

Science for Environment Policy

Resource use and pollutant emissions due to ship recycling in India



June 2016
Thematic Issue 55

**Ship Recycling:
Reducing Human
and Environmental
Impacts**

**[Subscribe](#) to free
weekly News Alert**

Source: Deshpande, P.C., Kalbar, P.P., Tilwankar, A.K. & Asolekar, S.R. (2013). A novel approach to estimating resource consumption rates and emission factors for ship recycling yards in Alang, India. *Journal of Cleaner Production*. 59: 251-259. DOI: 10.1016/j.jclepro.2013.06.026.

Contact:
asolekar@iitb.ac.in;
asolekar@gmail.com

Read more about:
[Resource efficiency](#),
[Chemicals](#), [Waste](#)

The contents and views included in *Science for Environment Policy* are based on independent, peer-reviewed research and do not necessarily reflect the position of the European Commission.

To cite this article/service: "[Science for Environment Policy](#)": European Commission DG Environment News Alert Service, edited by SCU, The University of the West of England, Bristol.

1. Dismantling of Vessels with Enhanced Safety and Technology (DIVEST) is funded by the European Commission under its Seventh Framework Programme. See: http://cordis.europa.eu/result/rcn/54389_en.html

The Alang shipbreaking yards in India recycle almost half of all end-of-life ships worldwide. The major activity at the yards is plate-cutting, used to recover steel from ships. This process consumes nearly 29 kg of oxygen and 7 kg of liquefied petroleum gas (LPG) and emits almost 22 kg of CO₂ per 1 km-long cut with a 1 mm depth. This study reveals the carbon footprint and resources consumed in the cutting of steel plates. The method used to derive these findings could be adapted to ship dismantling yards worldwide.

India is home to the world's biggest ship recycling zone, which accounts for almost half of all ships recycled worldwide. Every year at the Alang shipbreaking yards in western India, over 350 ships are broken down and recycled.

There are many benefits to the ship recycling industry in India. It generates materials that can be re-used or recycled, for example, it provides raw materials for nearby steel mills (almost 2% of all steel produced in India comes from ship recycling). This reduces the need for mining and thus reduces pressure on natural resources. Ship recycling is also a local source of employment – the industry in India alone is estimated to employ around 60 000 people.

However, the process is also hazardous for workers and pollutes the coastal environment. In this study, EU-funded¹ researchers investigated the pollution associated with the cutting of steel 'plates', an important process for recovering steel from ships. Like most shipbreaking yards, plate-cutting is the major operation that takes place at Alang; almost 70% of the manual workforce is dedicated to the process. Here, plates are cut manually using handheld devices called Oxy-LPG torches. The researchers estimated the resources used and pollution generated by this process, in an effort to better understand the associated health, safety and environmental concerns.

The researchers developed an input-output framework which, alongside extensive field data, was used to estimate inputs of labour, oxygen and fuel, and outputs of CO₂ and paint.

The results suggest that approximately four hours are spent cutting plates, per 1 km of length and 1 mm depth, while the total time spent on plate-cutting (including supporting activities, such as moving the plates) is double that. The results further showed that approximately 6.2 kg of LPG (liquefied petroleum gas) and 28.5 kg of oxygen is used per 1 km of length and 1 mm depth.

Ships contain significant amounts of paint on their hull surfaces, which can chip off during loading, transport and cutting of steel plates. Per 1 km length/1 mm depth of plate cut, 0.9 kg of paint is emitted to the atmosphere and 1.34 kg is deposited to intertidal sediments, the researchers say. Related CO₂ emissions were even higher, at 21.77 kg.

These are average values, and the researchers note that the rate of plate-cutting may vary based on factors such as the experience of the cutter. They also say that plate cutting is not the only source of air and sediment pollution due to ship recycling, and therefore the outputs described in the study probably represent an underestimate. However, the researchers describe their results as 'fairly accurate' and say they will aid efforts to make ship dismantling greener. Furthermore, the approach used to generate their results could be applied to shipbreaking yards worldwide.

The emissions factors presented here could also help to design technological solutions to minimise health and safety risks and protect the environment. For example, scrapping the surface coating before cutting the steel plate could reduce the toxic gases generated by plate cutting. Although there is a cost associated with adopting such new technologies, they are important in the light of international regulations (such as the [Hong Kong Convention](#) and the more recent [EU Ship Recycling Regulation](#)) and in the long-term will help ship recycling yard owners to attract clients looking for green ship recycling yards.

