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A reverse supply chain can enhance waste management programmes

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What is This?

A reverse supply chain can enhance waste management programmes

Outside the waste management community there is a predisposition to think of waste materials as undesirable 'objects' that have no connection with the product they were or the processes from which they were produced. Used electronics, for example, are often labelled as 'hazardous' or 'special' waste, ignoring the socioeconomic benefits the equipment provided and the positive environmental, social and economic impacts that could be derived from reuse (after refurbishment or remanufacturing), or recycling and recovery of its valuable component parts. Furthermore, while transboundary flows of products and raw materials are 'normal', international flows of waste are seen with different lenses. There are of course some justified cases, including for instance open burning of insulated copper cables to remove insulation, the 'bootlegging' of contaminated plastics and paper disguised as recyclables and nuclear waste transport, but there are many other cases of waste flows where an unjustified paranoia seems to inhibit advances in the reverse supply chain performance.

Reverse supply chain can be defined as the movement of products from the customer back to the seller or manufacturer. It is the reverse of the traditional supply chain movement of products from seller to customer. As a definition and as reported by Kumar and Chatterjee in their paper *Reverse Supply Chain: Completing the Supply Chain Loop*, published by 'Cognizant 20-20 Insights', 'reverse logistics can be considered as the process of planning, implementing and controlling the efficient and effective inbound flow and storage of secondary goods and related information for the purpose of recovering value or proper disposal'. There are various types of reverse supply chains but they always try to achieve the following key objectives: product acquisition, reverse logistics, inspection and disposition, remanufacturing and marketing.

Today´s world is characterized, at least in part, by population growth, technological achievements, materials demand and scarcity, transboundary trade of raw materials and products, and environmental degradation. These same concepts should be considered to redefine the reverse supply chain. The redefinition of the reverse supply chain should necessarily address legislation regarding waste systems in exporting countries and trade bans on inter-boundary movements of waste, insertion of creative solutions to attend the informal waste management, particularly in developing countries, technology investment and the integration of technology in waste management systems. However, prior to this redefinition, a better understanding of the existing international waste recycling regimen and main actors as well as the characterization of waste flows is needed.

There is a need today for waste management regulations to be more flexible, to reflect the realities of international trade and rapid introduction of new materials in commerce. For instance, regulations should be customized to encourage the recycling of waste materials that are able to be processed, shipped, and used as a raw material in an environmentally responsible manner. Regulatory obstacles, for example, have been documented in industrial symbiosis projects around the world, where waste streams of a specific industry can be recycled as an input stream in a complimentary industrial sector. Moreover, transboundary flows of used electronics are under the constant eyes of many countries and environmental non-governmental organizations (E-NGOs) obstructing secondary markets and formal recycling markets. This behaviour is, however, understandable based on documented environmental and public health hazards associated to waste electrical and electronic equipment (WEEE) management, particularly in developing countries.

The reverse supply chains need to be tied to the cultural imperative of the secondary products exporting and importing country and a clear understanding of the systems and its actors. There is certainly a difference between developed and developing countries where for instance members of the informal sector (often called 'scavengers') provide much of the labour that feeds the recycling markets. Legislation on national systems needs to reflect this uniqueness and escape from the mere reproduction of schemes that are successful in specific already developed countries, adapting their legislation to the particular case of developing countries.

In several industrial sectors reverse supply chain issues should be considered when planning the logistics for the recovery of secondary/used goods, particularly those of products that have a short life cycle and extensive consumption. The electronics, automotive and retail sales industries are some important cases. As an example, personal computers and other electronic products are well known to have relatively short useful lives; for example, it is estimated that by 2012 about 30 million used (and perhaps only slightly obsolete) personal computers will be available for recycling, with the residues discarded, most probably in emerging countries. How can we best improve collection, storage, and shipping logistics for all WEEE that move from developed to developing countries as secondary materials on a global scale? This question is still open and for a proper answer we need of course to redefine the reverse supply chain at any local level. Due, in part, to proper regulations and incentives, in some countries; such as Japan, the automobile reverse supply chain shows signs of a more mature system: high recycling (especially metals)

and recovery rates including resell, after quality control, of auto parts to secondary markets (see for instance Zhao and Chen, *Resources, Conservation and Recycling* 2011, 57: 15–21). Furthermore, mandatory container deposit laws or 'bottle bills', already in-place in some North American states/provinces and other countries in the world, have been proved to markedly increase recycling rates. Furthermore, post-consumer PET bottles collected around the world, in some cases by scavengers or formal waste collectors, are already part of a transboundary flow of recyclable material.

There is enough evidence to support the notion that a redefinition of the reverse supply chain could positively affect waste management performance. In this sense, *Waste Management & Research* serves as a forum for exchanging research results and scientific ideas supporting the development and application of innovative waste management options. Thus, *Waste Management & Research* invites researchers to submit manuscripts focusing on reverse supply chain actions for enhancing the waste management performance in specific industrial areas with high social impact.

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