Toxics Link
for a toxics-free world

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TOXICS Dispatch

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EDITOR'S DESK

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Associate Director, Toxics Link

Dear Readers,

We are happy to reach out to you with another edition of Dispatch.

In India, we are so used to seeing plastic litter across urban and rural spaces, in lakes, rivers, forests, and beaches. This plastic litter is a major environmental concern due to its non-degradability and inherent toxicity. This material persists in the environment for hundreds of years, in visible and invisible forms (micro-plastics), and leaches multiple "chemicals of concern" into the environment. Its presence in marine ecology is gradually being recognised as a severe threat to aquatic life and a source of global pollution. Over the years, this material is becoming omnipresent across all geographies, even in Arctic snow and in all mediums. While many reports point toward oceans as the ultimate sink for plastics, new data also points towards increased presence in soil. There is growing evidence of microplastics in different parts of the human body, which is highly concerning. The impacts of this are still being studied and investigated by scientific institutions. Unfortunately, it has taken the world community too long to act and arrest the growing effects of plastic pollution.

With the support comity of nations, UNEP has started to work towards a globally binding instrument to address the concerns arising on plastic pollution and is expected to be finalised by 2024, providing guidance and direction in dealing with this issue of plastic pollution.

Lately, the Government of India has announced a blanket ban on nineteen products classified as single-use plastic, including items such as earbuds, balloon sticks, straws, amongst others, which comes into effect from 01 July. This ban is a welcome step and must be implemented effectively, though the previous record of bans was not much effective. In consultation with all stakeholders, the government must explore more options to reduce and minimise the impacts of plastic pollution in India. We need to act together decisively, to combat this threat of plastic pollution that has spread far and wide in our country.

I would like to highlight two crucial global environmental events that brought together nations in Geneva to deliberate on critical environmental issues: the Conference of Parties on Minamata and BRS (Basel, Rotterdam, and Stockholm Conventions). Toxics Link, as a member of the civil society, participated and contributed to these conventions for years. Significant outcomes and decisions have been covered in this issue of Toxics Dispatch.

It has been extremely worrying to observe long spells of extreme heat in parts of Northern India and also the devastation caused due to excessive rainfall in the North-East part of the country; these are grim reminders for us to act to protect our biodiversity. The impact of such changes is most felt by the poor and marginalised sections of society, who have little say in driving change or mitigation strategies. The nation celebrated World Environment Day on 05 June, making many promises to control and reduce environmental degradation. The time to act is now, both individually and collectively to conserve our environment.

Wishing you all the best!

Bioplastics and its Future

Dr Amit, Programme Coordinator, Toxics Link

Plastic is found practically everywhere across the world, including everyday household items such as bottles, cell phones, laptops, eye specs, printers, amongst others. It is also used in various industries, from pharmaceuticals to automobiles. In 2020, global plastics production was expected to reach 367 million metric tonnes. The effects of the COVID-19 pandemic on the industry caused production to drop by about 0.3 percent in 2020 compared to the previous year (Statista 2022). The incredible versatility of this group of materials accounts for the continued growth in production year after year. In tandem with that growth, the market value of plastics also continues to grow.

Recently, plastic-waste-related environmental concerns have been gaining attention. According to the survey conducted by the United Nations Environment Programme (UNEP), over 3.80×10^8 tonnes of plastic is produced globally every year, of which about one-third of its production is non-recyclable. Up to 50% of them are for single-use purposes, in other words, used for just a few moments, but on the planet, it lasts for at least several hundred years[1]. On top of that, one of the major concerns is the presence of plastic wastes in the marine environment[2]. More than 8.3×10^9 tonnes of plastic have been produced since the early 1950s. Only around 9% of produced plastics had been recycled, 12% were incinerated, and 79% were accumulated in landfills

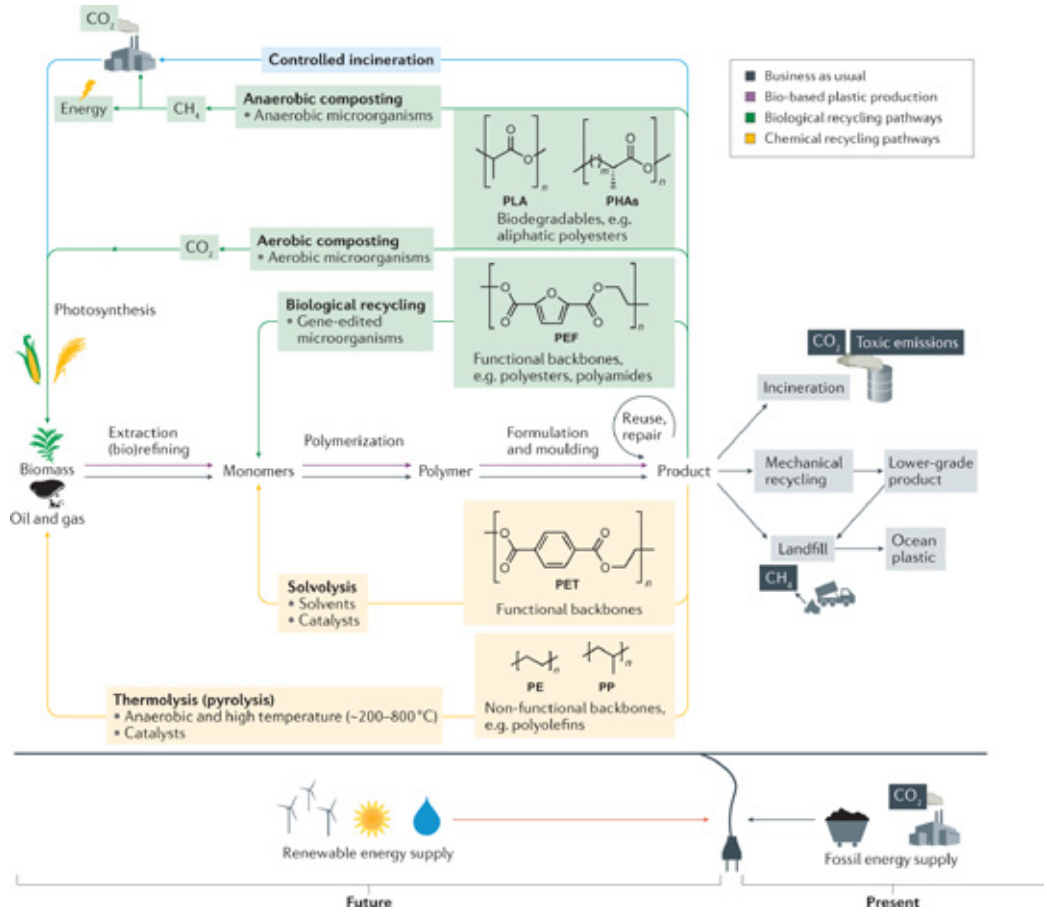
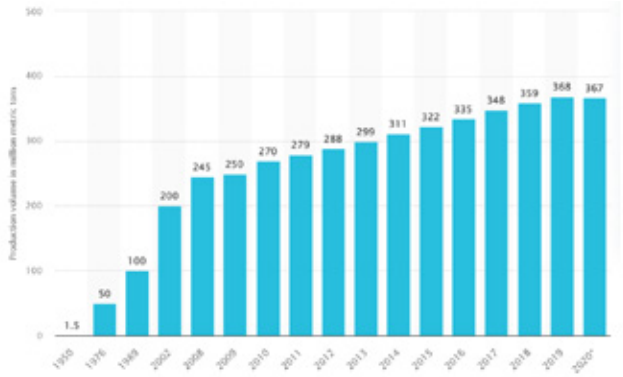


Figure 1: The circular plastic economy

or sloughed off into the natural environment (most of them ended up in the oceans)[1].

The plastic threat to marine species has been growing in recent years. Marine species have been sighted entangled in loops or openings of floating and submerged debris. As plastic is commonly mistaken for normal prey items, an extensive range of marine species consume plastic of various sizes (micro, macro, or both), resulting in system failure and, in some cases, death. For example, turtles are susceptible to plastic ingestion because they have trouble distinguishing between white plastic and jellyfish. The ingestion of plastic results in a continuous negative effect as a carnivorous diet leads to secondary ingestion of plastic contained in its prey passing on from one marine life to another. The majority of cases are sublethal with chronic effects that have long-term consequences. It can result in clogging of the intestinal tract, restriction of gastric enzyme secretion, suppressed hunger, decreased steroid hormone levels, delays in ovulation, and failure to reproduce[3,4]. Some studies claim humans might be at risk of consuming plastic-contaminated fishing products, e.g., oysters and mussels[5]. Consequently, plastics have become a significant environmental concern.

Annual production of plastics worldwide from 1950 to 2020 *(in million metric tons)*



THE SUSTAINABLE ALTERNATIVE – BIOPLASTICS

Bioplastics are plastics derived from renewable biological sources such as plants, bacteria, and algae that may be decomposed by soil microorganisms such as fungi and bacteria without releasing pollutants. Bioplastic is a broad phrase that can be broken down into three categories:

1. **Bio-based (i.e., from biogenic feedstock) biodegradable**: These include the bioplastics made out of bio polyesters. Polyethylene (PE), polyethylene terephthalate (PET) and certain polyamides (PA), and polyurethanes (PUR) are included in this category.
2. **Bio-based non-biodegradable**: These include versions like polylactic acid (PLA), polyhydroxyalkanoates (PHA), polybutylene succinate (PBS).
3. **Petroleum-based biodegradable**: These include PCL, PBAT, etc.

Bioplastics are often categorised into two classes based on their chemical structure: drop-in bioplastics and innovative bioplastics. Drop-in bioplastics have the same chemical structure as their fossil-based counterparts, allowing them to be replaced 1:1 and recycled in existing systems. Novel bioplastics are based on unique chemical structures and hence have different properties, allowing for the development of new applications. Bio-based non-biodegradable plastics, such as bio-based polyethylene terephthalate (bio-PET) and bio-based polyethylene (bio-PE), are sometimes called "drop-in" bioplastics because they are chemically and structurally identical to their petroleum-based counterparts despite being made from biogenic resources. These three classes of bioplastics made up roughly 40% of the bioplastic market in 2020 (UNEP 2020).

Bioplastics are a diverse group of biological material-based polymers with their own set of unique characteristics and applications. With new inventions happening in the field, the list is continually expanding. Various standards such as DIN SPEC 91236, ISO 16620, ASTM 6686, and EN 16785 can be used to classify biobased products such as bioplastics. The application of these bioplastics includes food packaging, thin films, medical implants, bags, automotive parts, and usage in construction[6].

FIGURE 2: Degradation of bioplastics © NIP, 2022

Further, using renewable resources in their manufacturing process helps maintain environmental health. Green plastics provide several advantages over petroleum-based plastics,

including non-toxic chemicals, ease of recycling, reduced use of fossil fuels, lower energy requirements, and renewable and environmentally beneficial properties. Bioplastics were first used to wrap candy in the early nineteenth century. Thus, their application is not new. Bioplastics are costly and come from biological origins, gaining various clouts[7,8]. The only difference is that bioplastics are biobased polymers or biodegradable plastics. The terms "biodegradable" and "biobased" are used interchangeably, but they are not interchangeable. Biodegradable plastics are made from natural or fossil materials and are biodegradable or traced into carbon dioxide and water in a reasonable amount of time due to the action of microbes. Bioplastics make up around 2% of the global plastics market, and their yearly growth rate of 3 to 4% is comparable to that of conventional plastics[3]. In absolute terms, global bioplastics production is expected to increase from 2.1 million tonnes in 2018 to 2.6 million tonnes in 2023[4]. Bioplastics' portion of the global

plastics market appears to be a drop in the ocean compared to conventional plastics' yearly manufacturing capacity of 335 million tonnes[7]. Low oil prices, political support that is slow to manifest itself, and limited market access contribute to the moderate increase in bioplastic manufacturing.

Types of Bioplastics

PLANT-BASED BIOPLASTICS

There are various plant-based sources, including starch-based sources such as rice, barley, wheat, sweet potato, corn, sorghum, and cellulose derivatives, which account for about 80% of the global bioplastics market. Thermoplastic starch is one of the most widely used bioplastics. Polylactic acid (PLA) is cane sugar used to manufacture bioplastics. Plants are being genetically engineered, and next-generation bioplastics are being developed, with the plastic being manufactured straight from the plant; genetically modified corn and potato are two examples of plant sources.

In addition to this benefit, bioplastics derived from plants have several disadvantages, including a negative impact on the human food chain, low biomass, and a longer production time [9].

Microorganism Based Bioplastics

SOURCES FROM BACTERIA

The most studied, popular, and well-known organisms in the production process of bioplastics are bacteria. Many bacterial species consume intracellular PHA granules as a source of carbon reserves and energy in their cells. During metabolism, bacteria produce acetyl coenzyme A which is converted to PHB by three biosynthetic enzymes 3-ketothiolase, (pha A) PHB synthase (pha C), acetoacetyl-coA reductase (pha B). Some of the important bacterial species used for production of PHAs are Bacillus megaterium with PHA content of 20%w/v, Klebsiella aerogenes recombinants having PHA content of 65% w/v, Pseudomonas aeruginosa having PHA content of 20–30% w/v. Algae may provide better potential for bioplastic production.

SOURCES FROM ALGAE

Autotrophic (algae) organisms can be unicellular or multicellular. Spirulina dregs, microalgae that cannot be simply harvested, are employed in bioplastics manufacturing. Due to their large biomass, cost-effectiveness, ease of cultivation in natural surroundings, ability to grow in a wide range of environments, and the ability to harvest throughout the year, macroalgae such as seaweeds offer more potential than the previously listed sources. Seaweeds are frequently employed in food technology, biotechnology, microbiology, and even medicine, but not in the plastics sector. It produces a suitable, toxic-free, environmentally friendly, low-cost bioplastic that meets the quality standards of tensile strength and chemical resistance. Seaweeds can thus be used as a new and alternative source of bioplastics in today's environment due to their unique features.

SOURCES FROM SEAWEEDS

Photosynthetic algae seaweeds exist at the bottom of the sea. They have three major groups based on their pigments and colouration.

- Green seaweeds (Chlorophyta) – Cordium fragile
- Brown seaweeds (Phaeophyta) – Macrocystis integrifolia
- Red seaweeds (Rhodophyta) – Porphyra

COST-EFFECTIVE BIOPLASTICS

Due to the controversy regarding the negative impacts of biopolymers, they are contributing to the global food crisis by using crops as feedstock. An alternative to it requires less valuable raw materials such as agricultural waste and food industrial wastes[10]. Few of the studies on low-cost methods of obtaining raw materials (carbon source) from discarded living things includes –

Microbial Polysaccharides: Researchers have used a variety of methods to generate polysaccharides (Exopolysaccharides) such as pullulan, dextran, xanthan, and levan from syrups and molasses at a low cost utilising the sulfuric acid pre-treatment method. With the help of Zymomonas mobilis culture, a high yield of levan was obtained by centrifugation and filtering in sugarcane molasses and sugarcane syrup.

Sugar beet pulp: Sugar beet waste has a large amount of starch, cellulose, hemicellulose, and pectin, which can be used to build composite products from inexpensive cellulosic material. Using hot aqueous mineral acid to extract pectin from apple pomace waste from cider-making enterprises, which may then be separated from the solution[11].

Way Forward

The use of petroleum-based polymers has various adverse effects on the environment. Only 10% of plastic garbage is recycled, resulting in contamination due to the accumulation of chemicals in landfills. In contrast, biopolymers are transformed into biomass by living organisms and used as manure in plants. The large amount of CO_2 and NH_3 produced when bio-waste is disposed of in landfills causes various environmental issues. As trash has a high amount of sugars, carbs, and cellulose, the ideal strategy is to utilise them in an environmentally acceptable way for industrial use by using bacterial fermentation in a cost-effective manner. With the help of the mutagenesis technique, biomass can be transformed into bio-oil, biofuel, biogas, etc., in environmentally friendly ways.

The major drawback of bioplastics is their high cost compared to conventional plastics. However, there are numerous feedstocks used to produce bioplastics cost-effectively. The market for biopolymers is expected to grow enormously in the future, owing to its long-term viability. Biotechnology of microorganisms offers new hope for bioplastic manufacture since it has the potential to affect production and overcome current constraints significantly.

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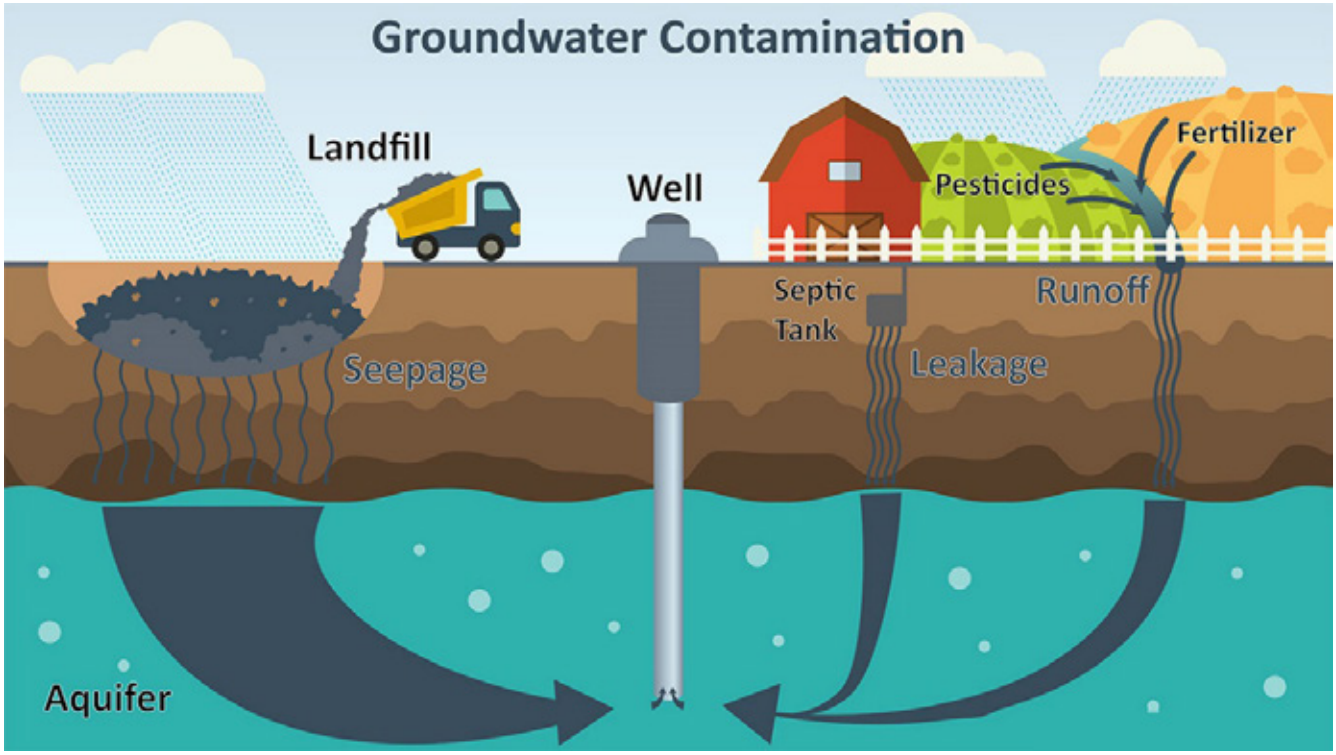
India's Groundwater: An Invisible but a Valuable Resource

Dr Omkar Gaonkar, Programme Coordinator, Toxics Link

The theme for this year's **World Water Day** (**Groundwater: Making the Invisible Visible),** observed globally on 22 March 2022, was focused on a vital water resource, the groundwater. In India, groundwater plays a crucial role as a decentralized source of drinking water for millions of rural and urban families. Globally, India is the largest user of groundwater, with an approximate usage of 230 cubic kilometres annually, signifying over 25% of the world's total (World Bank, 2012). Some estimates indicate that groundwater accounts for nearly 80% of the rural domestic water needs and 50% of the urban water requirements in India. These figures underline the significance of groundwater in India.

Groundwater is generally less susceptible to pollution compared to surface water contamination. However, in India, where there is intensive use of groundwater for irrigation and industrial purposes, several lands and water-based human activities pollute this precious resource. The remarkable rise of agricultural productivity in India, well-recognised as the Green Revolution, was based on the extensive use of fertilizers and pesticides and the development of groundwater resources. Moreover, rapid industrialisation has also been achieved by the intensive use of groundwater resources in recent years. India's groundwater quality has been rapidly declining, with nearly half of our groundwater resources being polluted with several poisonous contaminants. Various contaminants in groundwater, such as salinity, fluoride, arsenic, nitrates, iron, and heavy metals, are found to be in excess of the limits prescribed for drinking water by the Bureau of Indian Standards (BIS).

Figure 1: Diagrammatic representation of Groundwater Contamination



Currently, groundwater in India is not comprehensively regulated but is managed in a piecemeal fashion. Water is a State subject, and States fail to adequately implement laws on groundwater exploitation, poor aquifer management, and contamination. The chemical quality of groundwater in India is monitored every year by the Central Ground Water Board (CGWB) through a network of about 15,000 observation wells located across the country. However, there is only one CGWB monitoring unit for every 100–150 km^2. Considering the vast area of India and its huge population, it is essential to have more monitoring units to carry out increased and regular monitoring.

Additionally, many countries, such as the European Union, the United States of America, the United Kingdom, and others monitor emerging contaminants like drugs, personal care products, and industrial chemicals, amongst others in groundwater as priority substances. Contrastingly, India does not monitor or regulate these chemicals, as it involves methodological complexities and logistical problems.

Furthermore, there are no estimates of the public health consequences of groundwater contamination in India, especially groundwater polluted by emerging contaminants. However, several research studies have highlighted the presence of multiple emerging toxins in groundwaters in different regions of India. These chemicals act as endocrine disruptors and lead to adverse health effects, including carcinogenicity.

Figure 2: Sources of Groundwater Contamination

Thus, we must acknowledge that groundwater is India's water lifeline and ensure the protection of groundwater systems in the country. The first step towards coming up with measures to prevent and cure groundwater contamination is generating reliable and accurate information through regular water quality monitoring involving even the emerging contaminants to understand the actual source/ cause, type, and level of contamination. Adequate regulations, their implementation, and sensitisation programmes will make invisible water resources of groundwater **visible** to its users. Sustainable policies, robust monitoring systems, and comprehensive legal frameworks are the need of the hour to tackle these urgent groundwater challenges.

Impediments to Biomedical Waste Management in India

Aritri Chowdhury, Programme Officer, Toxics Link

Introduction to Biomedical Waste Management

Biomedical waste refers to every waste that is generated during the diagnosis, treatment and immunization of humans or animals involved in various health camps or research activities including the production or testing of biological organisms. However, of the total biomedical waste generated only 15% of the waste is hazardous or infectious and thus the need to identify such waste and ensure its handling and disposal with care and caution becomes critical. The cornerstone of sound bio medical waste management is good segregation practices of waste generated and its treatment and disposal by a specialist organization, Common Biomedical Waste Treatment Facility (CBWTF) that house required technology to treat this infectious waste. The current Rules and guidelines stipulate a distinctly defined process at each step of the waste flow till its final disposal at the CBWTF.

Need for biomedical waste management

The main objectives of BMW (Biomedical Waste) management are to prevent disease transmission from patient to patient, from patient to healthcare professional and vice versa, risking exposure to the harmful effects of cytotoxic, genotoxic and biotechnology waste along with infections from anatomical, chemical and biomedical waste generated in hospitals. Effective BMW management also reduces injury to healthcare workers and staff in support services handling biomedical waste[1]. Effective compliance-related practise, if adequately developed and implemented, can lead to efficient waste management. Biomedical waste management (BMWM) that is not regulated is a public health issue and not only put human health and safety in jeopardy but also the environment.

Governing Biomedical waste management in India

Effective BMWM is a legal requirement and a social responsibility and thus ideally be the focus of a national plan that includes dedicated infrastructure, standardised protocols, a competent regulatory authority and well-trained staff. These standards, norms, and laws on BMWM in a country govern the disposal of various types of BMW to protect healthcare professionals, patients, the general public, and the environment. BMW in India is governed by the BMW Management Rules of 2016 (CPCB 2016a). The CPCB is in charge of enforcing the BMW Management (2016) regulations in India[2]. These rules were first framed in 1998 and have since been revised in 2016. It has carefully drafted guidelines which amplifies the rules and details out the processes involved in effective management. However, there are several gaps observed within the management which have been observed over a prolonged time period in several states.

Plastic waste pilferage and bar coding

According to a WHO assessment biomedical waste generated in various healthcare facilities (HCF) in underdeveloped countries is not appropriately segregated, resulting in substantially higher levels of BMW as it is mixed with general waste[3]. While the guidelines and regulations for managing waste exist, its implementation is faced with multiple challenges because of sheer volumes of waste generation at dispersed locations and inadequate capacity among health workers. The overall amount of biomedical waste generated every day was reported by CPCB to be 774 tonnes, with 656 tonnes being non-COVID biomedical waste and 118 tonnes being COVID biomedical waste[4]. There are currently 208 CBWTFs (Common Biomedical Waste Treatment Facility) in-service engaged in the handling and treating of Biomedical waste generated in India with various lacunas in management system that poses a severe threat.

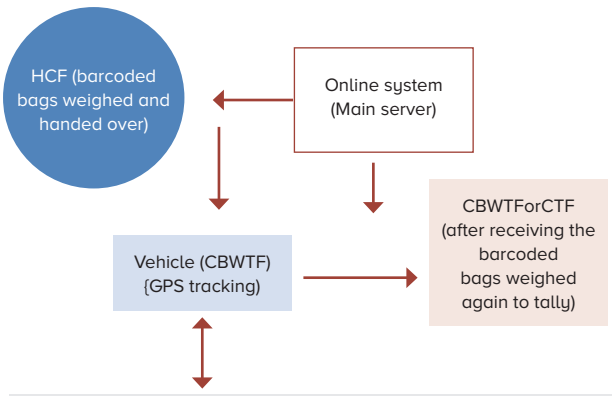
Mismanagement in the segregation and disposal of biomedical waste, particularly plastic waste, is one of the key dangers in the current situation. Various media sources and research papers have highlighted the gaps and concerns involved in the mismanagement of biomedical waste. There have been several instances of **pilferage and sale of plastic waste generated from healthcare facilities** in private and government hospitals. India TV performed a sting operation in February 2014 to underline the issue of plastic waste collection from hospitals which were recycled

and used in daily consumption items like cutleries in eateries and tea shops[5].

Plastic is a commodity which has good market value and fetches a good price. There have been several instances across the country involving sale of Bio medical waste containing plastics such as syringe, IV bottles, IV sets, gloves, etc. This untreated waste ending up with waste traders and ragpickers are means of livelihood for them but are highly dangerous to public health. What has also come to light over the years is also the reuse of these plastic items. These are repackaged and sold by unscrupulous elements and these find their way back to the healthcare facilities. The Biomedical Waste Rules 1998 did not dedicated guidelines that required the HCFs to present proper documentation recording the waste flow accountability[6]. The Biomedical waste management (BMWM) Rules 2016 amendment) stipulates that each healthcare facility needs to establish a Bar code for all the bags containing waste along with Rule 5 mandating the duty of all the operators of a CBWTF (Common Biomedical Waste Treatment Facility) to follow bar code system for managing and handling biomedical waste[7]. Bar code system helps in tracking the source of generation of the waste till its final treatment and disposal creating real time online monitoring. It further helps in identifying the waste indicating source of generation where waste is improperly disposed along with quantification of waste generated with color coding and unique bar code that is specific to the occupier or bar code label prescribed under the Biomedical Waste Management Rules (2016). With the introduction of the bar-coding system, the tracking of the waste became more systematic, recording real-time online monitoring of waste generation, collection, treatment, transportation and disposal along with identifying the source of bio medical waste generation in case of improper disposal. The main stakeholders involved in the enforcement and implementation of the barcoding system are the Central Pollution Control Board (CPCB), State Pollution Control Board (SPCB) in respect of state and the PCC (pollution control board) in the case of Union Territories, Healthcare facilities and operators of a CBWTF.

Most states across the country have not implemented this process of barcoding and the pollution control boards have also not initiated action for non-compliance.

Figure 1: The process of BMW management from healthcare facility to CBWTF implementing digital data entry through bar coding and GPS tracking



- HCFs with more than 30 beds need to have a digital weighing machine and bar code scanner
- CBWTF should carry a scanning and weighing machine before transferring to CTF
- GPS tracker should be attached to the vehicle to track and prevent pilferage.

Way forward

Barcoding implementation is crucial in biomedical waste management as it serves as a tracking mechanism capturing the complete waste flow recording the waste collection from its inception to the final disposal. Though barcoding was supposed to have been implemented in India by 27 March 2019[8], neither the issues of non-compliance were addressed by the administrative departments nor penalties have been imposed by SPCB or CPCB increasing the risk of plastic waste being pilfered and, in the process, recycled and reused which is extremely harmful for public health. It requires a small intervention requiring the development of a software and a scanning device along with labels with assigned barcodes which can be made available to the various healthcare facilities by the CBWTF operators. Barcoding is a necessary strategy that will plug the loopholes in the management mitigating pilferage in the intermediary stages of waste handling and transportation along with addressing issues of discrepancy in data generation and poor oversight. Thus, SPCB and CPCB along with the other key stakeholders should take up this issue urgently reducing the pernicious effect of biomedical plastic waste selling, recycling and reuse.

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Developments of COP-4 of the Minamata Convention on Mercury

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The Minamata Convention on Mercury is a multilateral environmental agreement to protect human health and the environment from the adverse effects of mercury and mercury compounds released due to anthropogenic activities. The convention was adopted in 2013 to phase out mercury globally. As of May 2021, 128 countries have signed the treaty, and 131 countries have ratified the Minamata Convention. The convention is named after the Japanese city, Minamata, as the community went through a devastating incident of mercury poisoning.

The convention aimed to reduce the mercury pollution from the targeted activities responsible for the major release of mercury into the immediate environment. When adopted, the Minamata Convention set a target to phase out or set up a target over products containing mercury, the manufacture, import, and export of which had been altogether prohibited since 2020. However, the countries can seek exemption for an initial 5-year after the notified exemption period to the Minamata secretariat. Further, Article- 23 of the convention has the provisions for the Conference of the Parties (COP) to review and evaluate the implementation of this convention.

Due to the ongoing COVID-19 pandemic situation, the COP-4 was organised in two segments: a first segment conducted online within the period of 1 to 5 November 2021, and a second segment in person from 21 to 25 March 2022 in Bali, Indonesia. The COP-4 meeting was commenced with the crucial Bali Declaration on Combatting Global Illegal Trade of Mercury. This non-binding political declaration aims to enhance international cooperation, develop practical tools to monitor and share information, and exchange experiences and practices to combat the illegal trade of mercury.

Decisions of the COP-4

The COP -4 discussed many critical issues, such as the framework to evaluate the effectiveness of the Convention, as well as the review of annexes -A and B on mercury-added products and manufacturing processes in which mercury or mercury compounds are used.

The COP-4 agreed to extend the phase-out list of mercury-added products and highlighted the importance of mainstreaming gender within all activities, projects, and programmes undertaken under the Convention.

The parties to the Minamata Convention are also on the schedule for its implementation on national reporting, artisanal and small-scale gold mining (ASGM), international cooperation, capacity building, and technical assistance, releases of mercury, and mercury waste thresholds.

The COP also reviewed the annexes A and B of the convention and added that the manufacture, import, and export of the following mercury-added products not be allowed after 2025:

- Compact fluorescent lamps with integrated ballast (CFL.i) for general lighting purposes that are ≤ 30 watts with a mercury content not exceeding 5 mg per lamp burner.
- Cold cathode fluorescent lamps (CCFL) and external electrode fluorescent lamps (EEFL) of all lengths for electronic displays not included in the current listing.
- Strain gauges to be used in plethysmographs.
- Melt pressure transducers, melt pressure transmitters, and melt pressure sensors except those installed in large-scale equipment or those used for high precision measurement, where no suitable mercury-free alternative is available.
- Mercury vacuum pumps.
- Tire balancers and wheel weights.
- Photographic film and paper.
- Propellant for satellites and spacecraft.

Further the COP also agreed to amend part II of Annex A and add the following provisions for dental amalgam:

Parties shall:

(i) Exclude or not allow the use of mercury in bulk form by dental practitioners by taking measures as appropriate.

(ii) Exclude or not allow, by taking measures as appropriate, or recommend against the use of dental amalgam for the dental treatment of deciduous teeth of patients under 15 years and of pregnant and breastfeeding

India signed the Minamata Convention in September 2014 and ratified it in June 2018. India is among the few developing countries which had initiated regulatory measures to phase out or restrict the use of mercury in various products even before the Minamata Convention came into force. However, it has sought a five-year extension to comply with the mercury-added products of Article 4 of Paragraph 1 up to 2025. In the COP-4, India again sought exemption for the mercury-containing tube lights till 2030.

women, except when considered necessary by the dental practitioner based on the needs of the patient.

The COP has also decided to engage with indigenous peoples, local communities, and other relevant stakeholders in developing and implementing national action plans. The COP-4 also decided what would be on the agenda for the COP-5, which will take place in Geneva, Switzerland, from October 30 to November 3, 2023, under the Romanian presidency.

Further, the COP took the decision that the phase-out date of the following products to be decided in COP 5:

- Button zinc silver oxide batteries with a mercury content of < 2% and button zinc-air batteries with a mercury content of < 2%
- Very high accuracy capacitance and loss measurement bridges and high-frequency radio frequency switches and relays in monitoring and control instruments with a maximum mercury content of 20 mg per bridge switch or relay [except those used for research and development purposes]
- Linear fluorescent lamps (LFLs) for general lighting purposes:

  (a) Halophosphate phosphor ≤ 40 watts with a mercury content not exceeding 10 mg per lamp

  (b) Halophosphate phosphor > 40 watts 5
- Linear fluorescent lamps (LFLs) for general lighting purposes:

Triband phosphor < 60 watts with a mercury content not exceeding 5 mg/lamp

It was also decided that in COP 5, consideration will be given to the production of polyurethane using mercury-containing catalysts to the part I of Annex B as it could not be agreed upon at COP 4. In addition, the COP asked the secretariat to prepare a report on the technical and economic feasibility of mercury-free alternatives for vinyl chloride monomer and sodium methylate production processes.

In Discussion with

Dunu Roy

A leading social activist, political ecologist, social scientist, and Director of the Hazards Centre, New Delhi, Anubrotto Kumar (Dunu) Roy received his early education at Montessori and Doon School, Dehradun, and obtained B.Tech (1967) and M.Tech (1969) in Chemical Engineering from IIT Bombay. He has worked for over five decades in rural and urban scenarios on land and water management, secure settlements, safe work, environmental planning, leadership training, and pollution control.

In 1975, Dunu Roy, along with his other like-minded friends, started an experiment named Kaam aur Kamai in the Shahdol district of Madhya Pradesh and performed significant social work while earning a living within the community. The outcome was the Vidushak Karkhana, a small workshop to repair rural machinery. The Vidushak Karkhana slowly evolved into the Shahdol Group, focussing on Environmental Planning and Environmental Education.

The Shahdol Group became a centre attracting students, academics, activists, and journalists from India and all over the world. After being associated with the Shahdol group for two decades, Dunu Roy moved to Delhi in the mid-1990s. He joined the World Wide Fund for Nature, New Delhi, and created a cell to monitor the effects of pollution. In 1997, Dunu Roy established Hazards Centre in New Delhi, a research group to provide professional services to community and labour organisations to identify, understand, and combat the hazards that beset them. The organisation assists urban and rural communities in research and action programs related to shelter, livelihood, services, governance, etc. Dunu Roy served as the Dean of Research at the People Science Institute, Dehradun. He is also a consultant to various agencies in the private and public sector on resource management, environment, biodiversity, and disaster preparedness in several states of India.

Mridul: In the mid-sixties, you went to IIT Bombay and did your B. Tech and M Tech, with lots of expertise in the field of Chemical engineering. What prompted you to work in the development sector and for the vulnerable communities?

Dunu: It was the challenge of applying the methods of science learned in engineering to the real problems in the wider social world.

Mridul: Can you please tell us about the Shahdol Group, how it was started, and the activities?

Dunu: Me and my other two friends went to Shahdol to learn how people planned, not to teach people what to do. So we had to earn our living. We started a repair workshop, began farming, opened a photo studio, took on electrification jobs, among others. That is how the Shahdol group evolved. The only activity was to learn from the people. It took us about ten years. Then we spent another ten years taking the learning process back to the people.

Mridul: What motivated you to start the Hazard Centre in Delhi?

Dunu: The method I learned in Shahdol seemed to be applicable everywhere else. That's how the Hazards Centre was set up in Delhi - a place where people could come up with their problems, get some guidance on how to understand their concerns,and then select their solutions.

Mridul: Please tell us some of the main activities of Hazard Centre.Would you wish to tell us some of the achievements of Hazard Centre?

Dunu: The activities span everything people think is a problem (or hazard). For administrative convenience, we have grouped them into issues related to governance, labour, and environment, but there is no real hard line for people. The Centre does not claim success in anything but if people succeed in solving their problem, we feel that maybe we have contributed something to their success.

Mridul: You had worked for many decades on urban governance, linking with waste, pollution, and toxicity among the urban communities. What are the main changes you noticed during the period?

Dunu: The most significant change is the retreat of government agencies and the takeover by private firms.

Mridul: What are the gaps and challenges in the existing urban governance? How are the marginalised community impacted?

Dunu: The challenge is how to demand transparency and accountability from government and private agencies, especially by the marginalised.

Mridul: How these challenges and gaps can be addressed holistically in future?

Dunu: Probably through greater understanding among the people and developing their own strategy for improving their condition.

Mridul: In the article "A Subaltern View of Climate Change" you enquire why everyone is not consuming at the level of the above-poor "developing" Indian? What does it mean to say?

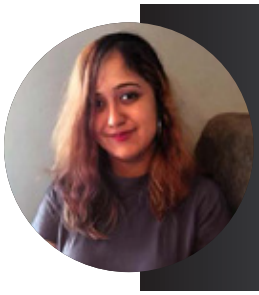
Dunu: It's a simple argument. There is the carrying capacity of the earth. Those consuming at 20 times the carrying capacity cannot tell the world how to live within that capacity. But those who are consuming (and producing) within that capacity should, logically, showus all what "best practice" is. A camel driver in the Thar desert should be able to tell us much more about how to survive in high temperatures than the scientist sitting in a research institute.

Mridul: What are your views on Delhi Master Plan 2041? What is the best part which has been addressed in this plan? Also, what do you think are the drawbacks of this plan?

Dunu: The plan addresses the concerns and privileges of those who have money to invest. For the corporate investor, it is excellent news. For the rest of the city, it spells ruin.

Mridul: How do you see the present environmental governance in the country? What will be your message for the future generation to combat climate change?

Dunu: It is in line with the investor-friendly profit-making thrust of all policies To paraphrase Gandhi, "Live simply, or you simply may not live."



Toxicity in the waters of West Bengal

Navoneela Chakraborty, M.A. Geography student, Jamia Milia Islamia

Food, culture, architecture, history and heritage, alluring tourist destinations, and most importantly, the kind-hearted people constitute the state of West Bengal. However, the concern that has drawn the attention of many environmentalists and researchers in recent years is the presence of toxic substances contaminating both river water and groundwater of Bengal, and. The article aims to present a literature review on toxicity and worsening water quality in the state.

Arsenic and other toxins in the groundwater of Bengal

Arsenic is a heavy metal which if mixed in in drinking water can cause deadly diseases such as cancer, diabetes, skin lesions, and respiratory and cardiovascular complications. As per WHO's recommendations, 10 µg/L should be the maximum limit of arsenic in water. However, back in 2009, groundwater arsenic contamination in West Bengal has witnessed an alarming rate, with nine districts' water being contaminated with arsenic at 50 µg/L. Murshidabad, Nadia, North and South 24 Parganas, Maldah, Hooghly, Howrah, and Burdwan, are the most severely arsenic affected districts. Consequently, a considerable part of the population has been affected by arsenic poisoning.

A recent 2020 study conducted by IIT Kharagpur has found that both groundwater and river water in the western Bengal basin is contaminated by pesticides, POPs (persistent organic pollution pollutants), and toxic polycyclic aromatic hydrocarbons (PAH) beyond the permissible limits. Pesticides mainly contaminate the waters in agricultural districts like Nadia and Murshidabad. On the contrary, PAHs, or specifically industrial discharges, pollute the water in urban and semi-urban areas.

Toxicity of water in the Santragachi Jheel and Adi Ganga

A set of indicators - Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), and total coliform helps to determine water quality. A recent analysis (2021) of these indicators has been carried out by the West Bengal Pollution Control Board in the water of the Santragachi Jheel, a lake located in Howrah, a biodiversity hotspot and a famous site for migratory birds in the winter season. The most important finding of this analysis is that the indicators mentioned above have highly deviated from their normal values set by the national water quality criteria. While the DO, BOD, and total coliform levels have been found to be 3 mg/l, 10.6 mg/l, and 1,70,000 MPN/1000 ml, respectively, their respective desired levels are 6 mg/l, 2-4 mg/l, and 5000 MPN/1000 ml. A spike in pollution is the major cause behind these alarming values of the indicators. This study has implied the deteriorating quality of water resources in the waterbodies of Bengal. Experts have declared that the water in the Santragachi Jheel is not favorable for any form of life.

Dumping of sewage at Adi Ganga

(Image: Eric Parker | Image source: https://www.thethirdpole.net/)

The condition of Adi Ganga is worse than that of the Santragachi Jheel. It was once a channel of the Ganga River but sadly has now been converted to a mere drain buried under garbage. Dumping of sewage, almost no dredging or maintenance, encroachments, and blockage in the water flow have been the major issues. BOD is more than the standard level, DO is below what it should have been, and the total coliform count has also increased. Several river sites have been hijacked severly that it has disappeared in regions like Narendrapur and Rajpur-Sonarpur. In its place, there are roads and human settlements.

Ganga and other rivers, the victims of wastewater

In 2013, an assessment report released by the Central Pollution Control Board (CPCB) revealed that more than 50% of the wastewater is dumped in the Ganga River without any treatment. The inefficiency of sewage treatment (either their inability to help the water maintain the standard values of indicators like biological oxygen demand and chemical oxygen demand or their non-operation) has been considered the main reason behind this. Pollution from drains has also been attributed as another factor behind this by CPCB.

Ganga Pollution in West Bengal

(Image source: https://www.downtoearth.org.in/)

A comparative analysis of Ganga's water over five years (2013-2018) didn't indicate any significant improvement in its water quality. Even in the monsoon season, when the water quality is supposed to improve in any river, monitoring stations at Palta Shitaltala and Beharampore revealed that Ganga's water quality remained in a poor state, thus implying the intensity of its damage. The West Bengal Pollution Control Board (2020) indicated that not only Ganga, but the water quality in nearly 11 rivers in West Bengal are alarming.

West Bengal is a densely populated region. Hence, high amounts of toxins in groundwater and contamination of the river water, mainly due to anthropogenic factors, creates a lot of concern. These pose a threat to the biodiversity and ecosystem of the whole region. Regulation of this threat is of utmost necessity now.

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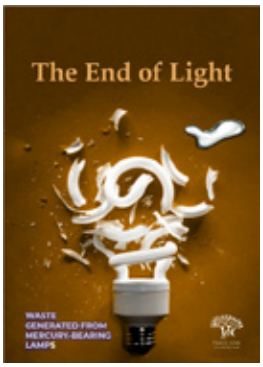
Resources

PUBLICATIONS

Plastic Mulching

Microplastics in agricultural soils

A first-of-its-kind study titled “Plastic Mulching: Microplastics in Agricultural Soils,” launched by environmental NGO Toxics Link, reveals a high abundance of micro plastics in the soil samples using plastic mulch sheets in some agricultural belts of Karnataka and Maharashtra.Mulching is a technique of covering the soil to maintain the soil temperature and moisture and thereby facilitate higher crop yield. The study found tiny plastic particles at various depths, exhibiting soil contamination due to the rampant usage of plastic mulch sheets. Microplastics or MPs are tiny plastic materials less than 5 mm in diameter and are considered the primary source of plastic pollution.



The End of Light

Waste Generated from Mercury-Bearing Lamp

The production of electronic equipment is growing at a considerable rate globally. In India, the government expects electronics manufacturing to register an annual growth rate of 30% over the next five years. However, at the same time, the effective lifespan of those electronics is substantially reduced as technological advances, aesthetic preferences, marketing, and compatibility issues lead consumers to replace them long before their useful life is over. The technology changes have been evident in the case of lighting equipment markets. Though LED is taking over the market from CFLs and FTLs in recent times, mercury-containing lamps are still used in large numbers and are unlikely to be phased out anytime soon.With the lack of an effective and safe collection and recycling system for mercury-bearing lamps in India, it is critical to understand the existing fatal menace of mercury lamps, and their hazardous effects to the environment. In light of this, Toxics Link has undertaken a study to underline this issue and assess the current situation of handling mercury-containing lamp waste in India.

Dirty Cleanser-

Assessment of Microplastics in Cosmetics

Microplastics have assumed critical proportion, mainly because of the widespread distribution as well as its possibility to impact the environment and the living beings. Though there is a need to reduce microplastics pollution from both primary as well as secondary sources, in applications like PCCP, it is easier because most of the times, these are not essential ingredients and are intentionally added to products. Despite worldwide attention devoted to the ocean plastics crisis, in India, there has been no action till date to restrict use of microbeads in PCCPs. To address this gap, Toxics Link has conducted a primary study to access the presence of microbeads in PCCPs. A total of 35 samples from personal care and cosmetics products (facewash, scrub, and body wash) were analysed to assess microbeads presence. Toxics Link found that out of 35 samples, 20 were detected with presence of polymers. Among the 20 samples with polymers, 14 have microplastics beads. Fourteen different type of polymers, namely acrilonitrile film, polyethyelene, poly acrylic, acrilonitrile/butadiene/styrene, polyvinyl alcohol, polyimide, poly butyl methacrylate, PAM, lanoline, ethylene/propylene copolymer, polypropylene, LDPE, ethylene/vinyl acetate coplomer, and EVOH were detected.

Menace of Antibiotic Pollution in Indian Rivers

Antibiotics are important life-saving medicines and play a key role in the wellbeing of human health. However, the unsustainable manufacturing processes coupled with indiscriminate use have given rise to antibiotic pollution in various environmental matrices. Environmental exposure to active pharmaceutical ingredients such as antibiotics can have negative effects on the health of ecosystems and humans. It has also led to the emergence of growing global threat of Anti-Microbial Resistance (AMR). However, the data regarding the contamination and distribution of antibiotics in Indian rivers is limited. In this context, Toxics Link came up with the present research study to highlight the presence of antibiotics in some of the Indian rivers. The report aims to trigger more large-scale nationwide studies on the occurrence of antibiotics in the aquatic environment including their contribution to rising AMR in the country. This report can also serve as a basis for better understanding of antibiotic pollution situation in India and highlights the need to establish sustainable practices at every stage of the supply chain.

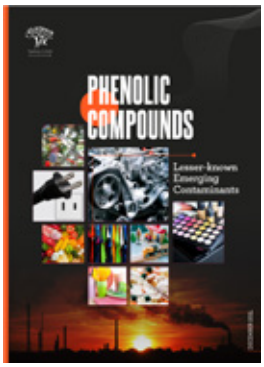
Less Is More

Strategies for minimization of Electronic waste

The study by the environmental group raises serious concern on the current focus on 'recycling' to address the challenges of dealing with rising e-waste volumes globally and stresses on the need to bring in holistic solutions and shift focus from mere recycling to other aspects of a circular economy like reduce and repair.

An Overview of Chemicals in Textiles

This study provides a preliminary understanding of the major chemicals of concern used in the textile industry, and their health and environmental impacts. This study highlights the existing global regulations governing these chemicals. The report further identifies the need to manage chemicals for an improved public health and environmental protection in the textile sector. With this study, we intend to initiate a discussion on reducing the net chemical consumption in the textile sector, and also reducing the net discharge to the environment.



Phenolic Compounds

Lesser-known Emerging Contaminants

There is no collated study on toxic phenolic compounds in consumer products and associated challenges from these chemicals. Therefore, Toxics Link came up with this secondary report to highlight the use of different toxic phenolic compounds such as nonylphenols, bisphenols, triclosan, etc. in several consumer products and the possible environmental and health challenges these chemicals can pose. This report also reviews regulatory progress on important phenolic compounds, such as nonylphenols, triclosan, chlorophenols, etc

News Alert

1. The Hindu, July 01, 2022: National and State-level control rooms set up, special enforcement teams formed

As the ban on certain single-use plastic (SUP) items kicks in from Friday, State governments will initiate an enforcement campaign and close down units engaging in the production, distribution, stocking and sale of such items, Union Environment Ministry officials said.

The violation of the ban will invite punitive action, including a fine or a jail term or both, detailed under Section 15 of the Environment Protection Act (EPA) and under the bylaws of the respective municipal corporations, they said.

Read more at: https://www.thehindu.com/news/national/india-ban-on-single-use-plastic-kicks-in-from-july-1-2022/article65586698.ece

2. Are we ready for the ban on single-use plastic

PrintWeek Team, April 04, 2022, As the country is preparing to face the ban on single-use plastic items like earbuds and cutleries from 1 July this year, the Central Pollution Control Board (CPCB), has now issued a notice asking producers, shopkeepers, street vendors and general public to stop production, stocking, sale and usage of identified single-use plastic items as per the specified deadline.

The CPCB has issued directions to state pollution control boards, almost all eCommerce websites, single-use plastic sellers and users, central board of indirect taxes and customs, stating that no single-use plastics identified in the notification dated 12 August 2021, should be sold, stocked or used.

The prohibited plastic items include earbuds, flags, candy and ice-cream sticks, decorative thermocol, PVC banners less than 100-micron thick, stirrers, wrapping films, cups, glasses, and cutlery, among others.

Read more: https://www.printweek.in/news/are-we-ready-for-the-ban-on-singleuse-plastic-55928

3. 'We want it back to what it was': the US village blighted by toxic waste

Can a $100m cleanup operation save Mead, Nebraska, from putrid pesticide-laced waste that has polluted water, with health implications yet unknown?

The Guardian, April 26, 2022, For a visitor to this rural part of eastern Nebraska, the crisp air, blue skies and stretch of seemingly endless farm fields appear as unspoiled landscape. But for the people who live here, there is no denying this is an environmental disaster that researchers fear may affect generations to come.

It has been just over a year since state regulators stepped in to close down the AltEn LLC ethanol plant on the outskirts of Mead, Nebraska, a small village of about 500 people near Omaha. The plant was found to be the source of huge quantities of toxic, pesticide-laced waste, which was stored in lagoons and piled into hills of a putrid lime-green mash. That waste then was accidentally spilled and intentionally spread throughout the area, including on to farm fields and into waterways that provide drinking water for people and wildlife several miles downstream.

Read more: https://www.theguardian.com/environment/2022/apr/26/pollution-mead-nebraska-pesticide-waste

4. 24 hours, 90 firefighters: Ghazipur landfill blaze still not under control

The Delhi Fire Service (DFS) said more than 90 firefighters have been working since Monday to control the fire

Express News Service, New Delhi, March 29, 2022, Nearly 24 hours after a massive fire broke out at the Ghazipur landfill site Monday afternoon, officials said it continued to rage in some parts of the area. The Delhi Fire Service (DFS) said more than 90 firefighters have been working since Monday to control the fire. At present, four fire tenders and six JCBs have been deployed at the landfill site.

Local residents complained of difficulty breathing as fumes from the blaze spread to nearby colonies. Fire officials Tuesday said they have been facing multiple challenges in the firefighting operation.

Read more: https://www.thequint.com/news/india/lack-of-access-segregation-of-waste-ghazipur-landfill-ablaze-after-hours#read-more

5. India wants to phase out tube lights by 2030

The Minamata Convention on Mercury is a global treaty to protect human health and the environment from the adverse effects of mercury.

HT, New Delhi, Mar 23, 2022, India has sought time till 2030 to phase out linear fluorescent lamps or tube lights to reduce adverse effects of mercury, senior environment ministry officials said at the ongoing Minamata Convention in Bali. The convention is being held from March 21 to 25.

According to the officials, though other countries including the EU, the US have pushed for a 2025 deadline for the phaseout of tube lights, India has responded to the proposal by stating that "Not completely agreed. However, since the consumption of this item is insignificant in the country, the complete phase-out will be done by 2030 but this aspect will be reviewed in 2025 for its early phasing out," a note shared by officials.

Read more: https://www.hindustantimes.com/india-news/india-wants-to-phase-out-tube-lights-by-2030-101648058987982.html

6. During COVID-19 Pandemic, India Generated Over 656 Tons of Biomedical Waste Daily: Government Report

IANS, 15 March, 2022. Biomedical waste worth about 656 tons per day (TPD) was generated across India in 2020, out of which 590 TPD was collected and treated by common biomedical waste treatment facilities, the Parliament was told on Monday.

Further, about 84.61 TPD of incremental COVID-19 biomedical waste was generated between May 2020 to February 2022 from healthcare facilities, quarantine centres/camps, sample collection centres, laboratories, home care/home isolations centres engaged in treatment, diagnosis and quarantine of COVID-19 infected or suspected patients, Minister of State for Environment Ashwini Kumar Choubey told the Lok Sabha in a written reply.

Read more: https://weather.com/en-IN/india/pollution/news/2022-03-15-india-generated-over-656-tons-of-covid-biomedical-waste-daily

7. SC issues notice to Centre on plea against NGT order asking to ban water purifiers where TDS below 500 mg per litre

ANI 1 March, 2022. The Supreme Court on an appeal filed by the Water Quality India Association has issued notices to the Central government ministries against the National Green Tribunal (NGT) order by which it had ordered to ban water purifiers where the level of total dissolved solids (TDS) in water are below 500 mg per litre. A bench of Justices SA Nazeer and Krishna Murari issued notices to the Ministry of Water Resources, Ministry of Environment and Forests, Central Pollution Control Board, and others on the appeal. The top court has asked them to file their responses within three weeks.

Read more: https://theprint.in/india/sc-issues-notice-to-centre-on-plea-against-ngt-order-asking-to-ban-water-purifiers-where-tds-below-500-mg-per-litre/853681/

8. India is committed to address plastic pollution: India at UNEA

Press Trust of India | New Delhi / March 1, 2022. India is committed to address plastic pollution to reduce its adverse impact on terrestrial and aquatic ecosystems as well as human well-being, Environment Secretary Leena Nandan said at the fifth session of the United Nations Environment Assembly on Tuesday. In her address at the assembly being held in Nairobi, she also said that India had piloted a resolution on addressing single-use plastic product pollution in the last UNEA in 2019. "India is committed to address plastic pollution including marine plastic pollution to reduce the adverse impacts on terrestrial and aquatic ecosystems and human well-being. India had piloted a resolution on addressing single-use plastic product pollution in the 4th United Nations Environment Assembly (UNEA) held in 2019, bringing global focus on the issue," Nandan said.

Read more: https://www.business-standard.com/article/economy-policy/india-is-committed-to-address-plastic-pollution-india-at-unea-122030101116_1.html

9. UN body weighs a global treaty to fight plastic pollution

"For the first time in history, we are seeing unprecedented global momentum to tackle the plague of plastic pollution," said UN Environment Program Executive Director Inger Andersen.

Associated Press, February 28, 2022, Delegates from United Nations member countries are considering proposals for a binding global treaty to curb plastic pollution. The UN Environment Assembly, meeting Feb. 28 to March 2 in Kenya's capital Nairobi, is expected to propose an international framework to address the growing problem of plastic waste in the world's oceans, rivers and landscape. "For the first time in history, we are seeing unprecedented global momentum to tackle the plague of plastic pollution," said UN Environment Program Executive

Read more: https://indianexpress.com/article/world/un-body-weighs-global-treaty-plastic-pollution-7794125/

10. Sri Lanka returns environmentally hazardous waste shipments to UK

Associated Press, Colombo, February 22, 2022, Sri Lanka has sent back the last of 263 shipping containers of waste from Britain, an official said Tuesday, as developing nations look to block the import of refuse and other environmentally hazardous items from wealthier countries. Customs officials in the South Asian country identified the large shipment

of waste two years ago, including mattresses, carpets and springs, which the local importers claimed were for recycling. Deputy environmental chief Ajith Weerasundara said the last 45 containers were sent out of the country on Monday. Sri Lanka is party to the Basel Convention which controls transboundary movements of hazardous waste and their disposal, especially in developing nations.

Read more: https://www.indiatoday.in/environment/story/sri-lanka-returns-environmentally-hazardous-waste-shipments-to-uk-1916352-2022-02-22

11. Chemical pollution has passed safe limit for humanity, say scientists

Study calls for cap on production and release as pollution threatens global ecosystems upon which life depends

The Guardian, January 18, 2022, The cocktail of chemical pollution that pervades the planet now threatens the stability of global ecosystems upon which humanity depends, scientists have said. Plastics are of particularly high concern, they said, along with 350,000 synthetic chemicals including pesticides, industrial compounds and antibiotics. Plastic pollution is now found from the summit of Mount Everest to the deepest oceans, and some toxic chemicals, such as PCBs, are long-lasting and widespread. The study concludes that chemical pollution has crossed a "planetary boundary", the point at which human-made changes to the Earth push it outside the stable environment of the last 10,000 years.

Read more: https://www.theguardian.com/environment/2022/jan/18/chemical-pollution-has-passed-safe-limit-for-humanity-say-scientists

Toxics Link's latest campaign on the ban of certain single-use plastic products

Toxics Dispatch was started in 1998 with a primary objective to create awareness about toxic pollution in our environment related to the management of waste and hazardous chemicals and their impact on the environment and public health.

Toxics Dispatch was born out of the need to reach out to various stakeholders, including government officials, judiciary, youth, and the general public, to sensitise them about the extent of toxic pollutants and their damaging effects on the environment.

Since its inception, Toxics Dispatch has highlighted pressing issues of hazardous, biomedical, municipal solid waste, e-waste, international waste trade, and the emerging issues of pesticides and Persistent Organic Pollutants (POPs). The newsletter aims to disseminate information to help strengthen the campaigns against toxic pollution, provide cleaner alternatives and bring together groups and people affected by this menace.

Toxics Dispatch comes out thrice a year and is available online and in print. You can subscribe to it by writing to info@toxicslink.org.

All issues of Toxics Dispatch can be viewed at https://toxicslink.org/Page/dispatch

DATE

1-2 December 2022

VENUE

India International Centre, New Delhi

More information at
http://www.toxicslink.org/filmfestival/QFTE/index.html

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