



Utilizing Waste Plastics and Copper Slag to Produce Value-Added Materials

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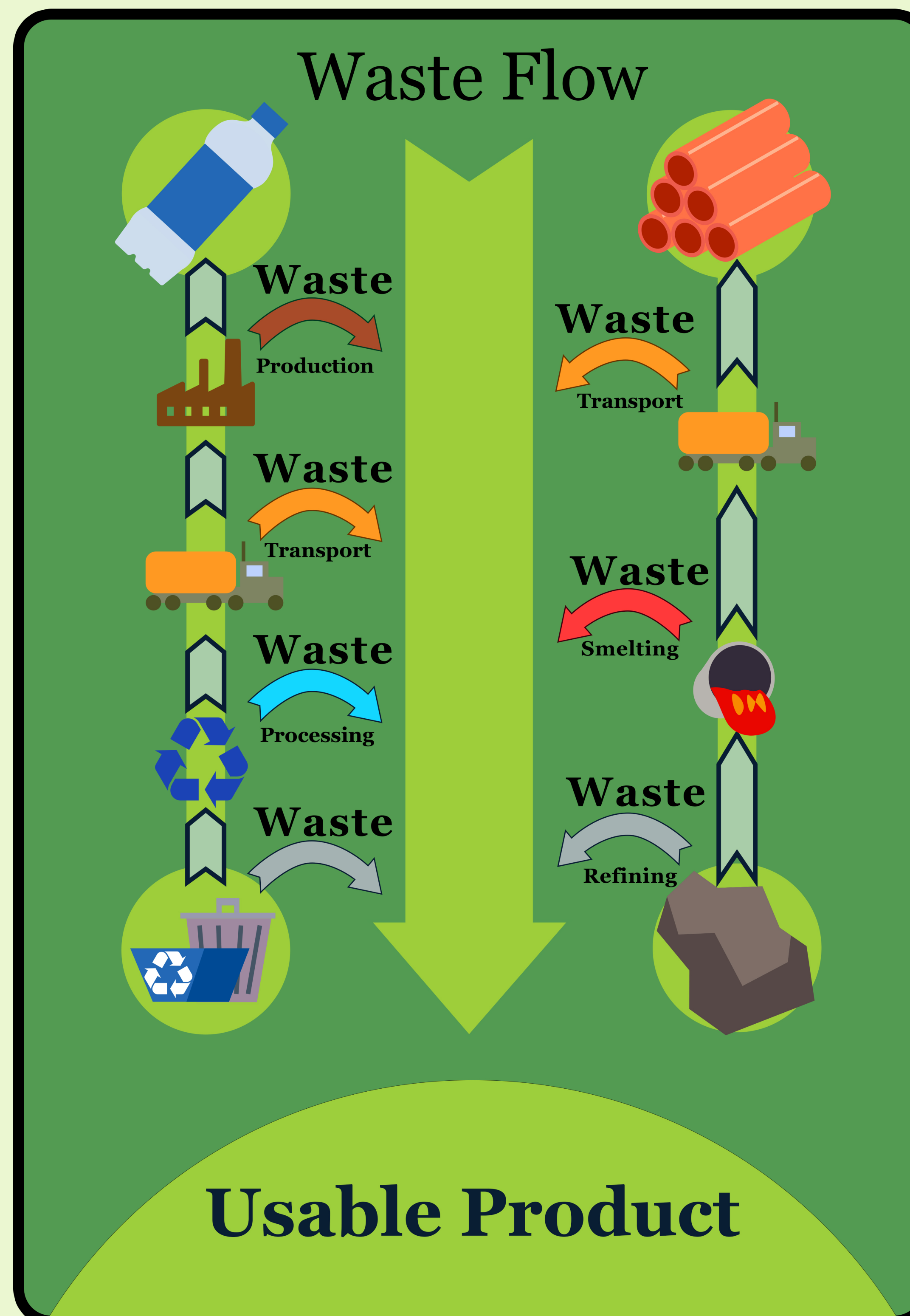
Professor Brajendra Mishra, Professor Diran Apelian

Problem Statement

Valuable resources found in copper slag and plastics are wasted and cost billions of dollars to be transported globally just to end up in slag fields and landfills, where they pollute local environments and communities.

Plastic Waste

Plastic wastes are difficult to recycle and toxic to burn, but can serve as a virtually inexhaustible resource. By 2015, 5,800 Mt of waste from primary plastic production accumulated in the world^[2], which contains enough carbon to reduce all of the annual iron oxide from copper slag product in the United States over 20,000 times.

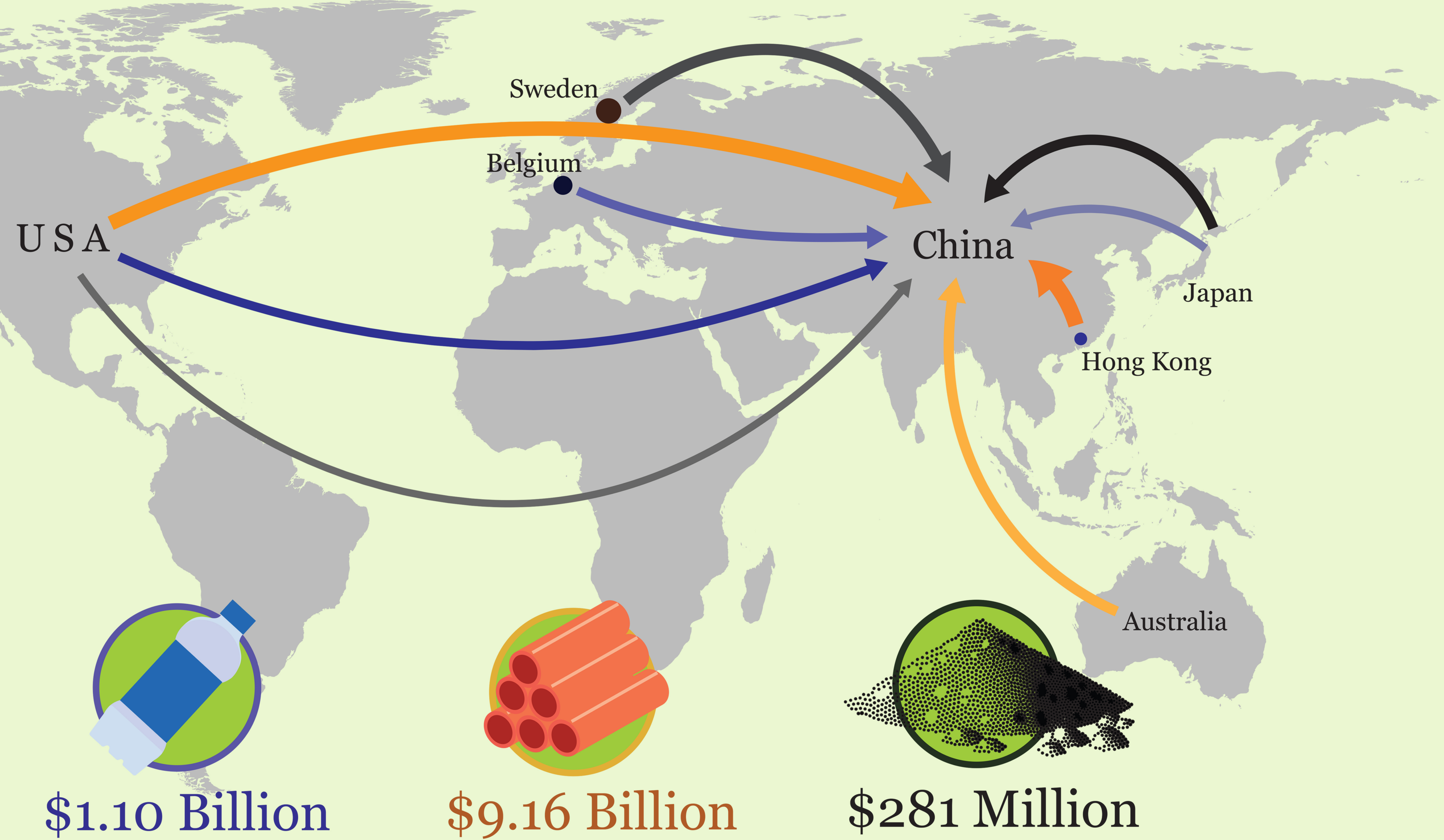


Copper Smelting Waste

Copper slag is the byproduct of copper smelting and contains a variety of toxic compounds and metal oxides. It is generally exported for use as an aggregate in concrete.



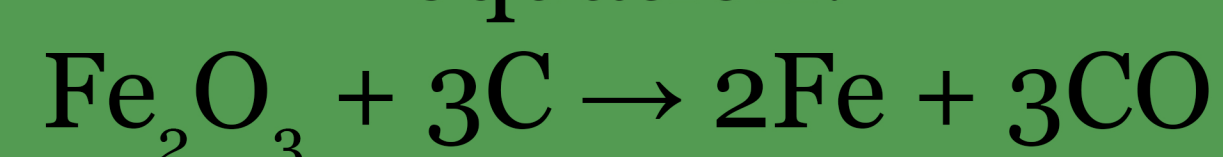
China is the top importer of *plastic scrap, copper slag, and granules and powders of iron*. Their top three trade partners for each commodity by value is shown via an arrow representing the flow of materials



OUR PLAN

Plastic-Slag Reduction

Iron oxides in copper slag can be reduced into iron powder by the carbon in plastics according to the following equation:



This method was confirmed through a successful small-scale experiment.

Commercially, massive amounts of plastic and slag could be processed in Peirce-Smith converters. Producing iron this way costs approximately \$49.1/tonne, a net gain when compared to the international selling price of iron: in 2017, the United States imported 76,600 tonnes of iron powder from Canada for \$1,240/tonne^[3].

Social Entrepreneurship

Through sustainable social entrepreneurship, poverty and plastic waste can be eliminated from communities. Community members collect and sell plastic trash to an intermediate company, where it is shredded and sold to be processed with copper slag.