

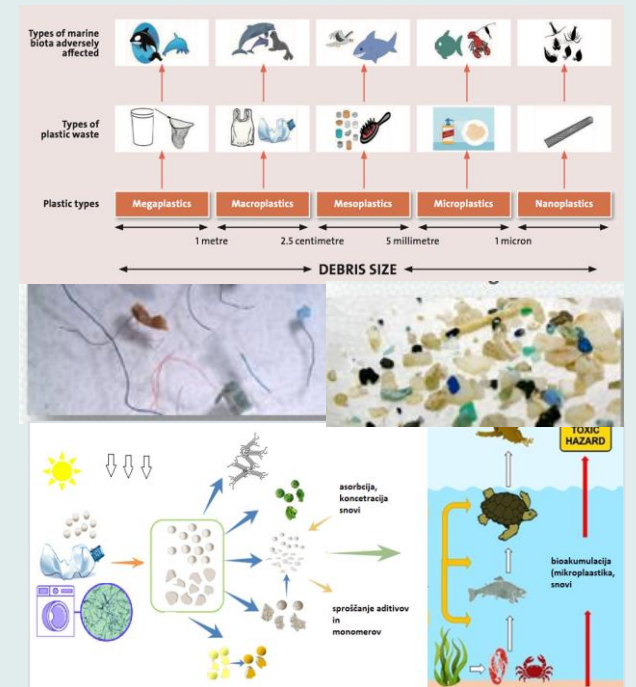
Kako izobraževalno misliti kemijsko varnost mikroplastike

Simona Slavič Kumer in mag. Andreja Bačnik, ZRSŠ

Vsebina:

- kaj naj bi v zvezi s kemijsko varnostjo (mikro)plastike vedel/-a naravoslovno pismen/-a posameznik/-ca
- vključenost ciljev/vsebin (mikro)plastike v UN za biologijo in kemijo
- glavni vsebinski poudarki potrebni za razumevanje kemijske varnosti mikroplastike (*kriteriji delitve sinteznih polimerov/plastike: vrste - fizikalne in kemijske lastnosti; velikostni razredi delcev...*)
- vnos v okolje in organizme → vpliv na okolje in organizme... → zdravje
- didaktični pristopi k tematiki v VIZ

Nabor virov, idej, prikazov in infografik (za uporabo je potrebna kritična presoja)!



BIOLOGIJA SŠ

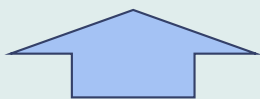


BIOLOGIJA

N Vpliv človeka na naravo in okolje

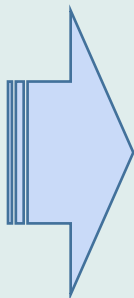
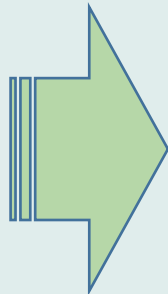
N1 Človekove dejavnosti lahko vključujejo tveganje s potencialno škodljivimi učinki na človeka in naravo.

Med tvegane aktivnosti spadajo uporaba naravnih virov in pridobivanje surovin, rast mest, sprememba uporabe zemljišč in ravnanje z odpadki.



NARAVOSLOVJE

Zgradba in delovanje ekosistemov



Učenci/ke

4 razumejo vplive človeka na biotske sisteme (organizmi, ekosistemi, biosfera) in te vplive raziščejo v lastnem okolju (urbanizacija, prekomerna raba naravnih virov, degradacija in drobljenje ekosistemov, onesnaževanje okolja idr.),

8 spoznajo, da pomembne osebne in družbene odločitve temeljijo na analizi koristi in tveganja (ekonomske in naravovarstvene) ter da posameznik preko koristi skupnosti koristi sebi (okolje kot vrednota),

9 spoznajo, da lahko okolje zaradi naravnih vzrokov in človekovih dejavnosti vsebuje snovi, ki so škodljive za človeka in druge organizme,

10 spoznajo, da trajnostni razvoj zahteva vzpostavitev standardov za spremljanje sprememb v tleh, vodah in ozračju ter ukrepov za preprečevanje škodljivih sprememb,

11 spoznajo, da je tveganje, povezano s človekovo aktivnostjo, osebni in družbeni izziv, saj nepravilna analiza posledic določenih aktivnosti vodi do podcenjevanja tveganja in s tem do škodljivih posledic za človeka in naravo ali pa do preostrogih preventivnih ukrepov, ki so nepotrebno finančno breme za posameznika in družbo.

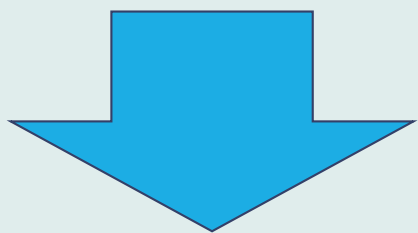
- ...
- spoznajo, da energijo, ki vstopa v ekosistem kot sončna energija, proizvajalci (rastline in fotosintezni mikroorganizmi kot temelj prehranjevalnega spleta) med fotosintezo pretvorijo v kemično vezano energijo in da se ta energija nato prenaša od organizma do organizma skozi prehranjevalni splet (potrošniki – prehranjevanje z drugimi organizmi),
- ...
- spoznajo, da se snovi prenašajo od organizma do organizma v prehranjevalnem spletu in od organizmov do neživega okolja; snovi neprestano krožijo,

KEMIJA

VS: DRUŽINA OGLJIKOVODIKOV S POLIMERI

VS: KISIKOVA DRUŽINA ORGANSKIH SPOJIN

VS: DUŠIKOVA DRUŽINA ORGANSKIH SPOJIN



KEMIJA V SŠ

Učenci/ke

- spoznajo nafto in zemeljski plin kot ključna vira organskih spojin (zlasti ogljikovodikov) in neobnovljiva vira energije, ...
- spoznajo reakcijo polimerizacije in razlikujejo med pojmom monomer in polimer,
- spoznajo nekaj primerov sinteznih polimerov ogljikovodikov (poliadicijski polimeri) ter njihovih lastnosti v povezavi z uporabo in vplivi na okolje,
- razmišljajo o preprečevanju oziroma zmanjševanju vplivov ogljikovodikov in njihovih derivatov na okolje in se zavedajo pomena recikliranja odpadkov,

...

- spoznajo nekaj primerov sinteznih kondenzacijskih polimerov kisikove družine organskih spojin (poliestri) ter njihovih lastnosti v povezavi z uporabo in vplivi na okolje,

...

- spoznajo primere poliamidov (najlon, kevlar): kot sintezne kondenzacijske polimere; njihove lastnosti, uporaba in vpliv na okolje,

Sintetični polimeri → plastika

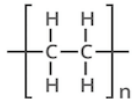
(iz **grške** besede πλαστικός: plastikós - oblikovati, ulivati):

sintetični in polsintetični materiali

A GUIDE TO COMMON HOUSEHOLD PLASTICS

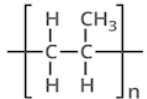
Plastics are substances called polymers – these are long, chain-like molecules, formed from many smaller molecules. We use a number of different plastics in our day-to-day lives. This graphic looks at uses of the most frequently encountered, along with their chemical structures.

PE POLYETHENE



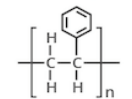
Polyethene is the most produced plastic, and comes in a number of different forms, including high density polyethene (HDPE) and low density polyethene (LDPE). It is used in plastic bags, bottles, plastic films, piping, and toys. It is not biodegradable.

PP POLYPROPENE



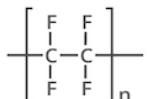
Polypropene is particularly resistant to heat, physical damage, and corrosion. As a consequence, it is commonly used in food containers, carpets and rugs, ropes, plastic furniture, and piping. It's also used to make items for medical or laboratory uses.

PS POLYSTYRENE



Polystyrene is one of the most widely used plastics. It's used in its solid form to produce plastic cutlery, CD cases, and disposable razors, whilst as a foam it's used in packing materials, building insulation, and foam containers for food and drink.

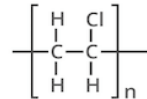
PTFE POLYTETRAFLUOROETHENE



PTFE's well-known brand name is Teflon. It's a very unreactive polymer, and is used in non-stick coatings on cookware. Gore-tex fabrics also contain PTFE-based fibres. It also has applications as a lubricant, and as insulation for electric wires and cables.

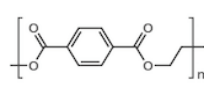


PVC POLYVINYLCHLORIDE



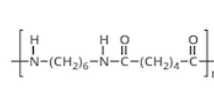
PVC comes in both rigid and flexible forms. In its rigid form, it can be used for window and door frames, piping, and bank cards. By adding plasticisers, a more flexible form can be obtained, which is used in electric cable insulation, and as a rubber substitute.

PET POLYETHYLENE TEREPHTHALATE



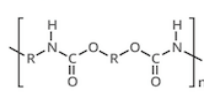
PET is a lightweight polymer, and comes in forms of varying rigidity. It's commonly used for plastic drink bottles, and also for clothing fibres (where it's often referred to generally as 'polyester'). Additionally, it's used in ready meal packaging and tapes.

PA NYLON (POLYAMIDE)



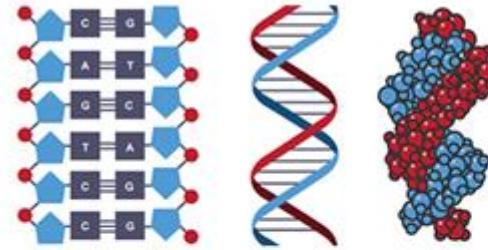
Nylon actually refers to a family of polymers; nylon 6,6 is shown here. It was originally intended as a synthetic silk replacement, for military applications such as parachutes. Today, it is used in clothing, guitar strings, and fishing lines.

PU POLYURETHANE



Polyurethanes are also a family of polymers; the R group in the structure above varies. Their uses include foam seating, for both furniture & cars, non-latex condoms, shoe soles, football coatings, skateboard and roller-blade wheels, and some varnishes.

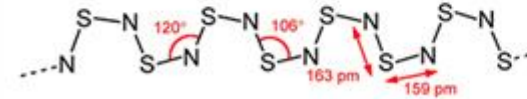
DIFFERENT TYPES OF POLYMERS



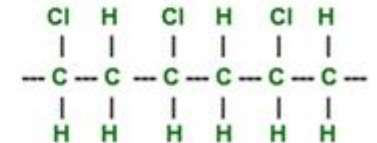
NATURAL POLYMERS



SYNTHETIC POLYMERS



INORGANIC POLYMERS



ORGANIC POLYMERS

Vir: <https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.blogformoob.com%2Ftypes-of-polymers%2>

Monomeri → polimerizacija → polimer - plastika:

- polimeri z DODATKI: barvila, mehčalci, stabilizatorji, polnila, ojačitve...

Dodatki vplivajo na kemično sestavo, kemijske lastnosti in mehanske lastnosti plastike, okoljski vpliv....

Polymer Name	POLYETHYLENE TEREPHTHALATE	HIGH-DENSITY POLYETHYLENE	POLYVINYL CHLORIDE	LOW-DENSITY POLYETHYLENE	POLYPROPYLENE	POLYSTYRENE	All other plastics, including acrylic, fiberglass, nylon, polycarbonate, and polylactic acid (a bioplastic)
Resin Identification Code							
Abbreviation	PET or PETE	HDPE	PVC	LDPE	PP	PS	OTHER
Recyclable?	Commonly Recycled	Commonly Recycled	Sometimes Recycled	Sometimes Recycled	Occasionally Recycled	Commonly Recycled (but difficult to do)	Difficult to Recycle
Percentage Recycled Annually			<1% donut chart"/>				
How Long to Decompose Under Perfect Conditions	5-10 Years	100 Years	Never	500-1,000 Years	20-30 Years	50 Years	Majority of these plastics: never
Maximum Temperature	70°C (158°F)	120°C (248°F)	70°C (158°F)	80°C (176°F)	135°C (275°F)	90°C (194°F)	Polylactic acid: 135°C (275°F) Polycarbonate: 150°C (302°F)
Brittleness Temperature	-40°C (-40°F)	-100°C (-148°F)	-30°C (-22°F)	-100°C (-148 °F)	0°C (32°F)	-20°C (-4°F)	Polycarbonate: -135°C (-211°F) Polylactic acid: 60°C (140°F)
Toxicity Level							
Most Commonly Leached Toxin(s)	Antimony Oxide, Bromine, Diazomethane, Lead Oxide, Nickel Ethylene Oxide, and Benzene	Chromium Oxide, Benzoyl Peroxide, Hexane, and Cyclohexane	Benzene, Carbon Tetrachloride, 1,2-Dichloroethane, Phthalates, Ethylene Oxide, Lead Chromate, Methyl Acrylate, Methanol, Phthalic Anhydride, Tetrahydrofuran, and Tribasic Lead Sulfate, Mercury, Cadmium, Bisphenol A (BPA)	Benzene, Chromium Oxide, Cumene Hydroperoxide, And Tert-butyl Hydroperoxide	Methanol, 2,6-di-tert-Butyl-4-Methyl Phenol, and Nickel Dibutyl Dithiocarbamate	Styrene, Ethylbenzene, Benzene, Ethylene, Carbon Tetrachloride, Polyvinyl Alcohol, Antimony Oxide, and Tert-butyl Hydroperoxide, Benzoquinone	BPA, BPS, as well as all other toxins mentioned

THE 7 TYPES OF PLASTICS

THEIR TOXICITY AND WHAT THEY ARE MOST COMMONLY USED FOR

TYPE	1	2	3	4	5	6	7
RESIN IDENTIFICATION CODE	1	2	3	4	5	6	7
ABBREVIATION	PET or PETE	HDPE	PVC	LDPE	PP	PS	OTHER
RECYCLABLE?	Commonly Recycled	Commonly Recycled	Sometimes Recycled	Sometimes Recycled	Occasionally Recycled	Commonly Recycled (but difficult to do)	Difficult to Recycle
PERCENTAGE RECYCLED ANNUALLY	36%	30-35%	<1%	6%	3%	34%	Low
HOW LONG TO DECOMPOSE UNDER PERFECT CONDITIONS	5-10 Years	100 Years	Never	500-1,000 Years	20-30 Years	50 Years	Majority of these plastics: never
MAXIMUM TEMPERATURE	70°C (158°F)	120°C (248°F)	70°C (158°F)	80°C (176°F)	135°C (275°F)	90°C (194°F)	Polylactic acid: 135°C (275°F) Polycarbonate: 150°C (302°F)
BRITTLINESS TEMPERATURE	-40°C (-40°F)	-100°C (-148°F)	-30°C (-22°F)	-100°C (-148 °F)	0°C (32°F)	-20°C (-4°F)	Polycarbonate: -135°C (-211°F) Polylactic acid: 60°C (140°F)
TOXICITY LEVEL							
MOST COMMONLY LEACHED TOXIN(S)	Antimony Oxide, Bromine, Diazomethane, Lead Oxide, Nickel Ethylene Oxide, and Benzene	Chromium Oxide, Benzoyl Peroxide, Hexane, and Cyclohexane	Benzene, Carbon Tetrachloride, 1,2-Dichloroethane, Phthalates, Ethylene Oxide, Lead Chromate, Methyl Acrylate, Methanol, Phthalic Anhydride, Tetrahydrofuran, and Tribasic Lead Sulfate, Mercury, Cadmium, Bisphenol A (BPA)	Benzene, Chromium Oxide, Cumene Hydroperoxide, And Tert-butyl Hydroperoxide	Methanol, 2,6-di-tert-Butyl-4-Methyl Phenol, and Nickel Dibutyl Dithiocarbamate	Styrene, Ethylbenzene, Benzene, Ethylene, Carbon Tetrachloride, Polyvinyl Alcohol, Antimony Oxide, and Tert-butyl Hydroperoxide, Benzoquinone	BPA, BPS, as well as all other toxins mentioned

POLYETHYLENE TEREPHTHALATE (PET or PETE)

COMMONLY USED FOR: Soda bottles, water bottles, food and beverage containers, fiber, clothing, carpets, geotextiles, and more.

PROPERTIES: Clear, strong, lightweight, and resistant to moisture and chemicals.

TOXICITY LEVELS: Generally considered safe for food and beverage contact.

CAN BE RECYCLED INTO: Fiber, clothing, carpets, geotextiles, and more.

HIGH-DENSITY POLYETHYLENE (HDPE)

COMMONLY USED FOR: Milk jugs, detergent bottles, and more.

PROPERTIES: Strong, durable, and resistant to moisture and chemicals.

TOXICITY LEVELS: Generally considered safe for food and beverage contact.

CAN BE RECYCLED INTO: Fiber, clothing, carpets, geotextiles, and more.

POLYVINYL CHLORIDE (PVC)

COMMONLY USED FOR: Pipes, vinyl flooring, and more.

PROPERTIES: Durable, strong, and resistant to moisture and chemicals.

TOXICITY LEVELS: Can release dioxin and other toxins when burned.

CAN BE RECYCLED INTO: Pipes, vinyl flooring, and more.

LOW-DENSITY POLYETHYLENE (LDPE)

COMMONLY USED FOR: Plastic bags, and more.

PROPERTIES: Flexible, strong, and resistant to moisture and chemicals.

TOXICITY LEVELS: Generally considered safe for food and beverage contact.

CAN BE RECYCLED INTO: Fiber, clothing, carpets, geotextiles, and more.

POLYPROPYLENE (PP)

COMMONLY USED FOR: Car seats, and more.

PROPERTIES: Strong, durable, and resistant to moisture and chemicals.

TOXICITY LEVELS: Generally considered safe for food and beverage contact.

CAN BE RECYCLED INTO: Fiber, clothing, carpets, geotextiles, and more.

POLYSTYRENE (PS)

COMMONLY USED FOR: Styrofoam, and more.

PROPERTIES: Lightweight, strong, and resistant to moisture and chemicals.

TOXICITY LEVELS: Can release styrene and other toxins when burned.

CAN BE RECYCLED INTO: Fiber, clothing, carpets, geotextiles, and more.

OTHER

COMMONLY USED FOR: Various other plastic products.

PROPERTIES: Varies depending on the specific plastic.

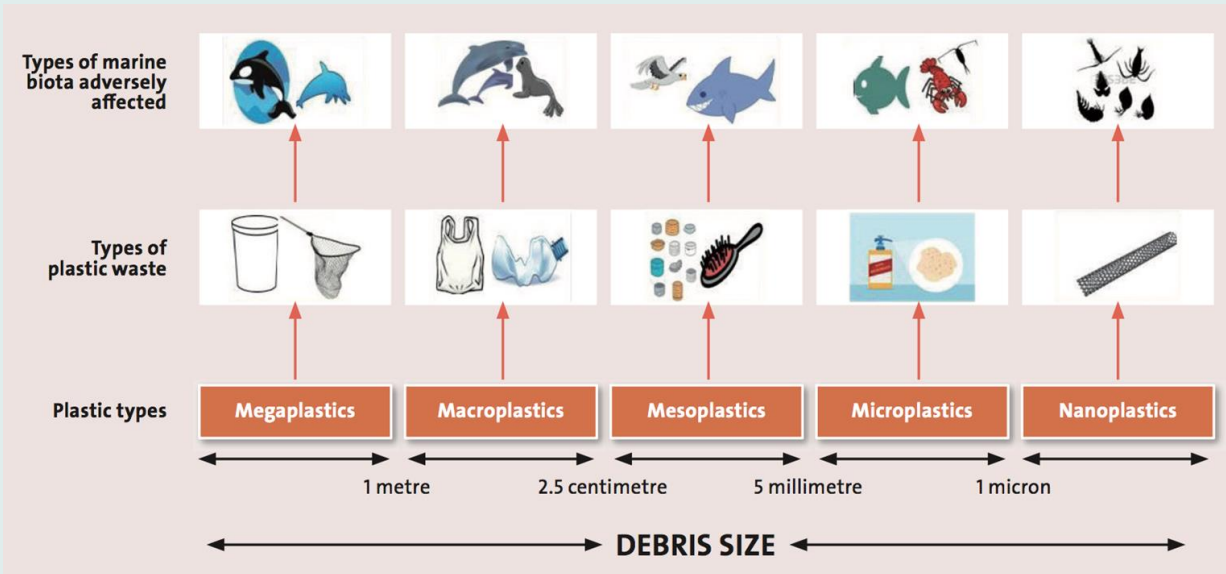
TOXICITY LEVELS: Varies depending on the specific plastic.

CAN BE RECYCLED INTO: Varies depending on the specific plastic.

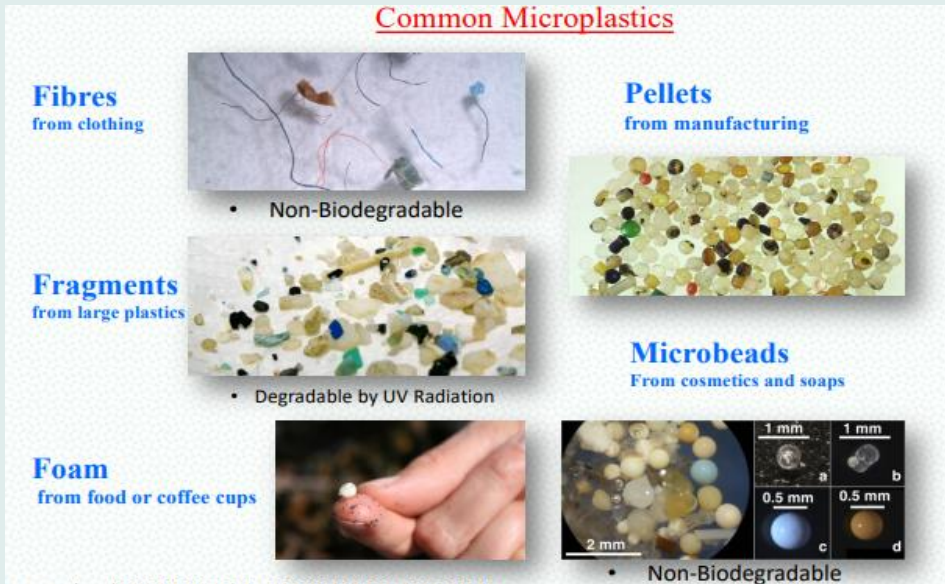
Poliester (PES): tekstilna vlakna.
 Poliamid (PA) (najlon): vlakna, ščetine zobnih ščetk, ribiške vrvice.

Vir: <https://infographicjournal.com/7-types-of-plastics-their-toxicity-what-theyre-most-commonly-used-for/>

Velikostni razredi (mikro)plastike



https://journals.openedition.org/factsreports/docannexe/image/5257/img_2.png



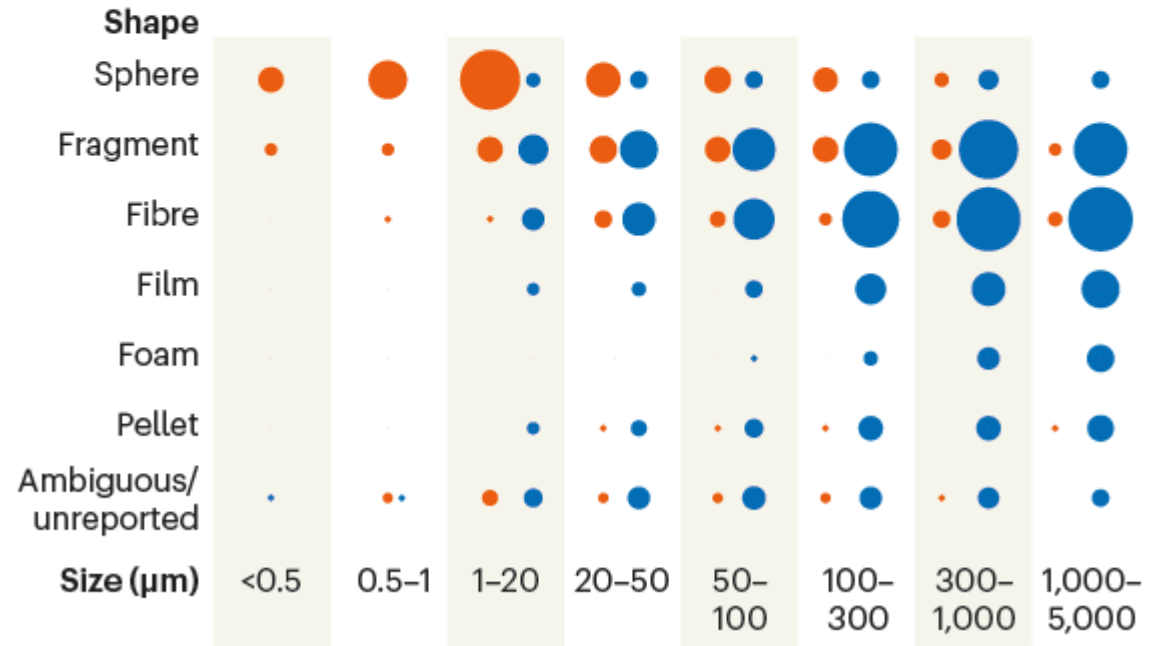
SIZING UP MICROPLASTICS

Laboratory scientists studying how microplastics affect organisms use shapes and sizes that are different from the microplastics detected in environmental assays. The tiniest specks, or nanoplastics, measuring less than 1 micrometre across, are rarely reported in environmental studies because they are so hard to detect.

Study type

- Organisms exposed to plastic in lab
- Plastic detected in environment

Number of times recorded in research papers*



*Nature analysis of 136 detection and 159 exposure studies.



Vir: https://media.nature.com/lw800/magazine-assets/d41586-021-01143-3/d41586-021-01143-3_19121388.png

Mikroplastika iz tekstila in gum glavni vir onesnaževanja morij

06.03.2017



Mikrodelci iz gum pomembno prispevajo k onesnaženosti morij. (Foto: www.shutterstock.com)

Mednarodna zveza za varstvo narave (IUCN) v novem poročilu ugotavlja, da so **nevidni delci plastike iz tekstila in gum glavni vir onesnaževanja morij**. V poročilu so odkrivali primarne vire mikroplastike v morjih, kamor spadajo avtomobilske gume, sintetična oblačila, prevleke plovil, oznake cest, kozmetika, plastični peleti in prah iz mest. Ocenjeno je, da naj bi bilo med 15 in 31 % od 9,5 milijona ton plastike, ki vsako leto konča v morjih, že pred prihodom v morje v obliki mikroplastike. Od tega **dve tretjini prideta iz pranja sintetičnih oblačil in obrabe gum med vožnjo**.

Poročilo kaže, da so v razvitih državah viri primarne mikroplastike večji onesnaževalci morja kot plastični odpadki. V Aziji je prvi vir tekstil, v obeh Amerikah odpadki. V poročilu je tudi omenjen, da bi Joao de Sousa iz IUCN, bi morali izsledki poročila pomeniti, da morajo države spodbujati zbiranje odpadkov in delkov mikroplastike, da bi se zmanjšala onesnaženja morij s plastiko, ki se sedaj osredotoča na območja, ki so najbolj onesnažena. Po njegovih besedah bi morala nova strategija vključiti spodbujanje infrastrukture ter priporočila za obnašanje potrošnikov, da bi se pri pranju izgubljala manj vlaken, potrošnike pa bi bilo potrebno spodbujati, da bi se izognili uporabi izdelkov, ki vsebujejo mikroplastiko. Čeprav so dobrodošli tudi pozivi za prepoved uporabe pilingov v kozmetiki.

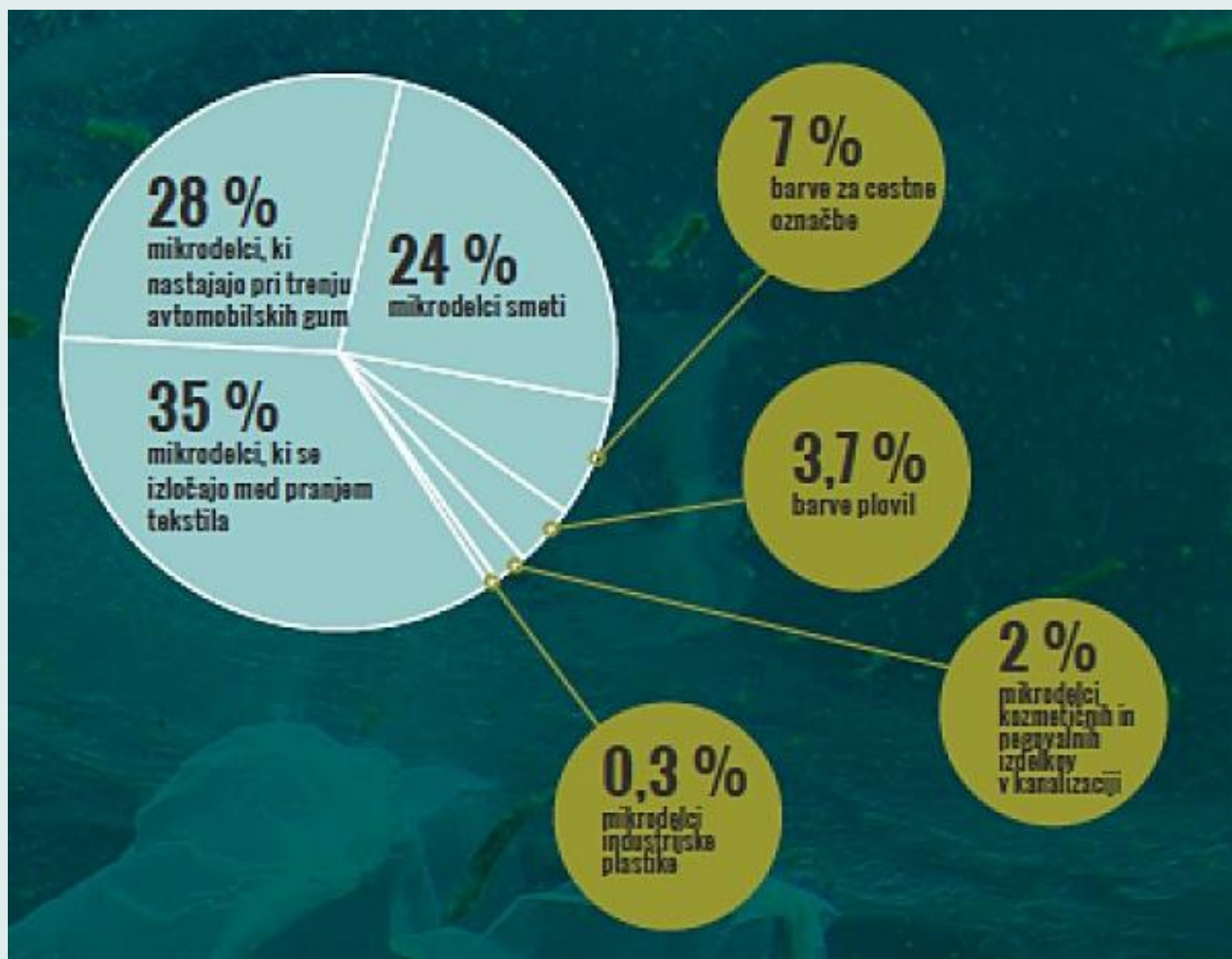


Odvržene maske na obali. Foto: Reuters

Vir: <https://www.delo.si/vest/2017/03/06/mikroplastika-iz-tekstila-in-gum-glavni-vir-onesnazevanja-morij-1127010>

Vir: Delo

Izvor primarne mikroplastike



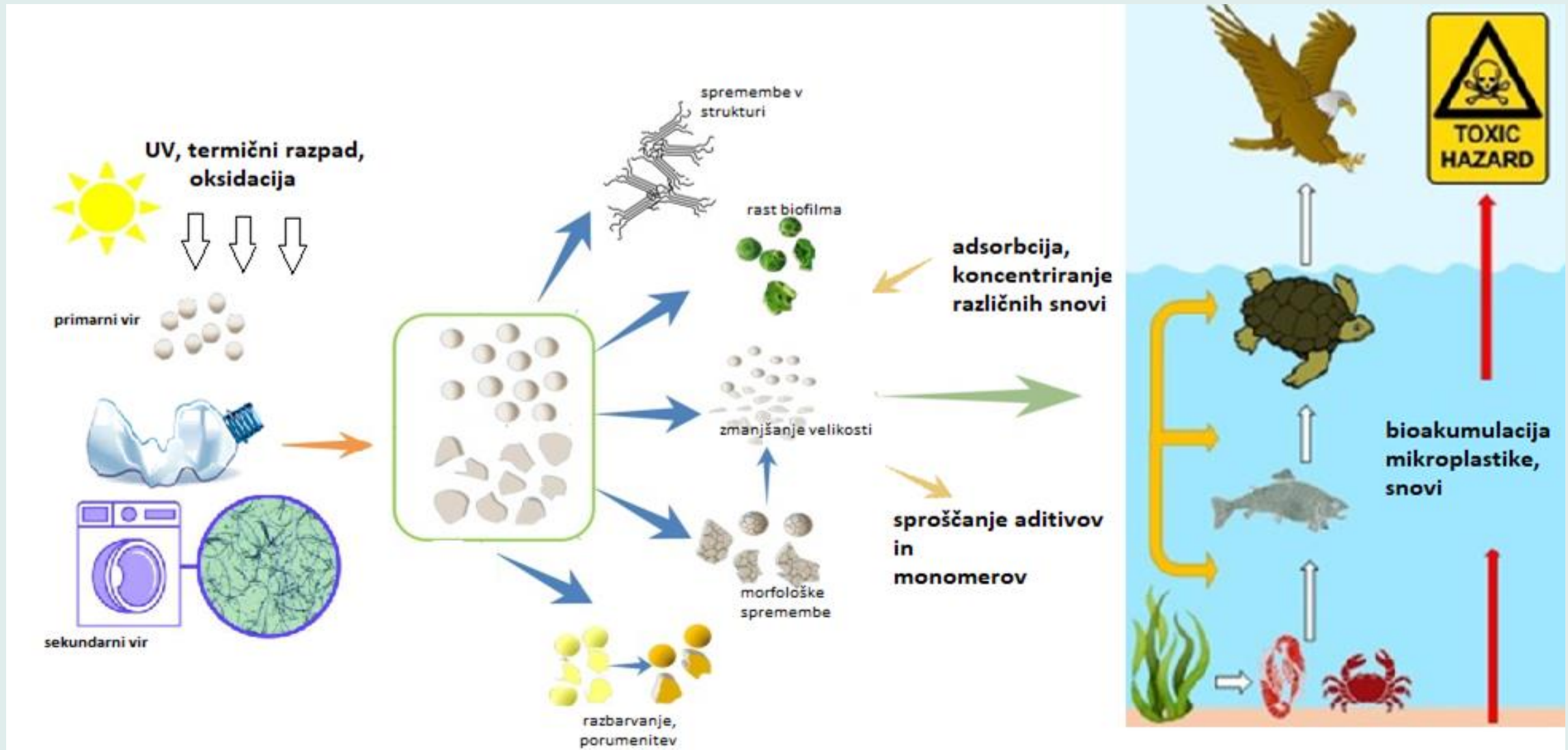
KAKO DOLGO TRAJA DA RAZPADEJO?

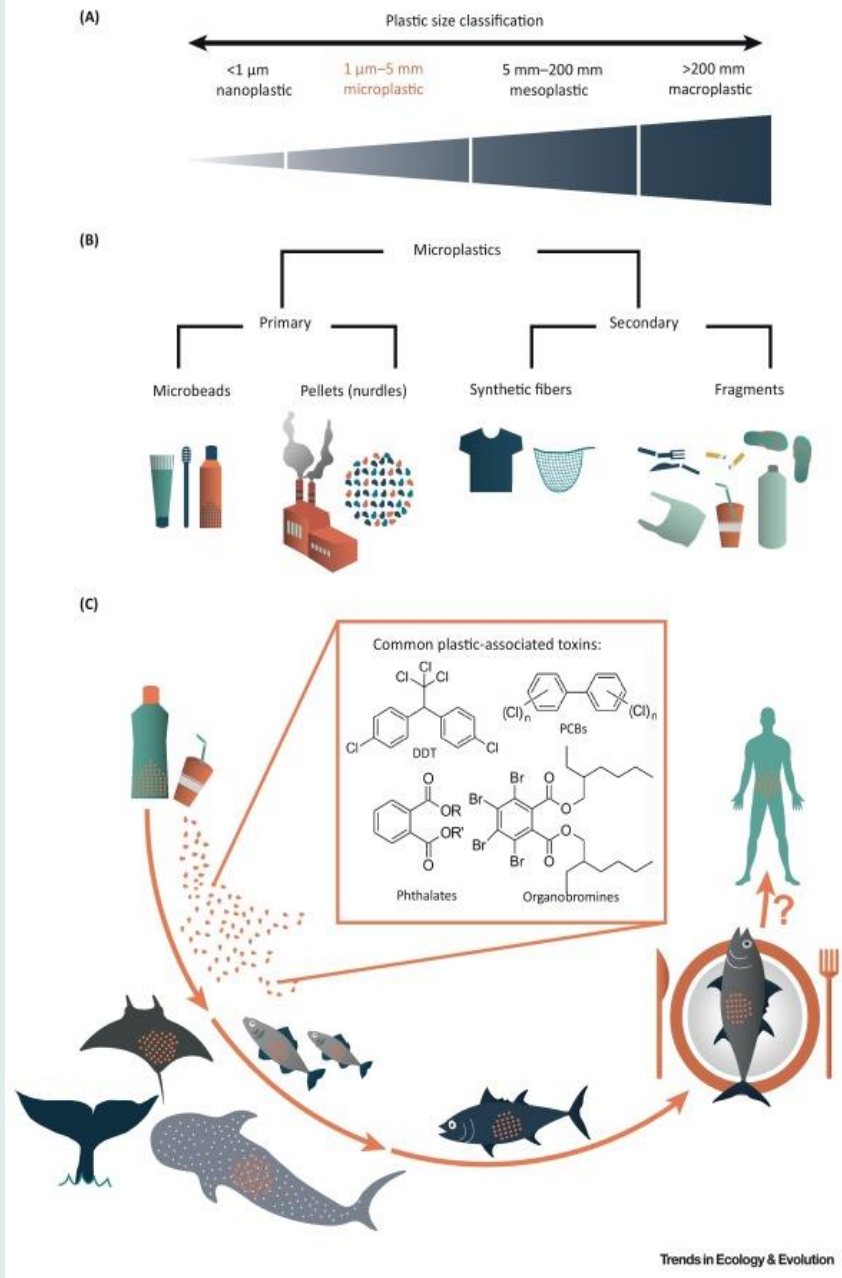
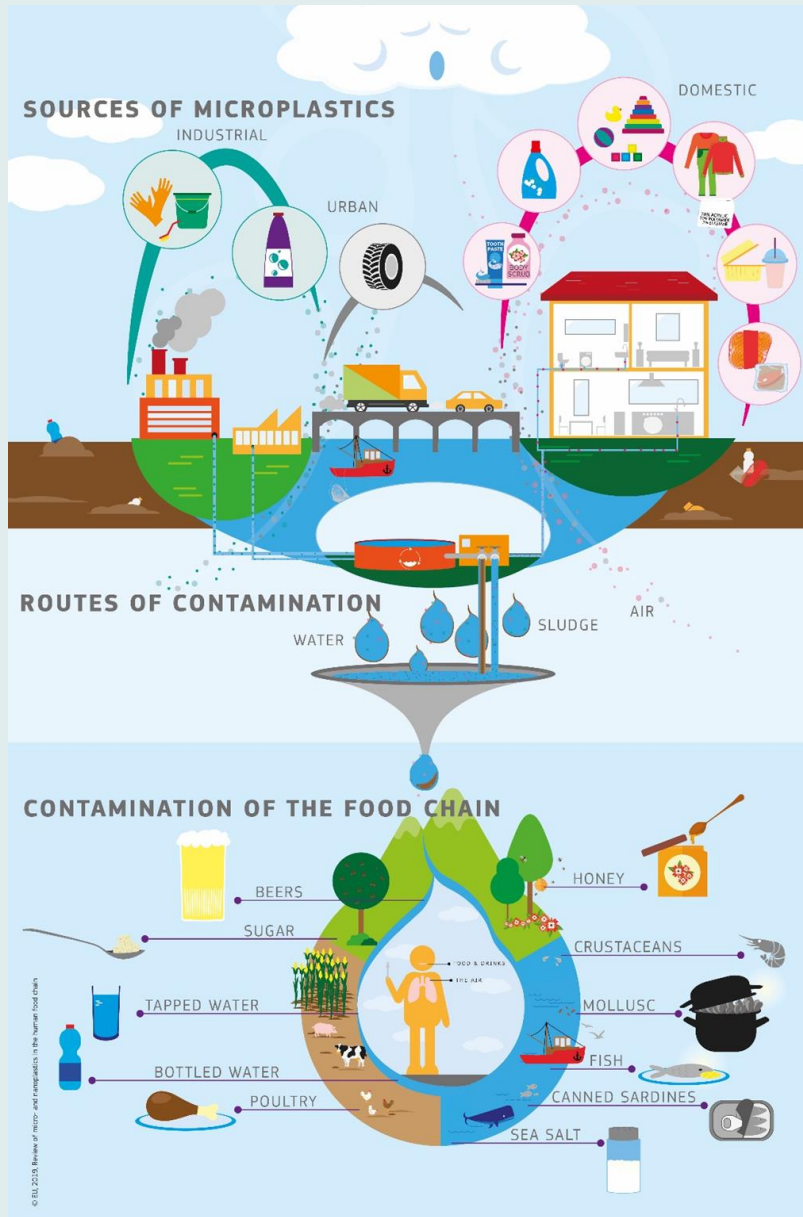
Item	Decomposition Time
Ribiški trnek	600 LET
Steklo	4000 LET
Cigareta	10 LET
Karton	2 MESECA
Plastični pribor	100-1000 LET
Toaletni papir	1 MESEC
Pločevinka	200 LET
PET platenka	DO 1000 LET
Plastična vrečka	10-20 LET
Plenice	450 LET

NE POZABITE: Plastika ni biorazgradljiva - sčasoma razpade na manjše in manjše kose.

ZELENI PLANET

Viri mikroplastike → vnos v okolje → vpliv na organizme





Malo za šalo, malo zares



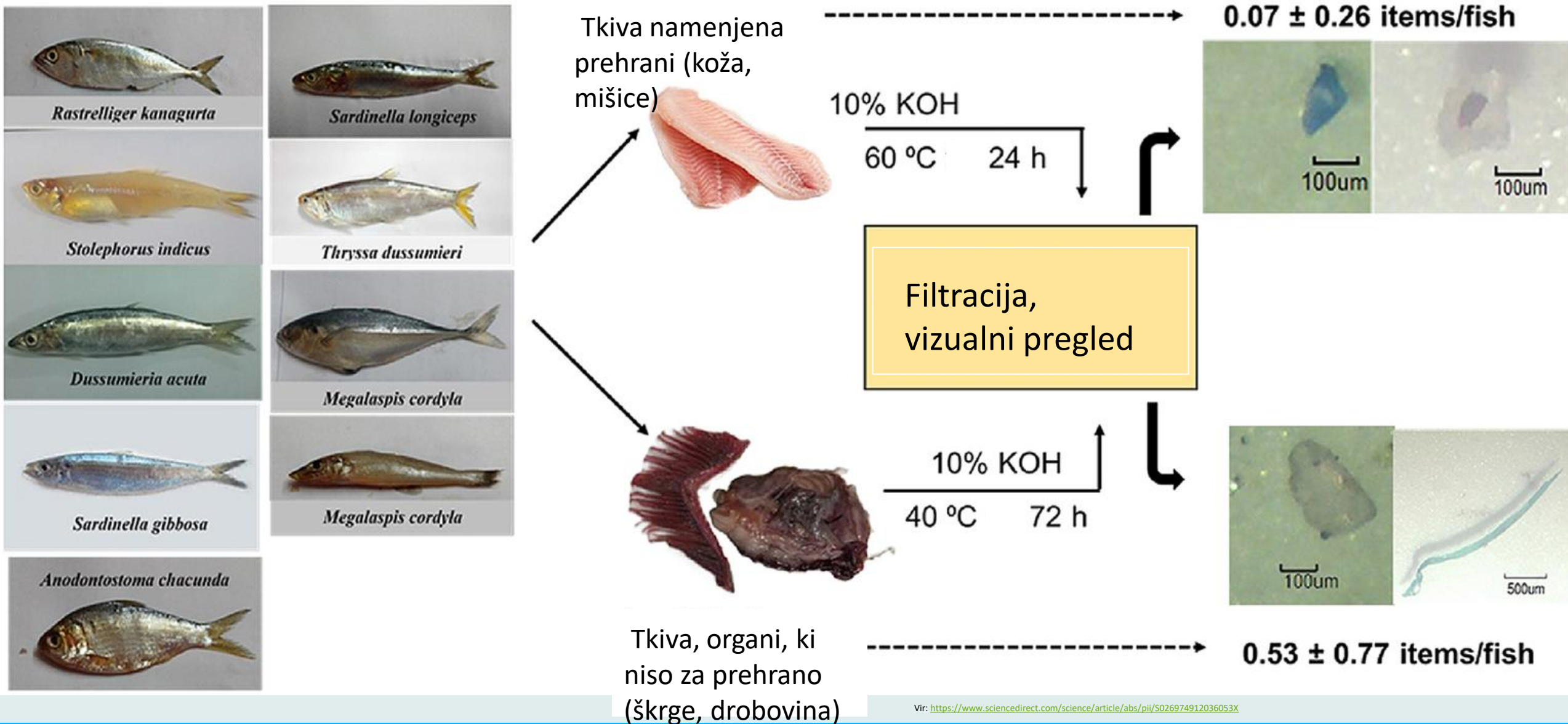
📷 Plastic pellets inside a dead fish washed ashore on a beach near Wellawatta, Sri Lanka. Photograph: Saman Abesiriwardana/Pacific Press/Rex/Shutterstock



📷 Nurdles collected on Briones beach, Spain. The plastic pellets act as 'toxic sponges' attracting other chemicals to their surface. Photograph: K Berger/PA

Vir: https://www.theguardian.com/environment/2021/nov/29/nurdles-plastic-pellets-environmental-ocean-spills-toxic-waste-not-classified-hazardous?CMP=Share_iOSApp_Other

Mikroplastika v ribah (primer iz Indije)



Kemijsko “obnašanje” mikroplastike v morskem okolju (Guo, Wang, 2019)

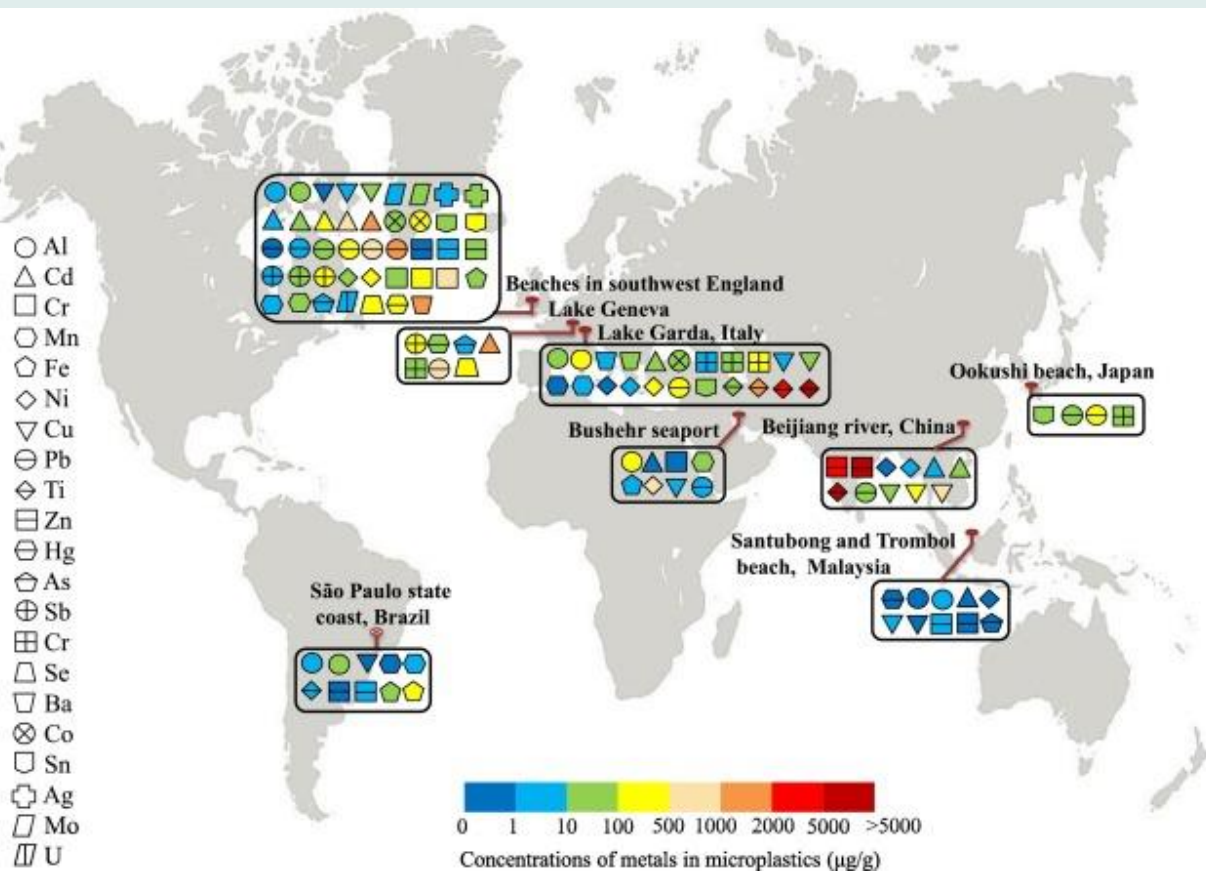


Fig. 2. Average concentration ranges of metals on microplastics.

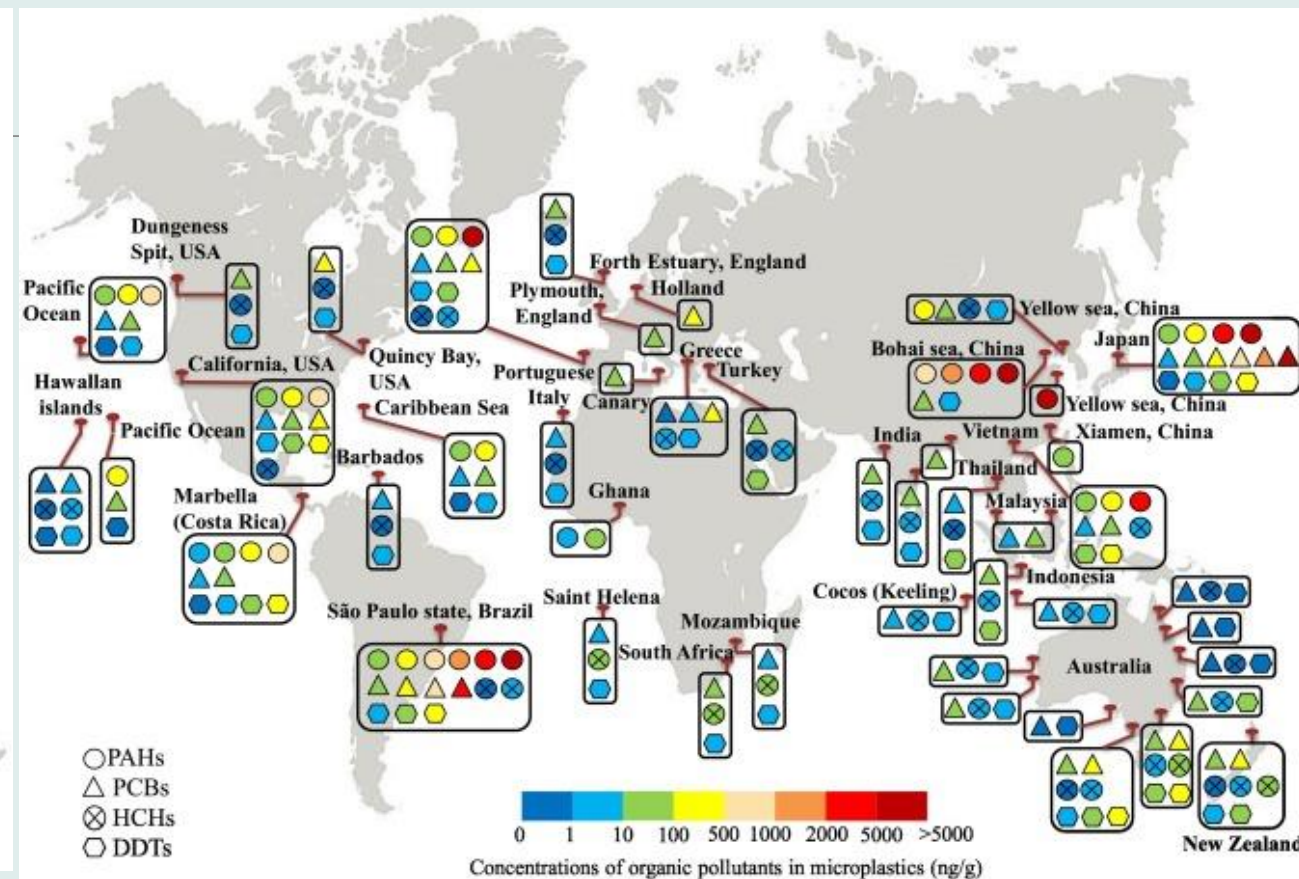


Fig. 3. Average concentration ranges of organic pollutants on microplastics.

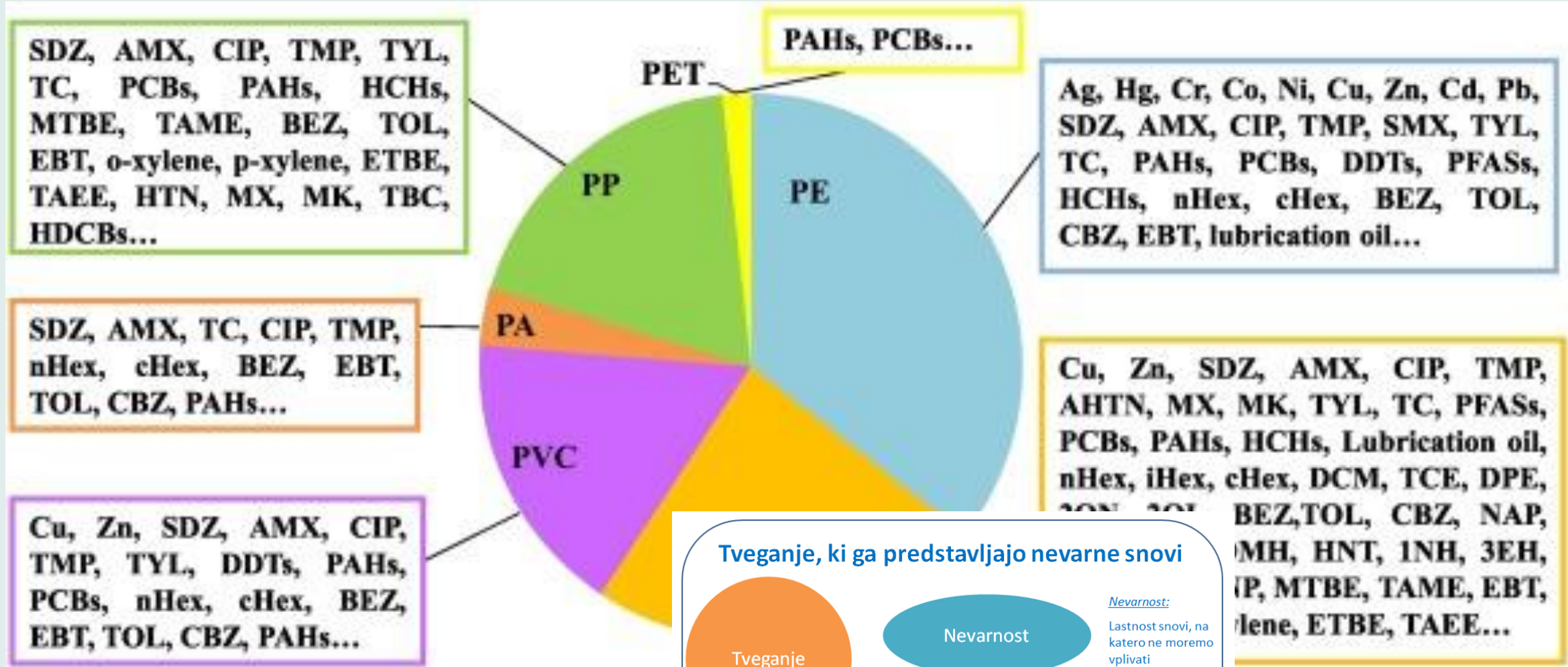
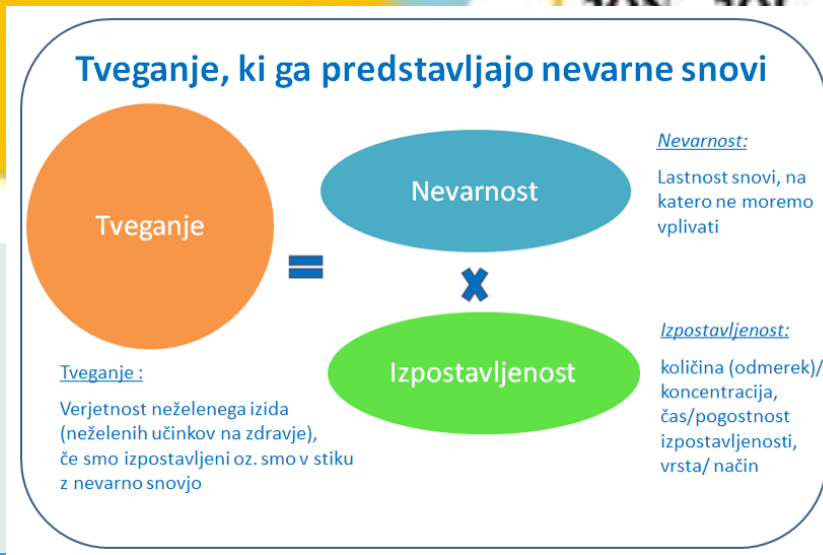
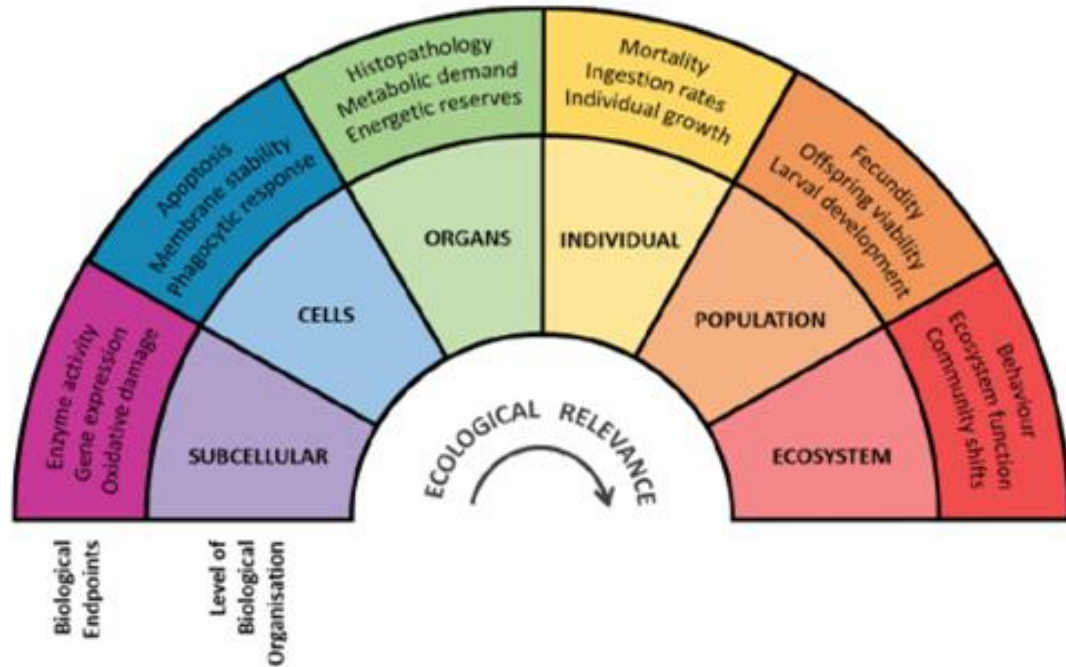


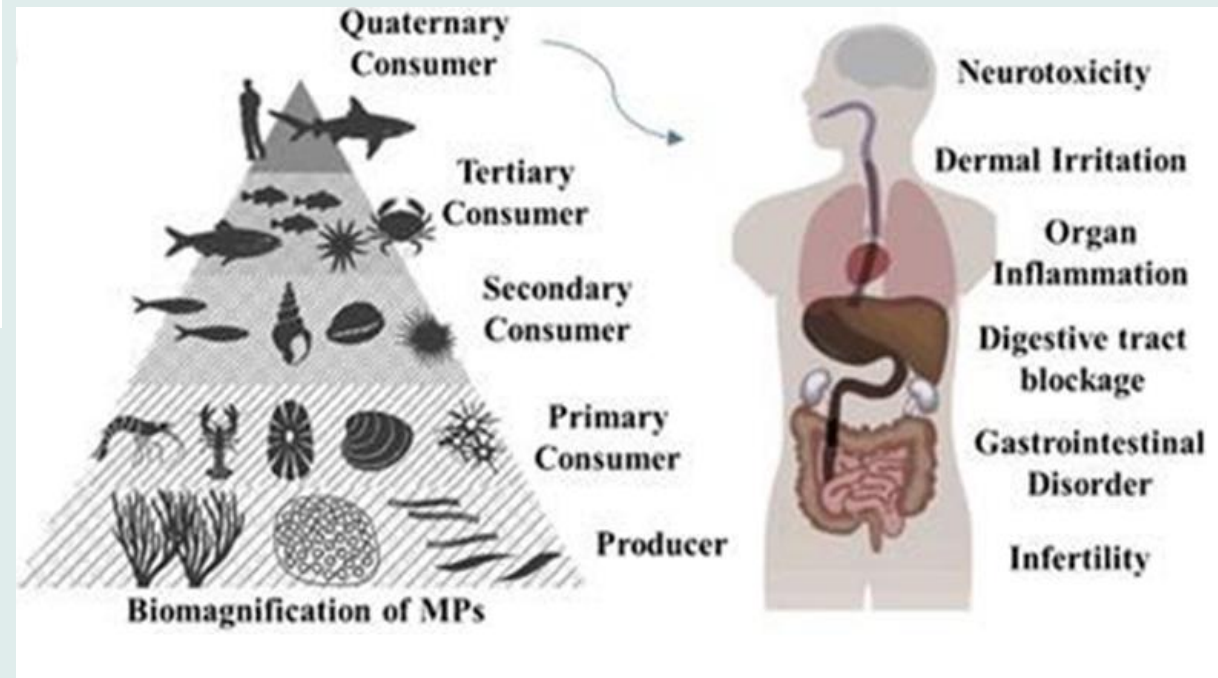
Fig. 4. Microplastics types and pollutants on microplastics (the size of each pie wedge represents the relative amount of the literature on the sorption behaviors of PE, PS, PVC, PA, and PP).



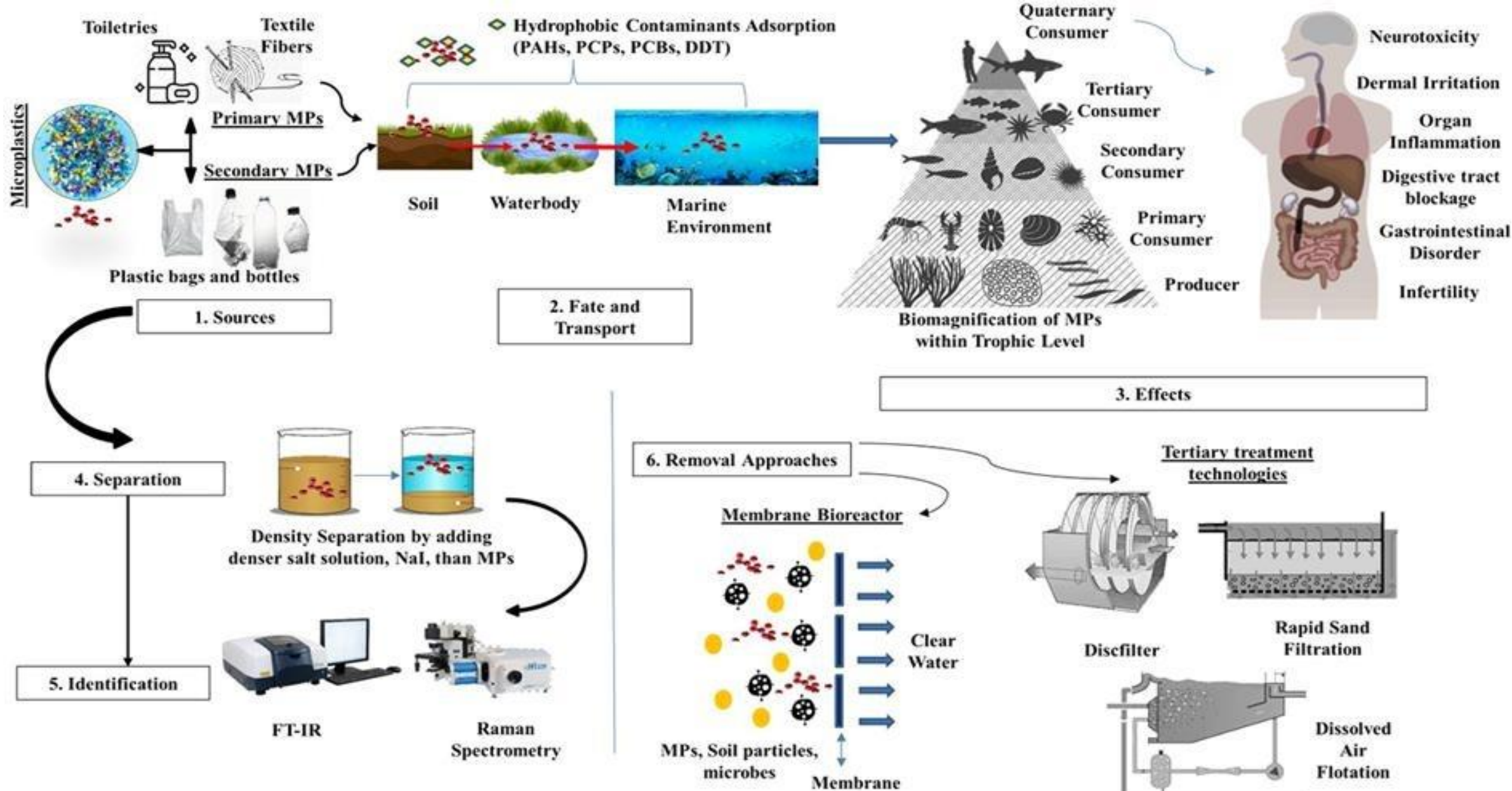
Vpliv nano in mikroplastike na bioto



Vir: https://ec.europa.eu/info/sites/default/files/research_and_innovation/groups/sam/ec_rtd_sam-mnp-opinion_042019.pdf



Vir: <https://www.sciencedirect.com/science/article/abs/pii/S2215153221001057>



Onesnaženje z mikroplastiko: celostni pregled virov, usode, učinkov in potencialna sanacija (Anik et al., 2021) <https://www.sciencedirect.com/science/article/abs/pii/S2215153221001057>

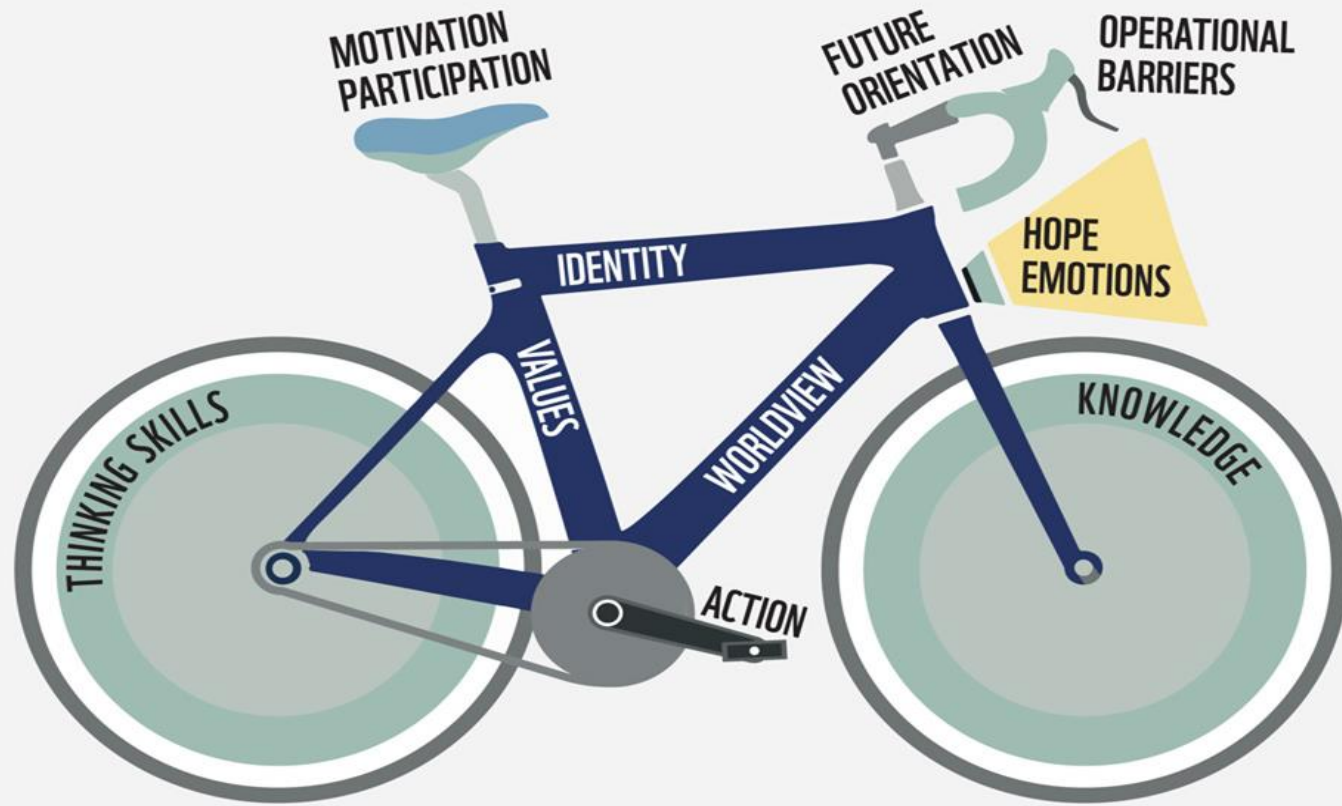
22 STRATEGIES

For Learning
Through Conversation

- | | | | | | | | |
|----------------------|---|---------------------------|---|-----------------------|---|--|---|
| 1 Concentric Circles |  | 7 Socratic Seminar |  | 13 Agree/Disagree |  | 19 Student-Led Conferencing |  |
| 2 QFT |  | 8 Pair & Share |  | 14 Four Corners |  | 20 Mentoring |  |
| 3 Stand & Declare |  | 9 Affinity Groups |  | 15 The Strong Circle |  | 21 Peer-to-peer or school-to-school learning |  |
| 4 Debate |  | 10 Fish Bowl |  | 16 Literature Circles |  | 22 Project-Based Learning |  |
| 5 Paideia Seminar |  | 11 Role-Playing Interview |  | 17 Write-Around |  | | |
| 6 Seed Discussions |  | 12 Oxford Style Debate |  | 18 Podcasting |  | | |



CLIMATE CHANGE EDUCATION BICYCLE MODEL



Terensko-raziskovalno delo:

Pregled sedimentov rek/morja (1m x 1m) z mikroskopom; vzorčenje obale/bregov



Sediment/wrack samples soaking (left); microplastics found in beach sand (right): Photo credits: Maia McGuire

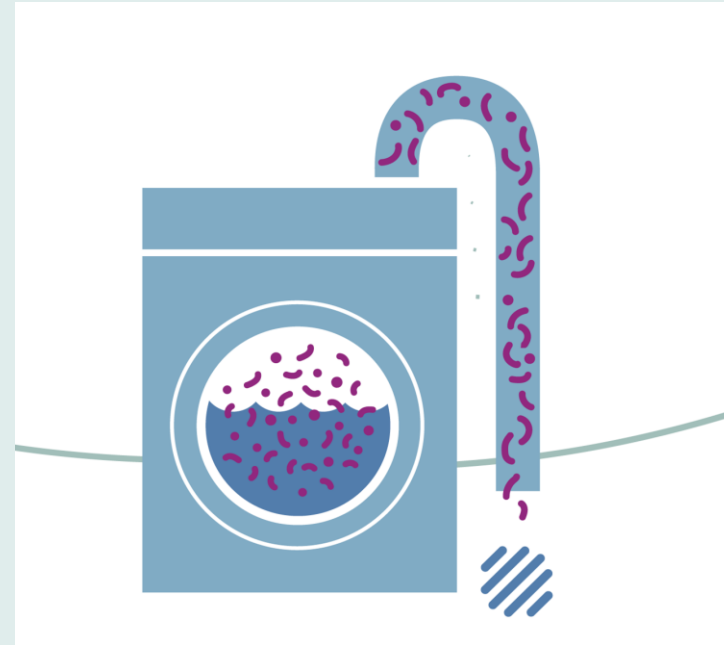
A Day at the Beach

An estimated **24 million people** visit Lake Tahoe each year. Imagine if every visitor came with this amount of **plastic**. How much of this plastic is reusable or recyclable? Where does all of this plastic end up?

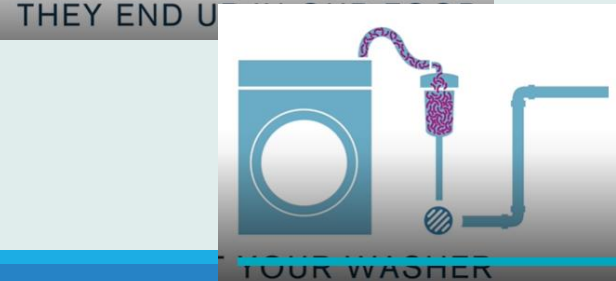
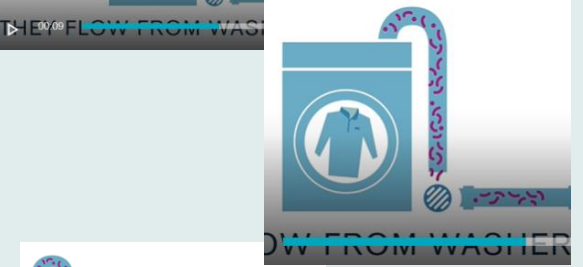
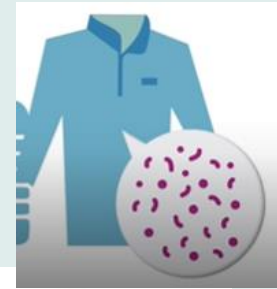
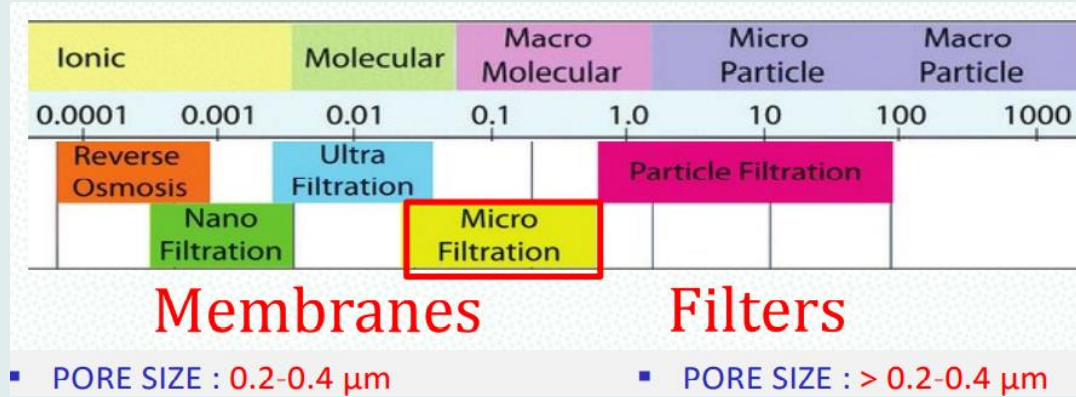
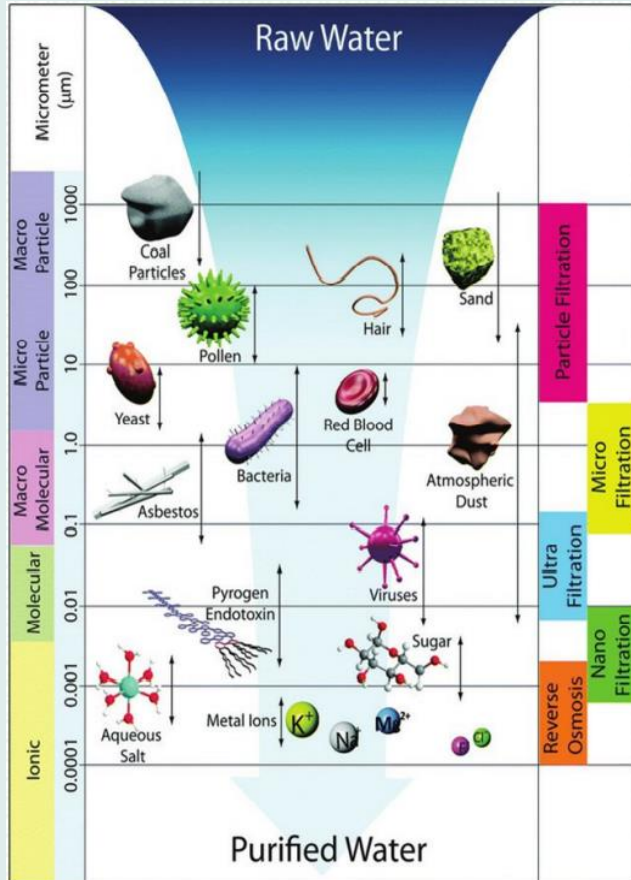
Gradivo: <https://flseagrant.ifas.ufl.edu/media/flseagrantifasufledu/sea-grant/pdf-files/microplastics/Microplastics-for-K-12.pdf>

Učenje z raziskovanjem

- analiza sestave domačih oblačil:
→ delež in vrste sintetičnih vlaken...
- mikrofiltracija...z membranami:



<https://www.kidsagainstplastic.co.uk/microfibres-problem-and-solution-pt2/>



Raziskovalne naloge

Dijaka po pretresljivi raziskavi: »Količina mikroplastike te odvrne od rib«

sobotainfo — 30. Julij 2021 06:35 v Lokalno



Gimnazija Franca Miklošiča Ljutomer, D. Bogdan in T. Kolerič.

Mentorica: M. Meznarič

Vir: <https://sobotainfo.com/novica/lokalno/dijaka-po-pretresljivi-raziskavi-kolicina-mikroplastike-te-odvrne-od-rib>

Mikroplastika v odpadnih vodah pralnega stroja

Avtorjici:

Maja Vidmar, 3.A, Urša Pirc, 3.B

Mentorica:

Alenka Mozer

Somentor:

Dr. Andrej Kržan

Ključne besede:

mikroplastična vlakna, poliester, odpadna voda pralnega stroja

Povzetek:

Plastična mikrovlakna, ki v odpadno vodo pridejo iz pralnega stroja, predstavljajo okoljski problem. Zaradi velike specifične površine se mikroplastike prehajajo v prehrabno verigo. V strokovni literaturi je opisano, kako se mikroplastike v članku s poudarkom na majhnih plastičnih vlaknih odpadkih v pralnem oblačilu.

Mikroplastika v oblačilih

Iva Baša, Teja Zajc in Manca Luštek

Mentorstvo: Goran Pešič in dr. Kostja Makarovič
Šola: Šolski center Novo mesto, Srednja elektro šola in tehniška gimnazija
Doseženo priznanje na državnem srečanju: **SREBRNO**

Povzetek naloge:

Plastika je skupno ime za vrsto sintetičnih in pilsintetičnih materialov, ki jih dobimo s polimerizacijo organskih spojin. Ker je lahka, uporabna in cenovno zelo ugodna njena poraba iz leta v leto narašča. Plastika se v naravi ne razgradi, temveč le razpada na vedno manjše delce. Delce plastike velikosti od 300 mikrometrov do 5 milimetrov imenujemo mikroplastika. Ta je postala sodobno onesnaževalo, ki ga je z naraščajočo proizvodnjo

Students have stormed a science competition with their homemade solutions to chemical analysis

Testing environmental contamination

Fionn built a spectrometer to measure the concentration of [microplastics](#) in water samples. Using a mixture of oil and magnetite, as well as neodymium magnets, he extracted various types of microplastics from water samples as ferro-fluids.



Source: Fionn

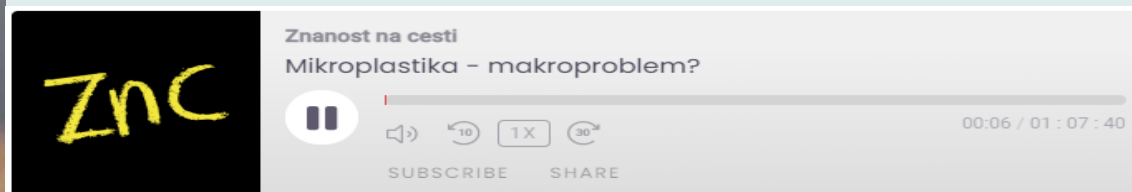
nase obstojna organska onesnaževala, po proizvodnji. Organizmi delce plastike nehoti v okolje sproščajo. Mikroplastika svetu predstavlja veliko grožnjo. Čeprav ne vplivajo na zdravje ljudi, koliko mikroplastike se izloči med pranjem oblačil in pranje perila ter kako mikroplastika vpliva na osnovne

z valjčnim mlinom izvedle simulacijo pranja v pralnem stroju. Suhi preostanek v steklenicah smo analizirali s elektronskim mikroskopu. Največja razlika v masi mikroplastike, ki se prale tkanine smo uporabili tudi za biološki test, kjer smo s pomočjo daljinskega vodikovnega peroksida in ugotovile, da voda

Uporaba domačih in tujih posnetkov in podkastov

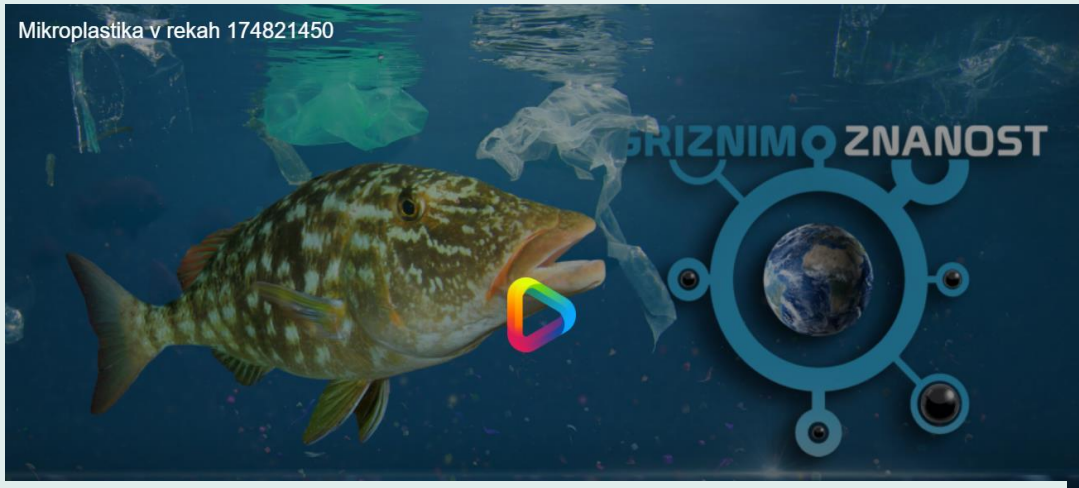


<https://www.youtube.com/watch?v=KpVpJsDjWj8>



<https://znc.si/dogodki/skodelica-znanosti/mikroplastika-makroproblem/>

http://videolectures.net/znanostnacesti_smuc_mikroplastika_makroproblem/



Mikroplastika v rekah

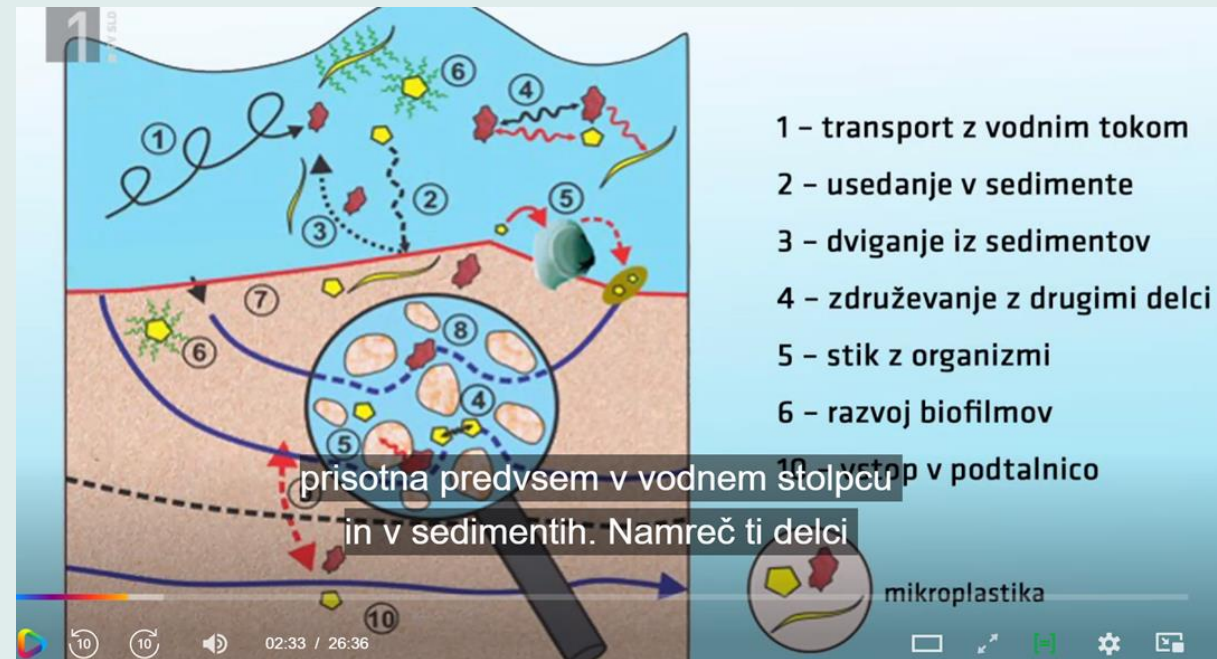
[Ugriznimo znanost](#)- stran oddaje

Trajanje: 26 min

Datum predvajanja: 11. 11. 2021

"Mikroplastika je povsod okoli nas. Ni več kotička, kjer je ne bi našli.

<https://ars.rtv slo.si/2021/11/manca-kovac-virsek/>



Delo z viri ... perspektive

ZNANOST IN TEHNOLOGIJA

Z bakterijami v boj nad mikroplastiko

Hong kong, 28.04.2021, 11:39 | Posodobljeno pred 7 meseci

PREDVIDEN ČAS BRANJA: 3 min

AVTOR
Nuša Stegnar

KOMENTARJI
6



Mikrobiologi so zasnovali trajnosten način odstranjevanja mikroplastike iz okolja in za to delo želijo uporabiti bakterije. Omenjeni izum bi lahko dolgoročno odprl pot trajnostnemu zniževanju ravni onesnaženja s plastiko s preprosto uporabo nečesa, kar najdemo v naravi.

<https://www.24ur.com/novice/znanost-in-tehnologija/z-bakterijami-nad-mikroplastiko.html>

Znanstveniki s pomočjo svetlobe razgradili plastiko

Plastika se je s pomočjo katalizatorja razgradila v šestih dneh

Znanstveniki iz Singapurja so razvili do okolja prijazno metodo, ki s pomočjo umetne sončne svetlobe pretvori plastiko v kemikalije za proizvodnjo elektrike. To bi lahko državam po svetu v prihodnosti pomagalo zmanjšati količino odpadne plastike.



Oglas



Znanstveniki s pomočjo svetlobe razgradili plastiko - RTVSLO.si

Mikroplastika

14.10
13.11.2021



Arktični ocean je poln mikroplastike iz naših sintetičnih oblačil

Arktično morje je polno poliestrskih vlaken, ki so v ocean globoko od severu prpljavala iz odpadnih vode naših pralnih strojev... Preberi članek »

11.10
11.11.2021



Turistični delavci skrbijo za čistejši ledenik

Orežanje s plastiko, še posebej z mikroplastiko, je vse večji svetovni problem. Znanstveniki iz v letih, ko se je močno povečala proizvodnja plastike, odkrili, da se ta ne odloga zgolj v vseh zve... Preberi članek »

<https://www.dnevnik.si/tag/mikroplastika>

„Grozljive“ številke

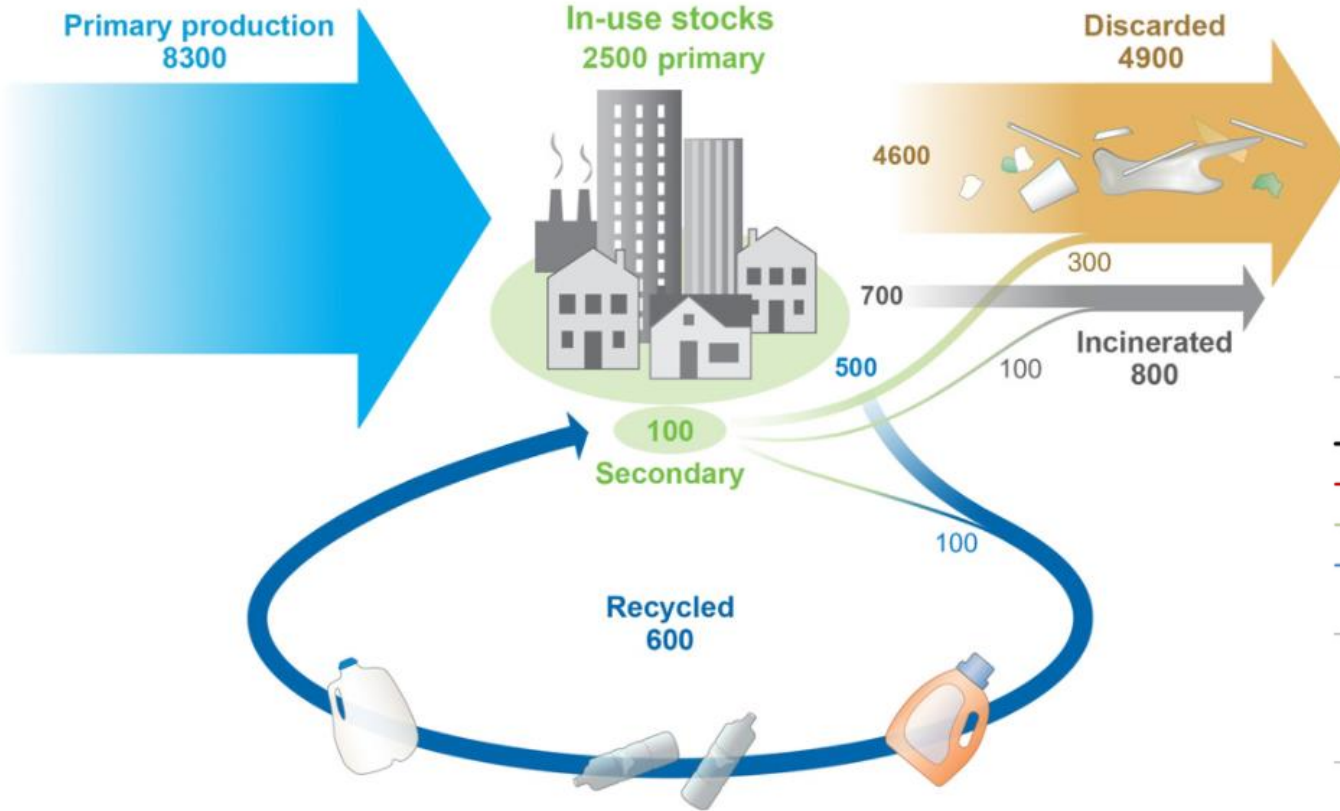
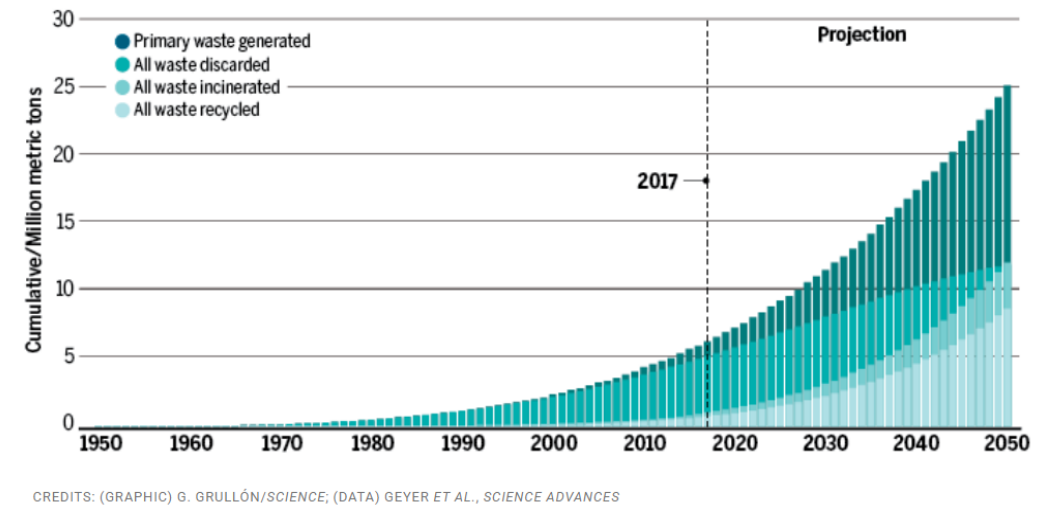


Fig. 2 Global production, use, and fate of polymer resins, synthetic fibers, and additives (1950 to 2015; in million metric tons).

[Production, use, and fate of all plastics ever made \(science.org\):
https://www.science.org/doi/10.1126/sciadv.1700782](https://www.science.org/doi/10.1126/sciadv.1700782)



CREDITS: (GRAPHIC) G. GRULLÓN/SCIENCE; (DATA) GEYER ET AL., SCIENCE ADVANCES

Cumulative plastic waste generation and disposal

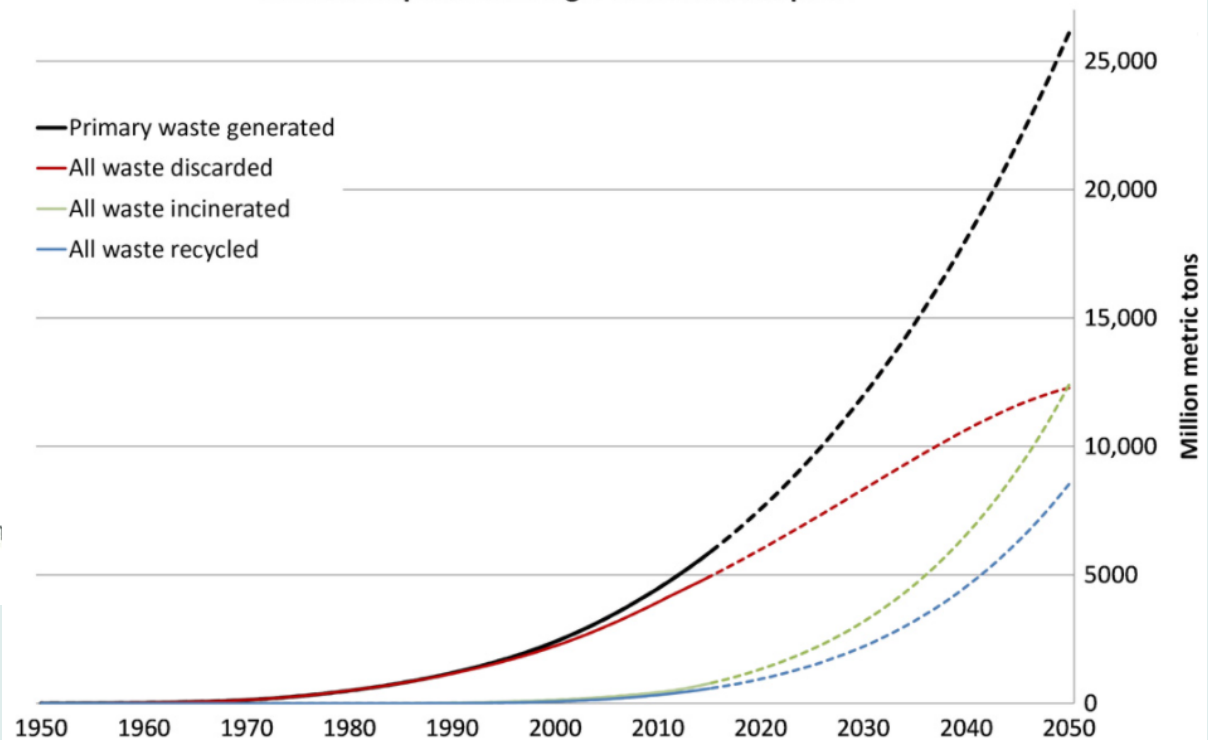
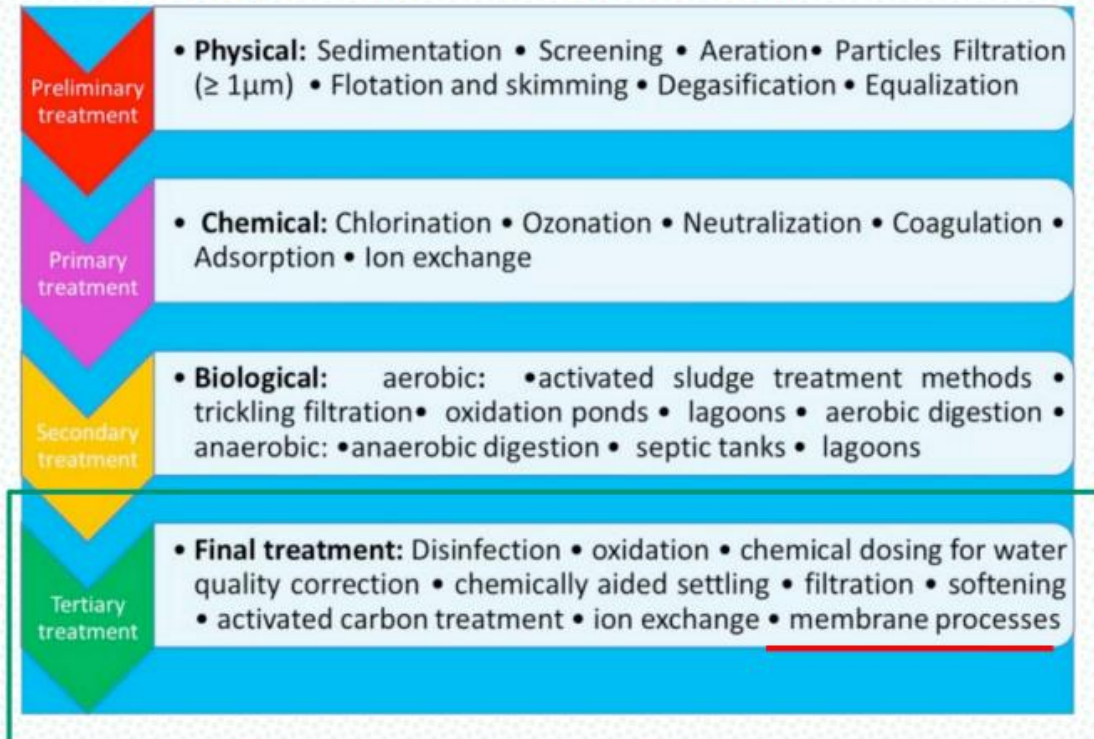


Fig. 3 Cumulative plastic waste generation and disposal (in million metric tons). Solid lines show historical data from 1950 to 2015; dashed lines show projections of historical trends to 2050.

Microplastics Removal

The wastewater processing for plastic pollution can be grouped into four main treatments:

- ✓ preliminary treatment,
- ✓ primary treatment,
- ✓ secondary treatment,
- ✓ and tertiary treatment or advanced treatment.

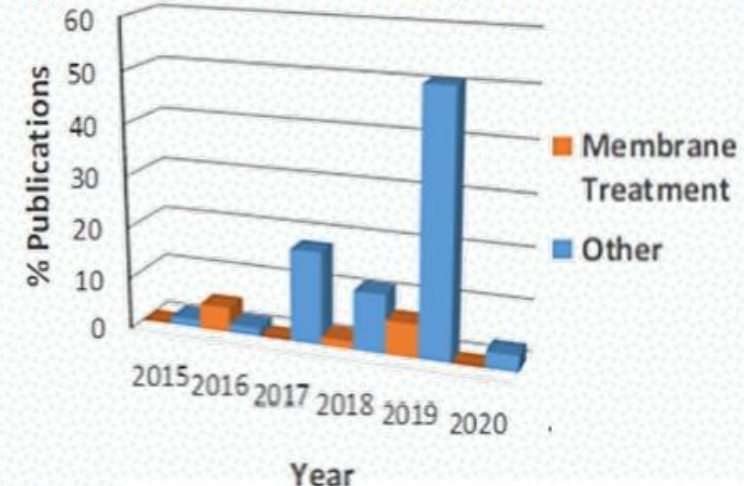


ADVANCED TECHNOLOGIES

The tertiary treatments included different filtering (sand and cloth), flotation techniques and membrane processes.

- ✓ Micro-screen filtration with discfilters (DF)
- ✓ Rapid (gravity) sand filters (RSF)
- ✓ Dissolved Air Flotation (DAF)
- ✓ Membrane bioreactor (MBR)

The distribution of publications related to microplastic contaminant removal from 2015 to 2020.



THE CHEMISTRY OF BIODEGRADABLE PLASTICS

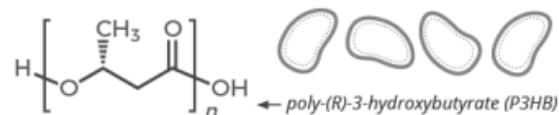
COMMON BIOPOLYMERS & SOURCES

POLYLACTIC ACID (PLA)



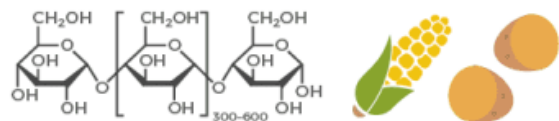
Obtained from fermented plant starch from corn, cassava, sugar cane or sugar beet.

POLYHYDROXYALKANOATES (PHAs)



Extracted from bacteria, which produce it via the fermentation of sugar or lipids.

THERMOPLASTIC STARCHES (TPS)



Starches from plant materials are heated with water, then mixed with plasticisers or other polymers.

EVERYDAY USES OF BIOPOLYMERS



Biodegradable coffee cups are paper cups with a PLA lining to make the paper waterproof.



PLA has the second largest production volume of any biopolymer (behind TPS). It is also used in plastic films, bottles, and food containers.



PLA and TPS both find use in the manufacture of plastic cutlery that's biodegradable.



TPS is also used in food waste bags and some magazine wrappers. PHAs have fewer uses, but have medical uses such as in surgical sutures.

ADVANTAGES AND DISADVANTAGES

GLOBAL PLASTIC PRODUCTION



Use of bioplastics is increasing, but they still account for less than 1% of the global plastics market (as of 2018).

CONDITIONS FOR BIODEGRADING



Compostable plastics need specific conditions to break down – and take much longer to do so completely if they go to landfill instead of being recycled. However, they still break down faster than conventional plastics.



Biodegradable plastics are more expensive than plastics derived from fossil fuels on weight basis, and require land to grow raw materials. However, the greenhouse gas emissions associated with their production are lower.



© Andy Brunning/Compound Interest 2019 - www.compoundchem.com | Twitter: @compoundchem | FB: www.facebook.com/compoundchem
This graphic is shared under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 licence.



Pomen znanja!

POPRAVI

Poškodovan ali pokvarjen izdelek poskusite popraviti.



ZMANJŠAJMO PORABO PLASTIKE KAJ LAHKO NAREDI VSAK IZMED NAS?

Čeprav je problematika odpadne plastike in predvsem njene količine aktualna že desetletje, se količina odpadne embalaže ne zmanjšuje, stopnja recikliranja ostaja nizka, ponovna raba pa izjemno redka. Spodnji krožni model ravnanja z odpadki ponazarja glavna načela za zmanjšanje porabe plastike in možnosti ponovne uporabe.

PREMISLI

Ali izdelek res potrebuje embalažo? Obiščite trgovine, tržnice ipd., ki ponujajo izdelke brez embalaže.



ZAVRNI

Zavrnite nakup izdelka z odvečno oziroma nepotrebno embalažo.



RECIKLIRAJ

Preverite, katere materiale je mogoče reciklirati, in jih odgovorno ločujte.



buy less
waste less

ZMANJŠAJ

Kupujte le, kar potrebujete.



PONOVNO UPORABI

Odsluženemu plastičnemu izdelku poiščite novo vlogo (ptičja krmilnica, vrtnarjenje ...).



INSULATION MADE FROM RECYCLED PLASTIC BOTTLES

REPREVE® IS A TRADEMARK OF UNIFI, INC. RPV-LBT-19-INS



Svetovni dan pravic potrošnikov 2021: Boj proti onesnaževanju s plastiko

Vir: <https://www.zps.si/okolje-topmenu-320/trajnostna-potronja-topmenu-366/10793-svetovni-dan-pravic-potrosnikov-2021-boj-proti-onesnazevanju-s-plastiko>

Hvala za pozornost!

simona.slavic-kumer@zrss.si

andreja.bacnik@zrss.si

Viri in literatura (ki niso navedeni na posamezni drsnici):

- Skvarč, M., et al. (2011). Učni načrt. Program osnovna šola. Naravoslovje. Ljubljana: Ministrstvo za šolstvo in šport: Zavod RS za šolstvo.
- Vilhar, B., et al. (2008). Učni načrt biologija: gimnazija: splošna gimnazija. Ljubljana: Ministrstvo za šolstvo in šport: Zavod RS za šolstvo.
- Vilhar, B., et al. (2011). Učni načrt. Program osnovna šola. Biologija. Ljubljana: Ministrstvo za šolstvo in šport: Zavod RS za šolstvo.
- Bačnik, A., et al. (2011). Učni načrt. Program osnovna šola. Kemija. Ljubljana: Ministrstvo za šolstvo in šport: Zavod RS za šolstvo.
- Bačnik, A., et al. (2008). Učni načrt kemija: gimnazija: splošna gimnazija. Ljubljana: Ministrstvo za šolstvo in šport: Zavod RS za šolstvo.