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Management of reverse logistics supply chains in construction projects

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Abstract

The paper discusses reverse logistics of construction products and materials during repair and demolishing works. In search of effective demolishing waste management methods the following options are considered in order of priority: reusing, resale, repairing, refurbishing, or other methods, ending with energy recovery, and finally disposal.

All these methods are related to planning and organizing supply chains, which here are called reverse supply chains, encompassing physical flows of waste and accompanying information.

Detailed examples which occur in logistics of such projects are discussed using an example. Disposal costs and increasingly rigorous waste management laws encourage effective waste management. The research and analyses indicate that launching reverse supply chains within a project has a significant added value for a business.

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1. Introduction

Waste management is a key environmental, social and economic issue, as well as a growing problem due to the amount of waste generated in Europe each year. Construction sector generates about 35.5% (Fig. 1a) of all waste, hence construction engineers must manage almost 871 million tons of waste a year [1]. The waste structure differs in individual EU countries, but concrete and bricks have the highest share in percent (Fig. 1b).

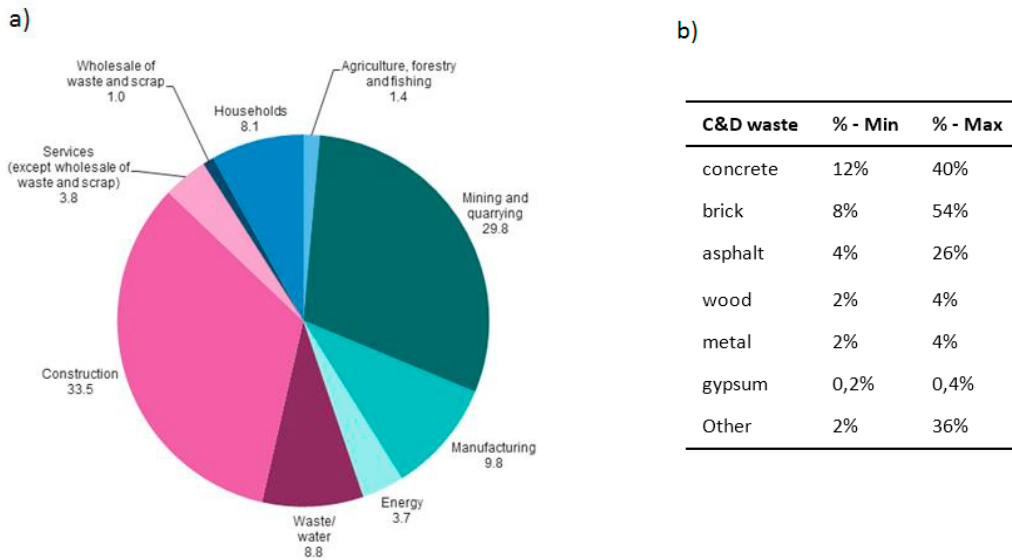


Fig. 1. (a) Waste generation by economic activities and households 2014 [1]; (b) Material composition of C&D waste in EU[2].

Such obligation results from EU directives, and in Poland directly from the Waste Act 2012 of 24 December 2012 (as amended) [3] according to which *a waste producer means anyone whose activities produce waste, [...] as a result of providing services in the area of construction, demolition and repair of buildings, [...]* (Art. 3 of the Waste Act). The waste producer becomes also a waste holder, which entails numerous legal obligations, including for waste management and the related costs (Art. 22). The construction waste management process is complex, the engineer's main tasks in that regard include planning and designing, waste collection, storage, transport, recovery or sending for disposal – understood as transfer of waste to businesses which operations include waste recovery or landfilling. Knowledge of methods and available technologies, as well as possibilities of construction waste processing is a basis to build reverse logistic chains. However, recovery is not always profitable; sometimes there are additional limiting circumstances such as time and place on site, which prevent or limit the aforementioned activities. A market research in terms of waste disposal costs is therefore also important. However, there are numerous logistic streams that can be used for waste management. After rejecting streams that cannot be implemented due to existing limitations, there are a few waste management variants worth considering which will be related to development of logistic chains.

2. Development of waste management models

2.1. Tools and methods

The possibilities of construction waste reuse and the required processes and research were determined using literature review and numerous case studies (section 2.2). Market prices of a dozen waste disposal plants were analyzed (section 2.3). The costs of construction works were determined using Contractors Estimators, current

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