

consumption associated with its transportation. Glass needs to be separated by color for recycling. Mixed glass has a much lower value due to strange colors obtained after melting. Clear glass has the highest value, due to high market demand.

Recycled wood comes from construction and demolition, plus from commercial, industrial and household sources. The main market of recycled woodchip has been the panel board industry, but new markets have been developed in recent years. Wood waste prices will vary considerably depending on the cleanliness of the material, volume and location. In the sorting process, plastic needs to be separated according to the type of resin. Glass needs to be separated by color. The various types of metals need to be separated. Undesirable materials, such as ceramics, need to be removed from the materials to be recycled. Today, in large urban areas, most of the necessary sorting is done mechanically.

Melting is required in the recycling of plastics, metals and glass. Paper and board are pulped.

## **RECYCLING UPDATE**

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Background: Back in 1970 the U.S. recycling rate was 6.6 percent, which increased to 34.1 percent by 2010. However, overall waste nearly doubled during that time frame (though some materials, such as glass and ferrous metals decreased or stayed the same), resulting in more non-recycled waste today than back in 1970.

The Federal Resource Conservation and Recovery Act (RCRA) passed in 1976. Among other things, the law mandated that landfills be closely monitored and enacted America's hazardous waste management program. Due to increased regulations and recycling, the number of landfills in America decreased by more than 75% between 1988 and 2002. Responsible disposal of hazardous waste prevented more than 15 million pounds of toxic chemicals from being released into soil and waterways from 2007 to 2010 alone. As of 2010, 25 states had passed legislation mandating statewide e-waste recycling.

The benefits of recycling can be summed up in energy savings, natural resource conservation, increased jobs and economic activity, and some reduction of waste disposal in landfills

Economic Impact: Per a U.S. Recycling Economic Information Study (2002) recycling was generating 1.1 million U.S. jobs, associated with \$37 billion in annual payroll. A 2010 update of that study found that recycling in Illinois generates 111,500 jobs, with \$3.6 billion in payroll, and over \$1 billion in state and local taxes. The Tellus Institute projects that increasing the U.S. recycling rate to 75% would result in 2.3 million recycling related jobs. Substantially increasing the cost of sending materials to landfills would be a strong incentive to achieve higher recycling rates.

Markets: As of 2009, roughly 60% of the recyclables collected in North America were reused in North America, while the remaining 40% were exported to other parts of the world, mostly to Asia.

Geographic location plays an important role in the price setting, due to differences in prices of machinery, labor, and other production costs. Sometimes the value of waste materials involves negative figures – in other words, the user is paid for acquiring the recovered materials. During periods when the price of recycled materials is low, such as during recessions, it is more economical to focus on waste-to-energy technologies. Mixtures of recycled and virgin materials can be used instead of purely virgin material in manufacturing processes without damaging the properties and characteristics of the resulting material.

With regard to paper and board, use of recovered paper has outstripped the use of virgin fibers since 2005. However, the use of some virgin fibers is required to strengthen the mixture of recovered paper during the papermaking process. The use of recycled fibers usually varies between three and eight times depending on the quality of the recycled paper.

Not all plastics can be recycled since there are chemical difficulties with some polymers. Mixed plastic packaging is not usually recycled due to problems in the separation stage. The type of plastics that can be recycled are PET, HDPE, LDPE, PP, PVC, PS and a few others. In 2007, 80% of the market for waste plastic was in Asia.

Turning to metals, recycling saves 95% of the energy used in aluminum production, 85% of the energy used in copper production, and 74% of the energy used in steel production. Steel is the most recycled material in the world, followed by paper and aluminum. In 2007, Asia imported 80% of the world's copper scrap, 50% of the world's aluminum scrap, and 30% of the world's iron and steel scrap.

Glass can be recycled endlessly without losses in quality or purity. Domestic markets for recycled glass remain at a high level and this fact makes the price paid for this material quite stable. Imports and exports of glass are rare because of its high weight and the high fuel