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Editorial

THROWN PLASTICS – CAUSE OF AN INCOMING GLOBAL DISASTER

All of us use different types of plastics every day. Many of us use several plastic carry bags regularly during marketing and after reaching home, we usually discard them. A huge quantity of plastic is used as packaging material just to attract us. The plastic packets, dishes, water bottles, foams and most of the other plastics are used only for single time. We do not bother about any appeal of the Government or any other bodies to control the use of plastics. Due to such casual approach, our entire civilization is perhaps approaching towards extinction.

Besides the radioactive waste produced by atomic plants and carbon monoxide, carbon dioxide and some other dangerous gases emitted due to the burning of hydrocarbon fuel, the next threat to our civilization is from the continuous deposition of non-biodegradable plastics on the surface of the earth. The land, the sea surface, the sea bottom, the mountain valleys, the poles - no region is now devoid of plastics (Pattanayak 2007).

Plastic : a very popular item

The benefits of plastic are undeniable. Plastics are cheap, lightweight and easy to give required shape. These qualities have led to a boom in the production of plastic over the past century (UNEP 2018).

Qualities like good gas and moisture barrier properties, high heat and chemical resistance, opacity, toughness, transparency, solvent resistance, waxy surface, strong tough and flexible nature etc. are attributed to different types of plastics.

Plastic packaging accounts for about half of the plastic waste in the world. Most of this waste is generated in Asia, while America, Japan and the European Union are the world's largest producers of plastic packaging waste per capita (UNEP 2018).

Production of plastics

Plastics are petroleum-based products. These are produced in various forms. The basic principle of production of plastic is the conversion of natural gas or crude oil components into monomers like ethylene, propylene, butane, styrene etc. in presence of catalysts. Then, the monomers are chemically bonded to a chain termed as polymer. Different combinations of monomers along with different additives (Chlorine, Nitrogen, Fluorine, Oxygen etc.) and color materials are used to prepare different types of plastics (Pattanayak 2007).

Type of plastics and their use

There are many types of plastics. Among them, polyethylene is the form of plastic that is used for production of polythene bags. Many kinds of polyethylene can be made from ethylene. The commonly used plastic bags are made from one of three basic types: high-density polyethylene (HDPE), low-density polyethylene (LDPE), or linear low-density polyethylene (LLDPE). The low-density polyethylene (LDPE) form of plastic is used to prepare common plastic carry bags and also used in packaging of frozen foods, fruit juices and milk cartons etc. High-density polyethylene (HDPE) is generally used for production of buckets, bowls, cups, plates, packets for cement and fertilizers, large sized bottles. It is also used in making milk containers, detergent bottles, refrigerators, toys, various types of plastic grocery bags etc.

Poly vinyl chloride (PVC) is used for production of Rexene, shoe soles, toys, pipes, tubing, blood and plasma transfusion bags etc. Polycarbonate (PC) is used to produce baby feeding bottles, large water bottles etc. The thermo set poly urethane (P.U.) is used to produce all types of foams. Polypropylenes (PP) are used to prepare packaging materials for edible items, luggage carrier and textile cones. Polyethylene terephthalate (PET) is used to prepare bottles for many purposes (Pattanayak 2007).

Plastic additives

Plastic additives are some chemicals used to add certain properties to the plastics. The main plastic additives are Bisphenol A, Phthalates, Brominated Flame Retardants and some Heavy Metals.

Handling of plastic as waste

Our ability to handle plastic waste effectively is already overwhelmed. Only nine per cent of the nine billion tons of plastic the world has ever produced have been recycled. Most ends up in landfills, dumps or in the environment. If current consumption patterns and waste management practices continue, then by 2050 there will be around 12 billion tons of plastic litter in landfills and the environment (UNEP 2018).

Toxicity of plastics

Direct toxic effects of plastics:

During production and use

All types of plastic require a huge amount of mineral oil for their production and transportation. As estimated, if the growth of plastic production continues at its current rate, then the plastic industry may account for 20 per cent of the world's total oil consumption of 2050 (UNEP 2018).

The process of plastic synthesis causes depletion of hydrocarbon fuel storage at a high rate and production of many dangerous gases. Many other dangerous gases are produced during production of usable form of plastics from the raw plastics. Only polyurethane (P.U) consume 11 percent of total production of chlorine and 85 percent of total production of dangerous 'Phosgene' gas of the world during its formation. Always there is a chance of occupational hazards of workers, environmental pollution and death of a huge number of humans, animals and plants due to accidental leakage and spread of by-products. Plastics themselves are also toxic, and the key of their toxicity remains in the history of their production (Pattanayak 2007).

Plastics are the product of polymerization of several types of plastic monomers. Almost all such monomers that make up plastics are carcinogenic, mutagenic as well as disruptive of the normal functions of the endocrine system of our body. As the polymerization process cannot be made perfect at any time, so some toxic monomers are always present in the plastics. Beside these loose monomers, many other toxic materials are also present in the plastics. The colour materials (mainly Lead and Cadmium based pigments), plastic additives and other chemicals like foaming agents, plasticisers etc. which are used during preparation of various types of plastics and remain in it as a part, are very much toxic and most of them are carcinogenic. They all remain poorly bonded with the plastic polymers and tend to leach out and mix with the adhered materials when come in contact (Pattanayak 2007).

Many plastics can cause severe health hazards. As for example - Styrofoam products, which contain carcinogenic chemicals like styrene and benzene, are highly toxic if ingested. It can damage the nervous systems, lungs and reproductive organs. The toxins in Styrofoam containers can leach into food and drinks kept in it (UNEP 2018).

Toxicity of plastic additives

A wide range of additives are used in plastics, but the following additives are the most relevant to ecology and human health.

Bisphenol A

This monomer is used to prepare hard and clear plastics. It is used in polycarbonate made food and beverage containers and many other consumer products. It is very toxic. It acts as an endocrine disruptor and show activity like the female hormone estrogen. It leaches in variable amounts and mix with the contents. The leaching is dependent on the product and conditions, *i.e.* it is released more easily at higher temperatures and with changes in acidity.

Along with effects on endocrine chain of the body, evidences are found for association of it with chronic diseases, including cardiovascular diseases and Type 2 diabetes and even hormonal changes in adults (Lang *et al.* 2008, Galloway *et al.* 2010, Melzer *et al.* 2010).

Phthalates (diesters of 1, 2 – benzene dicarboxylic acid)

These are a group of industrial chemicals used as plasticizers, which make plastics more flexible or resilient. Phthalates are among them. Phthalates are extremely widespread and are found in items including toys, food packaging, hoses, raincoats, shower curtains and vinyl flooring. High-molecular weight phthalates [*e.g.* di (2-ethylhexyl) phthalate, DEHP] are primarily used as plasticizers, but the low-molecular weight phthalates (*e.g.* diethyl phthalate, DEP) are used as solvents in personal-care products.

Certain phthalates have been shown to function as endocrine disruptors, and to have anti-androgenic activity. They are not chemically bound to the plastic matrix and so they can easily leach out of products to contaminate the environment (Talness *et al.* 2009, Meeker *et al.* 2009). There are experimental evidences of negative impacts of phthalates on reproductive system of animals and these resemble human reproductive disorders, especially testicular dysgenesis syndrome, indicating a possible link between phthalate exposure and human disease. However, the dosages in animal study are likely to be much higher than exposure levels to humans. But studies are performed for limited periods only, which may not represent the actual detrimental effects of slow and continuous intake of these chemicals. Links have also been found between exposure to phthalates with obesity and allergies.

Brominated flame retardants

These are added with plastics mainly for safety reasons. As example, polybrominated diphenyl esters

(PBDEs) and tetra-bromo-bisphenol A (TBBPA) are added to a variety of consumer products, including textiles and thermoplastics used in electronics (*e.g.* televisions and computers). Throwing of such materials outside after use is dangerous, as it increases the chance of their toxicity much more. Studies indicate that PBDEs and TBBPA have hormone-disrupting effects, in particular on estrogen and thyroid hormones, and that exposure to PBDEs impairs development of the reproductive and nervous system (European Commission 2011).

Metals

All heavy metals are toxic to our health and many are used in plastics. As example, cadmium is used in plastics, especially in children's toys and in plastic crates and pellets. Waste plastic components of mobile phones have also been found to contain lead, cadmium, nickel and silver (Nnorom and Osibanjo 2009).

Indirect toxic effects of plastics

Effect on human health

Plastic bags can block waterways and can exacerbate natural disasters. By creating blockages in drains and providing breeding grounds for mosquitoes and pests, plastic bags can increase the transmission of vector-borne diseases like malaria (UNEP 2018). Thrown plastic packets and utensils may be the actual cause of spread of many other important vector-borne diseases like Dengue, Chikungunya etc.by providing breeding place of the vectors.

Various components are used in plastics and some are already detected inside our body. Components such as phthalates, bisphenol A (BPA), polybrominated diphenyl ethers (PBDE) and tetra-bromo-bisphenol A (TBBPA) are detected in humans. These chemicals are having the ability to alter our endocrine system. Phthalates can function as anti-androgens; BPA is having estrogen-like activity. PBDE and TBBPA can disrupt thyroid hormone homeostasis and PBDEs can also exhibit anti-androgen actions (Talsness *et al.* 2009).

Effect on animals

Animals can not differentiate cellulose and plastics, so generally engulf plastics as or with foods. It may be a cause of esophageal obstruction, but generally the plastics show most toxicity after reaching the stomach of the animals.

Among herbivorous animals, after the accumulation of plastic packets in the first part of stomach (rumen) reaches a certain limit, the affected animal suffers acute tympanites, which does not respond to any type of carminative or purgative drugs. It leads to starvation. The actual reason remains undiagnosed in almost all the cases and the ultimate fate of such animal is death after chronic suffering (Pattanayak 2007).

Fig. 1. Tolley Canal, Kolkata, India.

Animals get different types of toxins from and with plastics. Apart from direct eating of plastics, food stored in plastic packets, water in plastic containers, decomposed food items in thrown plastic packets etc. are the other main sources. Accumulation of many types of chemicals inside the body could affect the normal functioning of a cell, tissue or organ of animals. The absorption of lead and cadmium-based toxic coloring materials, additives and the toxic monomers of the plastic packet etc. can not only cause toxicity in animals, but they can reach human through consumption of milk and meat (Pattanayak 2007). There is evidence that the toxic chemicals added during the manufacture of plastic transfer to animal tissue, eventually entering the human food chain (UNEP 2018).

Effect on marine life

High concentration of plastic materials, particularly plastic carry-bags, has been found blocking the airways and stomach of hundreds of species living in the marine environment. Plastic bags are often ingested by turtles and dolphins mistakenly as food (UNEP 2018). Other major marine sources of the plastics are the abandoned or lost fishing nets and pots, plastic packing loops, six-pack carriers and plastic rope. Ghost fishing by such abandoned nets can trap and kill fish, which can reduce catches for fisheries (Derraik 2002, Gregory 2009).

UNEP (2006) claims that plastic waste causes the death of up to a million seabirds, 100,000 marine mammals and countless fish through various impacts. Laist (1997) reported that at least 267 different marine species are known to have suffered from impacts of plastic waste. This includes 86 per cent of all sea turtle species, 44 per cent of all seabird species and 43 per cent of all marine

Fig. 2. A pond of Brindabanchak, West Bengal, India.

mammal species. This is likely to be an underestimate as the list was prepared more than twenty years ago and there may be a large number of other species which were perhaps not studied and so their impacts were not included.

Plastics in the sea: collection and transport of other contaminants by plastic waste

Many of the hydrophobic contaminants are concentrated at sea surface and their levels are up to 500 times greater than in the underlying water column (Wurl and Obbard 2004). As most plastics float in sea water, they have the potential to adsorb these contaminants that are concentrated at the sea surface. The plastics can either transport the contaminants to other areas and, if washed up, the contaminants could be transferred to shoreline sediment (Teuten *et al.* 2007). Otherwise, the plastics could be eaten by wildlife and potentially transferred to their tissues and further up the food chain. Plastic could be subject to fouling and then sink to the bottom where it becomes part of the sediment or is eaten by benthic organisms that live on the sea bottom (European Commission 2011).

Impact on economy

Plastic wastes cause a huge economic damage. Plastic litter in the Asia-Pacific region alone costs its tourism, fishing and shipping industries $1.3 billion per year. In Europe, cleaning plastic wastes from coasts and beaches costs about •630 million per year. Studies suggest that the total economic damage to the world's marine ecosystem caused by plastic amounts to at least $13 billion every year (UNEP 2018).

Micro and Nano plastics and their effect on environment and human health

Micro plastic may be described a heterogeneous mixture of differently shaped materials referred to as fragments, fibers, spheroids, granules, pellets, flakes or beads, in the range of 0.1–5,000 µm. Micro plastics may be categorized as primary or secondary. Primary microplastics are plastics that were originally manufactured to be that size while secondary microplastics originate from fragmentation of larger plastic items like plastic debris (EFSA 2016).

Nano plastics can be defined as a plastic with any external dimension, internal structure or surface structure in the nano scale (0.001–0.1 µm). These can be produced during fragmentation of micro plastic debris and also can originate from engineered materials used, as in industrial processes (EFSA 2016).

It is estimated that at least 5 trillion pieces of plastics are floating in the oceans of the world. Out of this, over 90% are believed to be micro plastics (Eriksen *et al.* 2014).

Micro and nano plastics are likely to originate from other sources than the food itself. The main sources are processing aids, water, air or release from machinery, equipment and textiles. It is possible that the amount of micro plastics increases during processing. The effect of other processes like cooking and baking on the content of plastics is not known (EFSA 2016).

Microplastics can contain on an average 4% of additives and the plastics can also adsorb contaminants. Both additives and contaminants can be of organic or inorganic in nature. The main plastic additives and adsorbed contaminants comprise phthalates, bisphenol A, polybrominated diphenyl ethers, polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs) (EFSA 2016).

The characteristic high surface area to volume ratio of nano plastics may add to their potential hazardous effects, as other contaminants like organic pollutants, could be adsorbed and undergo bio-accumulation and bio-amplification (Da Costa *et al.* 2016). In a recent study, it was found that some of the nano-plastics caused damage to the DNA and cell membranes and produced oxidative stress in *Mytilus galloprovincialis,* a consumable mussel for human (Teles 2018).

Nano plastics can have a bigger capacity to concentrate toxic compounds either associated with its production or adsorbed from the environment. Indications suggest that nano plastics carry more toxins than micro plastics. Nano plastics can also carry more microorganisms (Mendoza *et al.* 2018).

The study on micro and nano plastics in the marine environment is attracting more attention due to their potential impact in sea organisms and humans. Human being generally does not eat digestive tract of the fishes, but fish meal prepared from whole fishes is used as feed ingredient in poultry production and pig rearing. So, micro plastics may end up in non-marine foods also (EFSA 2016).

Presence of micro and nano plastics in food prepared for human consumption and in air samples has been reported (Wright and Kelly 2017). Micro plastics on land and in the air are not studied as frequently as in aquatic environments. Evidence suggests that micro plastics can occur in terrestrial habitats and is present in the atmosphere. At least some micro plastics are able to pass through wastewater treatment plants (Nalbone 2015), a portion of the plastics are retained in the sewage sludge. If such contaminated sludge is applied to land (*e.g.* in agriculture), then micro plastics may spread in terrestrial environments (Rillig 2012). Micro plastics fibers were detected at an abundance of 29 to 280 particles/m^2/day on an urban rooftop as a consequence of atmospheric fallout (Gasperi *et al*. 2015). Plastic fibers (*i.e*. polyester) have been found in human lung tissue also (Pauly *et al.* 1998).

Micro and nano plastics can induce physical damage through particles itself and biological stress through them or with leaching additives (inorganic or organic) (Revel *et al.* 2018).

If inhaled or ingested, micro plastics may accumulate and cause localized particle toxicity by inducing or enhancing an immune response. Chemical toxicity might occur due to the localized leaching of component monomers, additives and adsorbed environmental pollutants. Chronic exposure might be of greater concern due to the accumulative effect of the micro or nano plastics. That may be dose dependent, but report of exhaustive study on that subject is not available (Wright and Kelly 2017).

As per some recent reports, nano-plastics are perhaps entering inside human body from different food chains, drinking water, other food items like honey, beer, salt etc. (Revel *et al.* 2018).

Nano plastics in drinking water

In a global survey of tap water taken from six regions on five continents, it was found that 83% of the samples contain plastic particles. Most these (99.7%) particles were fibers between 0.1 - 5 mm in length. The range was between 0 and 57 particles per liter. Availability of plastic particles in water samples were Beirut (94%), Europe (72%), Jakarta (76 %), Kampala (81%), U.S.A. (94%), Quito (75%). On an average, annual 'drinking' rate of plastic particles are over 4,000 for men and over 3,000 for women (Kosuth *et al.* 2017).

Dumping of pollutants by plastics

Teuten *et al.* (2007) found that pollutants adsorbed by the plastics at a much higher rate than that of natural sediments. The release of the pollutant occurs more rapidly from sediments than from plastics. It means that the plastics act like a sink for the pollutants by lessening their availability to the environment. It also means that plastics increase their lifetime in the environment by hindering their disposal by natural means, such as microbial degradation.

Thus, the use of plastic may be considered as synonymous with bringing pollution to the environment and accumulating poisons inside the living bodies (Pattanayak 2007).

Destruction of plastics

Most plastics do not biodegrade at all. Instead, they slowly break down into smaller fragments -microplastics. Studies suggest that plastic bags and containers made of expanded polystyrene foam (commonly referred to as "Styrofoam") can take up to thousands of years to decompose even after contaminating soil and water (UNEP 2018).

Burning

In many countries, plastic waste is often burned for destruction, heat or cooking. Disposing of plastic waste by burning it in open-air pits releases harmful gases like furan and dioxin (UNEP 2018). So, burning of plastics is equivalent to exposing people to emissions of toxic gases. It is not at all a way to get rid of the gathered or used plastics.

Recycling of plastics – Indian context

Only a few types of plastic can be recycled maximum another two or three times. But practically, a very small portion of used plastics are recycled. During recycling, many toxic gases are emitted, and the quality of the recycled plastics is always worse than the original one. The process is also not economically feasible in most of the time.

So, almost all plastics are manufactured to remain as a source of continuous threat to the civilization (Pattanayak 2007).

Condition in India

In India, nobody perhaps practically aware about the dangerous roles of plastics played. Almost everybody forgot the old habit of carrying bag from home to the market. The thin plastic packets carrying individual items are generally gathered in another large sized plastic packet during marketing. The old system of use of disposable plates made from the leaves of Shal [*Shorea robusta* Roth. (Family: Dipterocarpaceae)] at parties, festivals, feasts and also for family use are replaced by disposable plastic plates. All such plastics are thrown just after single use in the ponds, lakes, canals, rivers or drains. Practically, almost all the canals of urban India are already converted to some open drains to carry all the biological, chemical and physical effluents gathered with different types of plastics to the rivers and then to sea. Underground water is considered as the only source of water to use in each and every purpose and the waste water is carrying the thrown plastics along with other effluents in this way (Fig. 1). In the rural areas, the ponds are converted to a dumping area of all of these (Fig. 2).

Recycling of plastic is not a very common practice in India. In the countries like India, it is hazardous for health of the people who are engaged in collection of thrown plastics from dirty dustbins and also work in the small, unlicensed factories of recycling.

International guideline for use of plastics

Given the broad range of possible actions to curb single-use plastics and their mixed impact, United Nations has drawn up a 10-step roadmap for all governments.

1.Target the most problematic single-use plastics by conducting a baseline assessment to identify the most problematic single-use plastics, as well as the current causes, extent and impacts of their mismanagement.

2.Consider the best actions to tackle the problem (*e.g.* through regulatory, economic, awareness, voluntary actions), given the country's socio-economic standing and considering their appropriateness in addressing the specific problems identified.

3.Assess the potential social, economic and environmental impacts (positive and negative) of the preferred short-listed instruments/actions. How will the poor be affected? What impact will the preferred course of action have on different sectors and industries?

4.Identify and engage key stakeholder groups – retailers, consumers, industry representatives, local government, manufacturers, civil society, environmental groups, tourism associations – to ensure broad buy-in. Evidence-based studies are also necessary to defeat opposition from the plastics industry.

5.Raise public awareness about the harm caused by single-used plastics. Clearly explain the decision and any punitive measures that will follow.

6.Promote alternatives. Before the ban or levy comes into force, assess the availability of alternatives. Ensure that the pre-conditions for their uptake in the market are in place. Provide economic incentives to encourage the uptake of eco-friendly and fit-for-purpose alternatives that do not cause more harm. Support can include tax rebates, research and development funds, technology incubation, public-private partnerships, and support to projects that recycle single-use items and turn waste into a resource that can be used again. Reduce or abolish taxes on the import of materials used to make alternatives.

7.Provide incentives to industry by introducing tax rebates or other conditions to support its transition. Governments will face resistance from the plastics industry, including importers and distributors of plastic packaging. Give them time to adapt.

8.Use revenues collected from taxes or levies on single-use plastics to maximize the public good. Support environmental projects or boost local recycling with the funds. Create jobs in the plastic recycling sector with seed funding.

9.Enforce the measure chosen effectively, by making sure that there is clear allocation of roles and responsibilities.

10.Monitor and adjust the chosen measure if necessary and update the public on progress. (UNEP 2018).

Yes, guideline is there, rules are also there.

But can we be able to change our vice of unnecessary use and throwing of plastics from today?

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REFERENCES

Da Costa PJ, Santos PSM, Duarte ADC, Rocha-Santos TAP (2016) (Nano)plastics in the environment – sources, fate and effects. Sci Total Environ 566-567: 15-26.

Derraik GB (2002) The pollution of the marine environment by plastic debris: a review. Marine Polluti Bull 44: 842-852.

European Commission (2011) Plastic waste: ecological and human health impacts. Science for environment policy**.** http://ec.europa.eu/environment/integration/research/newsalert/indepth_reports.htm. Accessed on 21.08.2018.

EFSA Panel on Contaminants in the Food Chain (CONTAM) (2016) Presence of microplastics and nano-plastics in food, with particular focus on seafood. EFSA J 14(6): 4501.

Eriksen M, Lebreton LC, Carson HS, Thiel M, Moore CJ, Borerro JC *et al.* (2014) Plastic pollution in the world's oceans: More than 5 trillion plastic pieces weighing over 250,000 tons afloat at sea. PloS One 9: e111913.

Galloway T, Cipelli R, Guralnik J,Ferrucci L, Bandinelli S, Corsi AM, Money C, McCormack P, Melzer D (2010) Daily Bisphenol A excretion and associations with sex hormone concentrations: results from the InCHIANTI adult population study. Environ Hlth Perspect 118: 1603-1608.

Gasperi J, Rachid D, Rocher V, Tassin B (2015) Microplastics in the continental area: an emerging challenge. Norman Bullet 4: 18-19.

Gregory MR (2009) Environmental implications of plastic debris in marine settings – entanglement, ingestion, smothering, hangers-on, hitch-hiking and alien invasions. Philosophic Transacti Royal Soc B 364: 2013-2025.

Kosuth M, Wattenberg EV, Mason SA, Tyree C, Morrison D (2017) Synthetic Polymer Contamination in Global Drinking Water. https://orbmedia.org/stories/Invisibles_final_report. Accessed on 18.09.2018.

Laist DW (1997) Impacts of marine debris: entanglement of marine life in marine debris including a comprehensive list of species with entanglement and ingestion records. In: Coe JM and Rogers DB (Eds.) Marine Debris - Sources, Impacts and Solutions. Springer-Verlag, New York. 99-139.

Lang IA, Galloway TS, Scarlett A,Henley WE, Depledge M, Wallace RB, Melzer D (2008) Association of urinary Bisphenol A concentration with medical disorders and laboratory abnormalities in adults. J Americ Medic Assoc 300(11): 1303-1310.

Meeker JD, Sathyanarayana, S, Swan SH (2009) Phthalates and other additives in plastics: human exposure and associated health outcomes. Philos Trans R Soc Lond B Biol Sci 364: 2097-2113.

Melzer D, Rice NE, Lewis C, Henley WE, Galloway TS (2010) Association of urinary Bisphenol A concentration with heart disease: evidence from NHANES 2003/06. PLoS One 5(1): e 8673.

Mendoza LMR, Karapanagioti H, Álvarez NR (2018) Micro (nano) plastics in the marine environment: Current knowledge and gaps. Current Opini Environmental Sci Health 1: 47-51.

Nalbone J (2015) Discharging microbeads to our waters: an examination of wastewater treatment plants in New York. Environmental Protection Bureau of the New York State Attorney General's Office. Available at: http://www.ag.ny.gov/pdfs/2015_Microbeads_Report_FINAL.pdf. Accessed on 26.7. 2018.

Nnorom IC, Osibanjo O (2009) Toxicity characterization of waste mobile phone plastics. J Hazardous Materi 161: 183-188.

Pattanayak S (2007) Some aspects of plastic pollution. Livestock International 11(3): 21-23.

Pauly JL, Stegmeier SJ, Allaart HA, Cheney RT, Zhang PJ, Mayer AG, *et al.* (1998) Inhaled cellulosic and plastic fibers found in human lung tissue. Cancer Epidem Biomarkers Prevention 7: 419-428.

Revel M, Chatel A, Mouneyrac C (2018) Micro(nano)plastics: a threat to human health? Current Opinion Environmental Sci Hlth 1: 17-23.

Rillig MC (2012) Microplastic in terrestrial ecosystems and the soil? Environ Sci Technol 46: 6453-6454.

Teles M (2018) First time observation of genetic/ physiological damage caused by nanoplastics in mussels. Autonomous University of Barcelona, July 26, 2018, availability of https://m.phys.org. Accessed on 01.11.2018.

Talsness CE, Andrade AJM, Kuriyama SN, Taylor JA, Vom Saal FS (2009) Components of plastic: experimental studies in animals and relevance for human health. Philos Trans R Soc Lond B Biol Sci 364(1526): 2079-2096.

Teuten EL, Rowland SJ, Galloway TS, Thompson RC (2007) Potential for plastics to transport hydrophobic contaminants. Environ Sci Technol 41: 7759-7764.

United Nations Environment Programme (UNEP) (2006) Ecosystems and biodiversity in deep waters and high seas. UNEP regional seas reports and studies No. 178. UNEP/ IUCN, Switzerland. 50-54.

United Nations Environment Programme (UNEP) (2018) Single-use plastics: a roadmap for sustainability. Available at : www.unenvironment.org/resources/report/single-use-plastics-roadmap-sustainability. Accessed on 18.08.2018.

Wurl O, Obbard JP (2004) A review of pollutants in the sea-surface microlayer (SML): a unique habitat for marine microorganisms. Mar Pollut Bull 48: 1016-1030.

Wright SL, Kelly FJ (2017) Plastic and Human Health: A Micro Issue? Environ Sci Technol 2051(12): 6634 -6647.

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