

Mikroplastika u životnoj sredini: izazovi, rešenja i održivi pristup

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01

Izazovi

Izazovi

Definicija

Podaci monitoringa

Uticaj na životnu sredinu

Uticaj na zdravlje ljudi

Nedostatak standardnih metoda

Nedostatak regulative

- Thompson R. et al. Lost at Sea: Where Is All the Plastic? Science 2004, 304, 838.
 $< 5 \text{ mm}$
- ISO/TR 21960:2020
 - 1-1000 μm - mikroplastika
 - 1 mm-5 mm – velika mikroplastika
- Frias J. and Nash R. Mar Pollut Bull. 2018;
128:145-7
 - 1 $\mu\text{m}-5 \text{ mm}$

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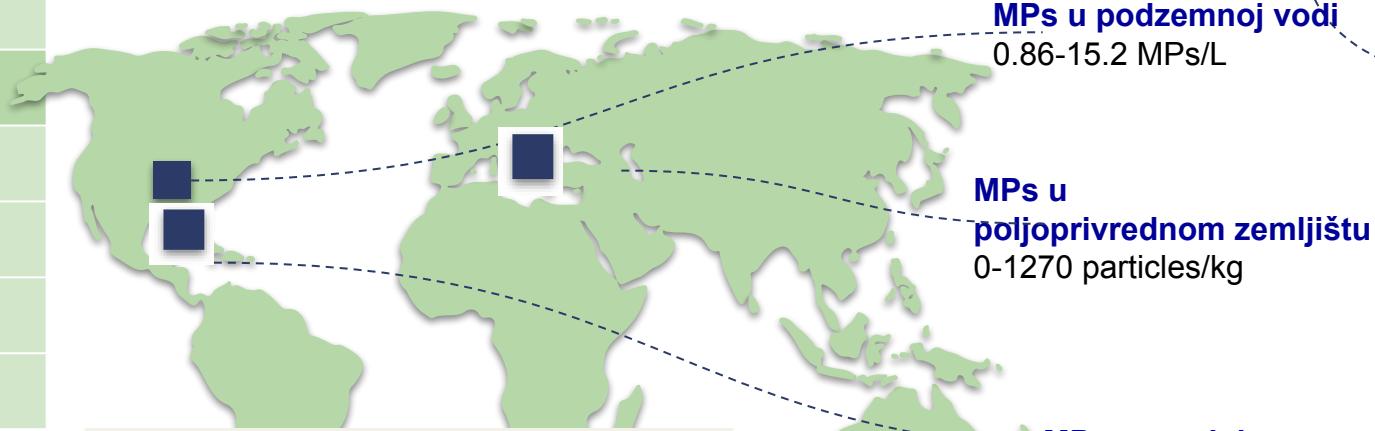
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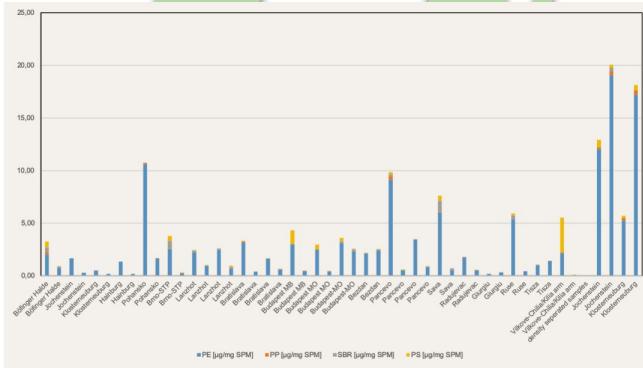


MPs u podzemnoj vodi
0.86-15.2 MPs/L

MPs u poljoprivrednom zemljištu
0-1270 particles/kg

MPs u vazduhu
275 MPs/m²/dan

Xu et al. Science of the Total Environment 904 (2023) 166641



MPs u Dunavu (JDS4)

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International Standards Organization:

Određivanje mikroplastike u vodi primenom infracrvene spektroskopije

Određivanje mikroplastike u vodi primenom termogravimetrije

Preporuke za uzorkovanje vode za analizu mikroplastike

ASTM (formerly American Society for Testing and Materials):

Određivanje mikroplastike u vodi primenom infracrvene spektroskopije

Preporuke za uzorkovanje vode za analizu mikroplastike

Southern California Coastal Water Research Project (SCCWRP):

Određivanje mikroplastike u vodi za piće primenom infracrvene spektroskopije

Određivanje mikroplastike u vodi za piće primenom Ramanove spektroskopije

*C(2024) 1459 COMMISSION DELEGATED DECISION supplementing Directive (EU)
2020/2184 of the European Parliament and of the Council by laying down a
methodology to measure microplastics in water intended for human consumption +
annex*

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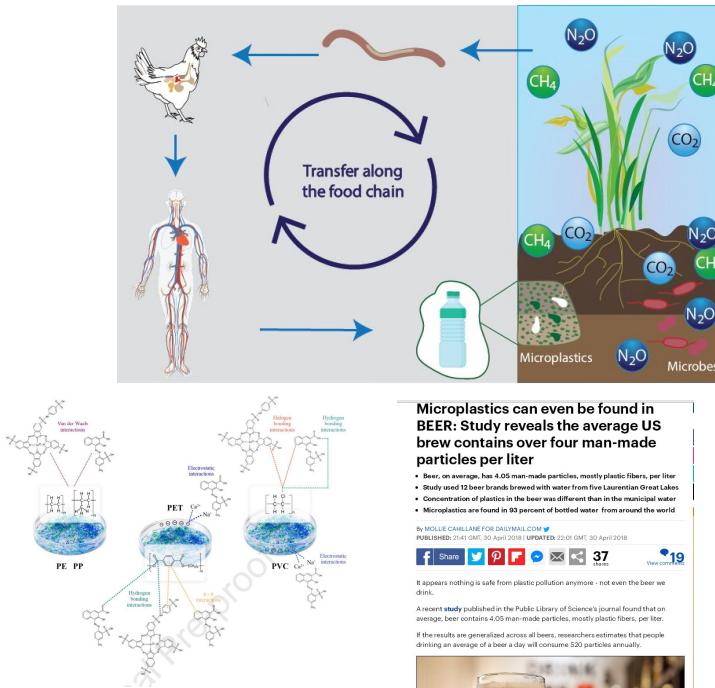
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Microplastics can even be found in BEER: Study reveals the average US brew contains over four man-made particles per liter

- Beer, on average, has 4.05 man-made particles, mostly plastic fibers, per liter.
- Study used 100 beer samples from five Laurentian Great Lakes.
- Concentration of plastics in the beer was different than in the municipal water.
- Microplastics are found in 93 percent of bottled water. From around the world.

By MOLLE CAHILL JANE FOR DAILYMAIL.COM PUBLISHED: 21/4/2018 3:20:08 PM | UPDATED: 22/04/2018 10:40:28 AM

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It appears nothing is safe from plastic pollution anymore - not even the beer we drink.

A recent study published in the Public Library of Science's journal found that on average, beer contains 4.05 man-made particles, mostly plastic fibers, per liter.

If the results are generalized across all beers, researchers estimates that people drinking an average of a beer a day will consume 520 particles annually.

Prenos kroz lanac ishrane:

Biljna hrana

Hrana životinjskog porekla

Morska hrana

Plastic fibres found in tap water around the world, study reveals

Exclusive: Tests show billions of people globally are drinking water contaminated by plastic particles, with 83% of samples found to be polluted

- We are living on a plastic planet. What does it mean for our health?



▲ The average number of fibres found in each 500ml sample ranged from 4.8 in the US to 13 in Europe. Photograph: Michael Hulme/Alamy

Microparticle contamination has been found in tap water in countries around the world, leading to calls from scientists for urgent research on the implications for health.

Sixteen of 50 water samples from more than a dozen nations were analysed

Još uvek je malo rezultata i nisu uporedivi

Procena uticaja na zdravlje ljudi je tek započela

Tubić et al. (2023) Dyes and Pigments, 209, Part A, 110884



02

Rešenja

Rešenja

Prevencija

Pravilno odlaganje i tretman otpada

Tretman otpadnih voda

Čišćenje zagađenih lokaliteta

Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment



Biobased

VS



Biodegradable

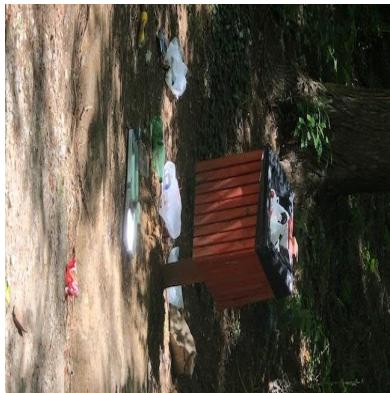
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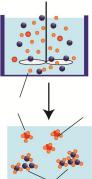
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Prevencija

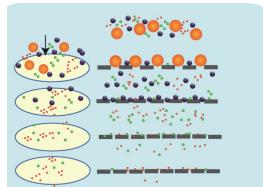
Pravilno odlaganje i tretman otpada

Tretman otpadnih voda

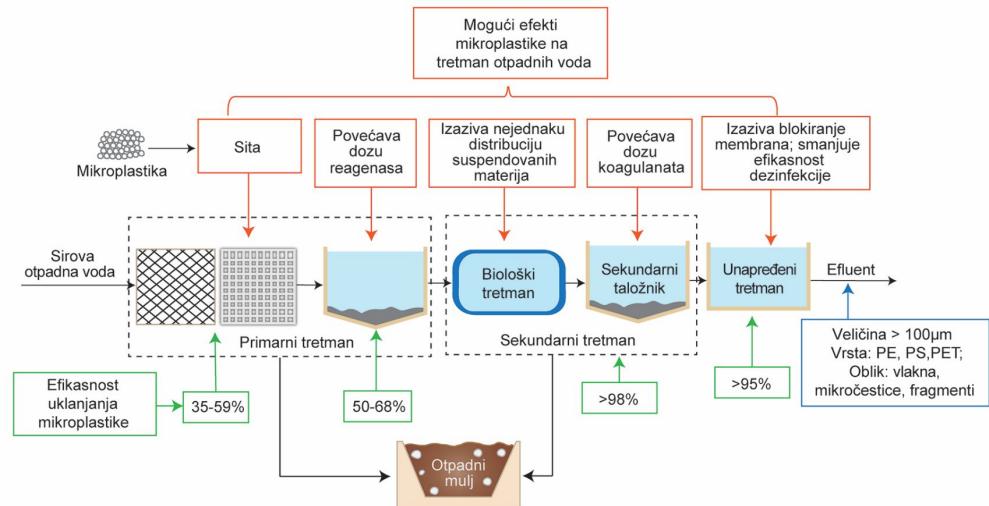
Čišćenje zagađenih lokaliteta



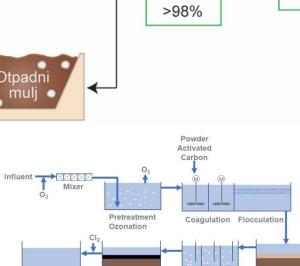
Koagulacija/flokulacija



Membranska filtracija



Sorpcioni procesi



Ozonizacija/AOPs/GAU

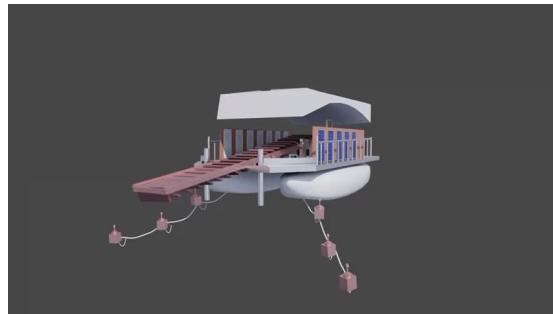
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THINK
OCEAN
CIC





03

Održivi pristup

Održivi pristup

<u>Učešće svih zainteresovanih strana</u>
<u>Zero waste koncept</u>
<u>Harmonizacija protokola i razvoj standardnih metoda i referentnih materijala</u>
<u>Razvoj instrumentalnih tehnika za analizu i obradu podataka</u>
<u>Edukacija</u>

- smanjenjem zagađenja plastikom
- ograničenjem upotrebe proizvoda u kojima se namerno dodaje mikroplastika
- smanjenjem nemernog oslobođanja mikroplastike

Pojedinci

Nauka i struka

Industrija

Organizacije
civilnog društva

Donosioc
i odluka

Održivi pristup

Učešće svih zainteresovanih strana

Zero waste koncept

Harmonizacija protokola i razvoj standardnih metoda i referentnih materijala

Razvoj instrumentalnih tehnika

Edukacija

Materijalna reciklaža sekundarnih sirovina

Korišćenje energetske vrednosti otpada

**Smanjenje
količine otpada**

Ponovna upotreba

Reciklaža

**Korišćenje otpada kao
resursa**

**Pravilno
odlaganje**

Održivi pristup

Učešće svih zainteresovanih strana

Zero waste koncept

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Razvoj instrumentalnih tehnika za analizu i obradu podataka

Edukacija



Koje su karakteristike metode analize?
Koje uzorke planiramo da analiziramo?

Eksperimentalni plan
Svrha primene

Zahtevi za kvalitet podataka:

Granica detekcije

Granica kvantifikacije

Tačnost i istinitost

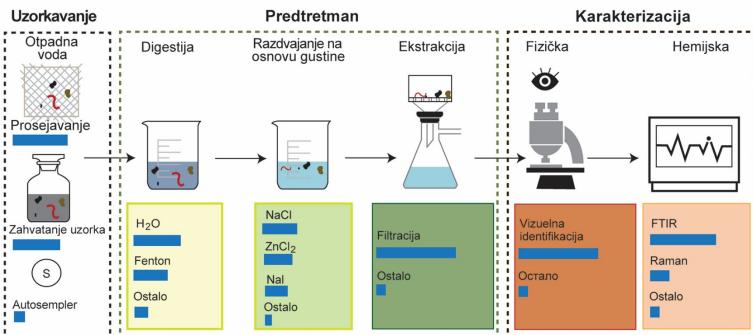
Preciznost

Radni opseg

Linearnost kalibracione krive

Merna nesigurnost

Robusnost



Održivi pristup

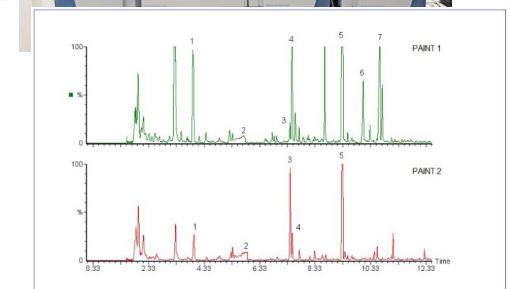
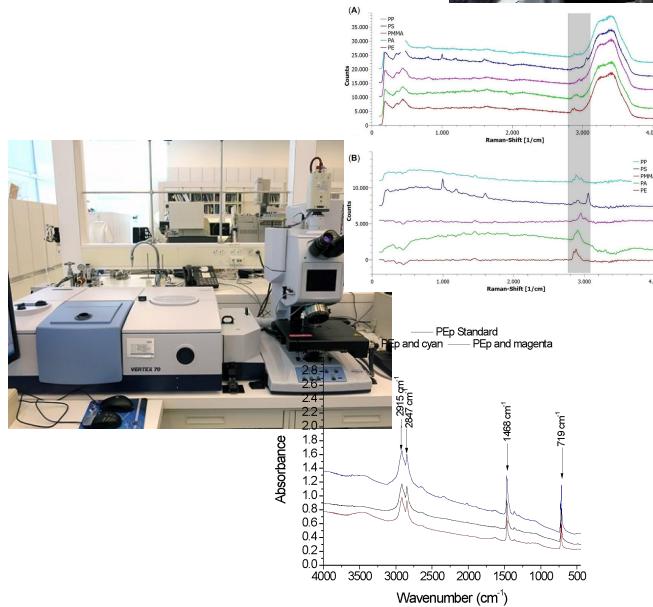
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Održivi pristup

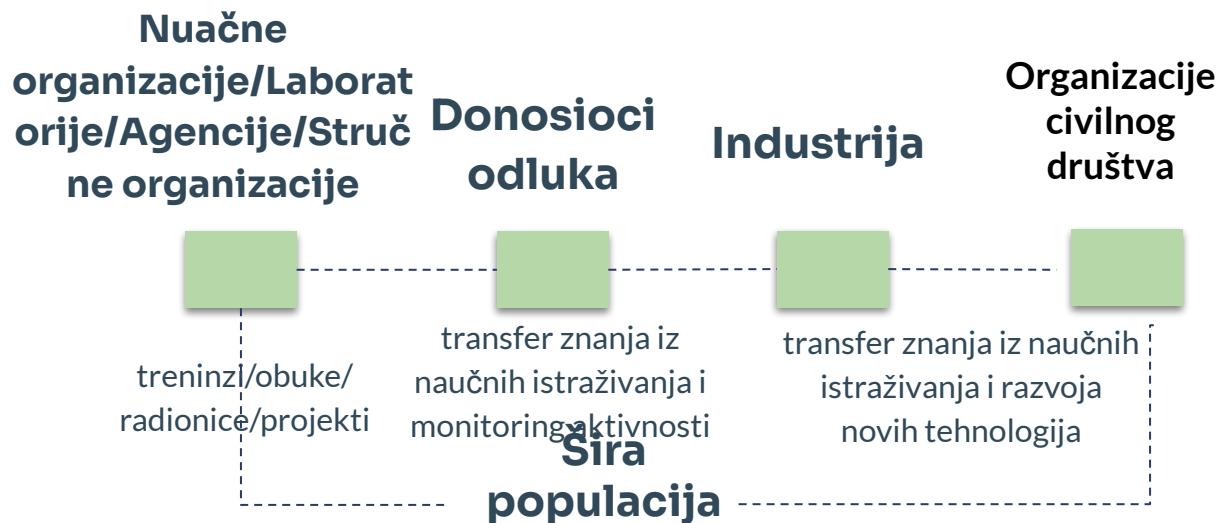
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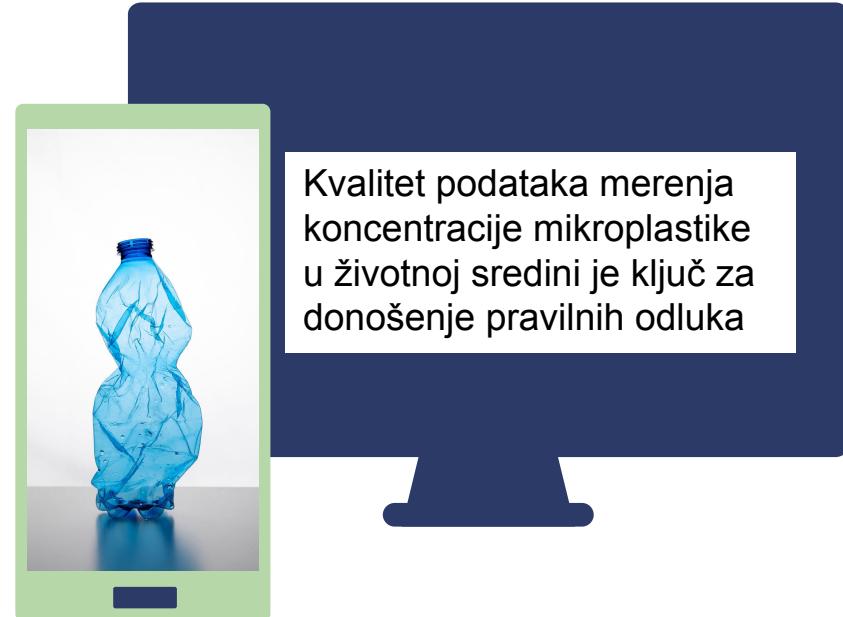
Edukacija



Izaberite prirodnu kozmetiku; Prilagodite svoj izbor garderobe; Perite odeću odgovorno; Podržite ekološki prihvatljive brendove; Smanjite korišćenje plastike za jednokratnu upotrebu; Uključite se u lokalne akcije čišćenja; Obrazujte sebe i druge; Zalažite se za promene u regulativi

Poruka za kraj

*Samo kvalitetni podaci mogu biti osnova
za kvalitetne odluke*



Hvala na pažnji



<https://ca-priority.eu/>



<https://sundanseproject.eu/>



<https://sundanseproject.eu/>



<https://www.icplastic.eu/>

Za više informacija:
aleksandra.tubic@dh.uns.ac.rs

