

Sea was declared one of the most polluted seas in Europe after the northeastern part of the Mediterranean and the Celtic Sea in a study by an international team of experts published in the journal *Marine Pollution Bulletin*. Waste, much of it plastic, is accumulating on the Adriatic seabed, with devastating consequences for marine life, coastal communities and, longer-term, the economies of Adriatic states such as Montenegro.

In years past, Montenegrin fisherman Ivo Knezevic would see waste appear on the surface of the open sea after a strong dose of the 'Jugo', the southeastern wind that whips up high, choppy waves on the Adriatic. Not anymore. "Now the plastic is everywhere," he says. "We end up eating any plastic bag that isn't thrown away properly," said the 37-year-old from the town of Ulcinj, near the Montenegrin border with Albania. "We're killing ourselves."

And it's not just on the surface.

"There is hardly a single place on our seafloor where I haven't seen discarded trash," said Adi Karamanaga, a diver from Ulcinj. "There are piles of plastic bottles, cans, chairs and even wheel rims from trucks."

"I don't think there is a single organism in the sea any more that has not been in contact with plastic," the 44-year-old told the Centre for Investigative Journalism of Montenegro, CIN-CG, the Balkan Investigative Reporting Network, BIRN, and the weekly *Monitor*.

The waste is generated by the some four million people who live along the Adriatic coast, and by tourists who increase that number six-fold every summer. Of the waste that ends up in the Mediterranean, the highest amount per capita - eight kilograms per year - is generated from Montenegro, according to the International Union for Conservation of Nature, IUCN - to devastating effect for the environment, fish stocks, local communities and Montenegro's long-term appeal to the tourists on whom the country's economy depends. Environmental activist Azra Vukovic said plastic accounts for 80-90 per cent of waste in the Adriatic, including carrier bags, cups, bottles and plastic cutlery, "creating a major problem for the organisms that live in the sea, but also for those on the land."

EU: No progress

Much of the waste reaches the Montenegrin coast via the River Bojana that flows from Lake Skadar on the border between Albania and Montenegro. The problem is at its worst during the first autumn rains, when brooks and streams start flowing again and bring down waste discarded in dried-up watercourses. In Montenegro, according to data from the organisation Zero Waste Montenegro, each resident on average uses and throws away more than 600 non-recyclable plastic bags every year. Montenegro has a population of some 620,000

people.

“Just in the hinterland of Velika Plaza [Long Beach, in Ulcinj], 22 illegal landfills have been mapped in which, apart from construction and bulky waste, plastic has also been found,” said Vukovic. “This threatens to cause lasting damage to the development of tourism on the Ulcinj Riviera.”

In the most recent report on Montenegro’s progress towards membership of the European Union, the bloc’s executive arm, the Commission, said no progress had been made on managing waste. In 2019, Montenegro’s then minister of sustainable development and tourism, Pavle Radulovic, announced a ban on the use of plastic bags but it never came into force. Radulovic resigned in November 2019 after a video surfaced that appeared to show inspectors from his ministry taking a bribe. The ministry says the drafting of a new state plan for managing waste for the period 2021-2026 while adoption of a new Law on Waste Management has been promised since the start of 2020. Under Chapter 27 of Montenegro’s EU accession negotiations, the country has committed to recycling 50 per cent of its plastic, paper, metal and glass waste by the end of 2030. It also plans to guarantee to recycle at least 70 per cent of non-hazardous construction waste, a requirement set by the EU.

Beach waste just “tip of the iceberg”

According to EU-funded research carried out by scientists from countries bordering the Adriatic and Ionian Seas – Slovenia, Italy, Croatia, Albania, Bosnia and Herzegovina, Montenegro and Greece – there are on average 670 pieces of plastic per square kilometre in the Adriatic, which constitutes a relatively high density. As much as 90 per cent are made from artificial materials, while analysis of one ton of waste found on beaches and in the sea indicates that more than half is composed of plastic, 30 per cent wood, 10 per cent metal and six per cent textiles.

“Marine debris represents one of the biggest threats to the Mediterranean marine ecosystem with environmental, economic, security, health and cultural effects,” said Milica Mandic, a senior scientific collaborator at the Institute of Marine Biology in the Montenegrin coastal town of Kotor.

Mandic described the Adriatic as a semi-closed basin with weak currents and long retention of water masses, making its waters vulnerable to persistent pollution. The Bay of Kotor, which is only partially protected, is particularly threatened, Mandic told.

Waste found on beaches is only the “tip of the iceberg,” Mandic told CIN-CG/BIRN/Monitor. “About 80 per cent of the waste located beneath the surface of the sea in the Bay of Kotor originates from the land,” said Mandic. “It is estimated that in the area of the Bay of Kotor

there are 160–250 kilograms of waste per square kilometre, and in the area of the open sea of the Montenegrin coast between 40 and 80 kilograms.”

“Those most at fault for what is found are the local population, tourists and, partly, inadequate waste management on the land.”

Dr Pero Tutman of the Institute of Oceanography and Fisheries in the Croatian city of Split said that about 70 per cent of waste from the land that reaches the sea ends up on the seabed, piling up over years beyond human reach.

“These quantities are increasing every year and even though the exact amount is not known they are certainly worrying,” Tutman told CIN-CG/BIRN/Monitor.

“The effect on marine organisms is mainly through entanglement (for example, lost fishing tackle, plastic bags etc.), after which they ingest it and then waste reaches their digestive system,” he said. “Larger marine organisms, such as mammals (seals, dolphins and whales) and turtles, and then sea birds are particularly exposed to this.”

Link to cancer

Plastic in the sea never disappears, it simply breaks down into smaller pieces. Microplastics – plastic particles smaller than five millimetres – can be found in all species of marine organisms. The problem with microplastics is that they can absorb significant amounts of heavy metals, viruses and bacteria. In 2013, as part of the DeFishGear project to improve data on marine litter, it was found that seven out of 10 fish in the Adriatic contain microplastics. The presence of nanoparticles in human hearts and brains has been linked to brain cancer, while research in wildlife and laboratory animals has linked exposure to tiny plastics to infertility, inflammation and cancer, The Guardian reported in August 2020. At the Institute of Marine Biology in Kotor, analysis was made of the contents of the stomachs of five different commercially important species of fish – sardines, horse mackerel, chub mackerel, mullet and sole.

“Pieces of microplastics more than five millimetres big were found in all the mentioned species, in greater or lesser quantities,” said Mandić. “Of the overall 235 samples analysed, microplastics were found in a quarter.”

One of the most threatened species in the Adriatic is the sea turtle. Research published in the journal *Current Biology* suggests that plastic bags smell like a delicacy to turtles because of the bacteria and algae that accumulate on them.

“Research carried out until 2011 showed that, of 54 dead loggerhead sea turtles (the dominant species of turtle in the Adriatic), waste was found in the digestive systems of 35 per cent of them,” said Tutman. “The more there is of this waste, unfortunately the more sea

turtles are threatened.”

Mandic said the lack of action at the level of the state was worrying.

“Not much is being done to solve the problem,” she said. “There are no legal regulations dealing with the issue of marine debris, but also... there are insufficient national funds for fundamental scientific research” into the effects of accumulating waste on the health of marine organisms and consequently humans.

Tutman said it was vital that, given that marine debris can travel large distances, Montenegro join forces with its fellow Adriatic nations in trying to find solutions.

In early 2018, in Croatia’s walled city of Dubrovnik, the environment ministers of Croatia, Montenegro and Albania agreed to “firm up cooperation” and tap European funds to address the issue of marine debris in the Adriatic. But there has been little in the way of progress since then.

In Montenegro, the Public Company for Management of Marine Assets, a state body, announced in August 202 that the government was preparing a monitoring programme, including of waste in the sea, “with the aim of improving the environment of the Adriatic Sea.”

“The new legal regulations must provide significant improvement and greater efficiency of the local businesses which are responsible for collecting and disposing of waste, but also development of mechanisms in Montenegro for recycling plastic, glass, metal and other packaging, as well as mechanisms for monitoring and reducing waste in production, such as the ban on single-use plastic products,” said Miljan Zivkovic, a PR for the Public Company. “This will all contribute to a reduction of the waste on the beaches and other public areas.”

Karamanaga, the Ulcinj diver, said livelihoods were at stake:

“All this is dangerously undermining Montenegro’s reputation as a beautiful tourist destination and our sea as a source of quality fish products,” he said, “endangering us and our local communities, which crucially depend on the sea.”

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