

### A Sea of Foam: The Invisible Dangers of EPS

A young girl kneels, her face a slate of motionless surprise, her body sunken into what appears to be mounds of powdery snow. A closer look, however, reveals that these white piles are anything but snow: they are mounds of expanded polystyrene beads (EPS), clumped together in the thousands. This cinematic image accompanies a recent Vancouver Sun article, one of the first to highlight the surprising dangers of EPS. It contaminates the coastal waters of British Columbia (BC), Canada's westernmost province so often portrayed as a pristine haven in travel brochures and government sites. Beneath the surface of these blue waters, however, clumps of EPS are wreaking havoc upon marine and human life.

EPS poses a dire problem for BC. Styrofoam containers, which contain high concentrations of EPS, have already been banned across the Lower Mainland as of January 1, 2020. However, EPS has yet to be completely eradicated from the environment. "Since it is lightweight and considerably cheap, EPS has been used along the coast as floating docks, infrastructure materials, aquaculture [implements], and insulation materials," says Stephanie Wang of Ocean Wise, a conservation research and policy group based in Vancouver.

Combined with other debris, EPS is one of the most common forms of garbage found during the Great Canadian Shoreline Clean-up. "Year after year, pieces of foam are among the top 12 items we collect," said Tegan Gallilee-Lang, the volunteer engagement coordinator for the national conservation program. Much of this foam consists of EPS; much of the remaining EPS is invisible to the eye.

EPS crumbles out of ageing dock floats and dissolves into smaller fragments, which are easily mistaken for food by unsuspecting marine animals. Trillions of EPS particles the size of plankton, in fact, are becoming a part of the marine food web. "Foam pieces pose a significant threat to BC's coast by harming wildlife," added Gallilee-Lang, "for example, animals that ingest the material are susceptible to reduced appetite and starvation." Animals along British Columbia's coastlines such as Canadian geese and otters also ingest EPS, which can cause choking or intestinal blockage.

Humans are equally at risk. EPS contains toxic chemicals, including a small percentage of the toxic styrene monomer. As EPS degrades, styrene monomer is released into the surrounding environment, where it quickly travels up the food chain and into humans. Styrene has also been classified by the International Agency for Research on Cancer as a potential carcinogen, a substance that can cause cancer or increase the risk of developing it.

EPS is also difficult to recycle, and its half-life is unknown. Research shows that it could take more than decades for EPS to break down in the environment. What's worse, some scientists hypothesize that the properties of these petroleum-based plastics mean that they will continue to

degrade into smaller constituents but never truly disappear. In BC's aquaculture industry alone, there are currently more than 400 floats made from exposed plastic foam which contains EPS — each of which will need to be replaced and recycled in order to eliminate the risk of crumbling. Currently, there is no government-mandated plan for the replacements of these floats, leaving many of them to release EPS particles with little oversight.

Conservation programs are limited in enforcement power and scope of influence. The nature of marine debris, Galilee-Lang says, is such that the site of pollution is often far away from the source of pollution. This makes regulation extremely challenging, as sites of pollution are not necessarily those in which EPS particles are observed.

The burden, then, falls on both government and individuals to keep EPS out of our waterways. While EPS does not dominate headlines, its implications are far more pervasive than one might imagine. To address this, some organizations have voluntarily chosen to reduce the use of EPS. For instance, the Shellfish Growers Association has replaced 800 devices which contain EPS. Many organizations, however, are either reluctant to spend exorbitant replacement costs or are unable to do so.

The government can incentivize businesses to avoid using EPS through expanding programs like extended producer responsibility. For instance, by assigning the cost of environmental cleanups to the cost of production through an industry tax, the government may implicitly require the marine industry to remove devices that include EPS from our waterways. The BC Women's Liberal Commission has already suggested that unencapsulated, or exposed, EPS should be banned in all new and replacement floating facilities. However, the industry is likely to lobby against this and other costly legislation. Middle-of-the-road options may be necessary to gain broader approval.

Dock owners can help by making sure that their EPS floats are encapsulated in a hard polyethylene shell. These shells help to contain EPS, but only affluent businesses and individuals can afford this device at the moment. Alternative plastics that biodegrade in the marine environment, like polyhydroxyalkanoate (PHA), exist. Subsidizing these alternatives may also encourage businesses to accelerate the replacement process.

In the meanwhile, increasing levels of marine debris such as EPS are still taking a toll on marine and coastal ecosystems. This calls for greater awareness of the UN Sustainable Development Goal (SDG) #14: "Life below water," which extols the conservation and sustainable use of oceans and marine resources. The world's oceans drive the very "global systems that make the Earth habitable for humankind", including the water we drink, the food we consume, and even the air we breathe. Organizations like the UN can mobilize their stature to increase awareness among individuals, supplementing the organizational outreach efforts of local and provincial governments.

As the SDGs and other initiatives urge, elimination of EPS is not only up to industry and government, but also private citizens. During the summer of 2018, the residents of Lasqueti Island, a southern BC community, collected over 2 tonnes of foam waste during their annual Styrofoam Day. Volunteer initiatives like these lend confidence that progress is being made. Galilee-Lang, the

conservation coordinator, is optimistic: “Beyond broad bans and financial disincentives, every individual has the power to mitigate shoreline litter.”

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