especially with the representatives of the neighboring countries, in order to avoid environmental problems, or, if they exist, in order to solve them; the implementation of the environmental policies within the EU and Romania, according to which, starting from 2021, the use of some single-use plastic products will be forbidden on the territory of the European Union.

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