

Science for Environment Policy

Chittagong ship recycling industry linked to carcinogenic air pollution

Dangerously high air pollution in the vicinity of shipbreaking yards has been detected by a recent study, where the concentrations of toxic chemicals in the air were found to be above carcinogenic risk limits (as set by the World Health Organisation). The research, carried out in Chittagong, Bangladesh, noted that shipbreaking activities and the subsequent processing and treatment of materials – particularly the burning of waste – result in emissions of persistent organic pollutants (POPs).

In 2014, the Chittagong area accounted for 22% of shipbreaking activities worldwide. The industry employs over 100 000 adult workers, and there are an estimated 50 000 children involved in e-waste recycling – of which 40% occurs in shipbreaking yards. Chittagong city has a total population of around 4.5 million people, and the prevailing westerly winds mean that air is generally carried from the shipbreaking yards into the city.

The study, which is the first to measure POPs in ambient air in Bangladesh, took data from 23 sites in Chittagong's residential and industrial areas and the shipbreaking yards to the north-west of the city. A total of 25 passive air samplers were used between the sites for 7 to 9 days in February 2013, after which the filters (polyurethane foam disks) were collected and analysed to reveal the pollutants that had been absorbed.

POPs, including polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and hexachlorobenzene (HCB), were found at their highest levels in sites near the shipbreaking yards, whilst dichlorodiphenyltrichloroethanes (DDTs) and short-chain chlorinated paraffins (SCCPs) were at their highest levels in urban areas. Readings for all these pollutants were high when compared to similar studies conducted in other parts of Asia.

The toxic equivalent quotient (an air toxicity standard developed by the World Health Organisation) for PAHs was above the World Health Organisation's carcinogenic risk limit¹ at 18 of the 23 sites. The detection of DDT in urban areas may be from historic use, but the researchers suggest it is likely evidence of recent or current (and therefore illegal) use. This is because the interpretation of the results, in terms of ratios between compounds that should degrade with different rates, indicates that concentration ratios have 'recent' signals.

It should be taken into account that the study was conducted during the dry season – at a time of year when annual air quality is at its worst in Chittagong. Throughout the sampling period there was no rainfall (which helps remove particulate matter from the air) and the study was conducted at a busy time in the industrial calendar. For this reason, the authors recommend that a follow-up study should be conducted in the wet season to give some insight into seasonal variability of the air quality in Chittagong.

The results of the study show that the effects of shipbreaking on air pollution are significant. The levels of phenanthrene, a type of PAH, were higher in Chittagong than levels detected in the ambient air of Shanghai and in industrial areas of Taiwan. The researchers state that more must be done at an international level to prevent transport of hazardous waste, in the form of ships, from more economically developed countries to less developed countries, where international regulations on safe ship recycling may not be enforced.



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1. WHO Air Quality guidelines for Europe
http://www.euro.who.int/_data/assets/pdf_file/0005/74732/E71922.pdf

