PREDICTIVE RESOURCE PLANNING: COUPLING CONSTRUCTION NEEDS WITH DEMOLITION WASTE FORECASTS

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Key Words: Demolition waste, resource planning, lifetime analysis

Current systems of construction and demolition waste (CDW) recycling function insufficiently to meet the European ambitions of resource efficiency (Dahlbo et al., 2015). Knowledge about when, where and what will become available from CDW could stimulate the development of new recycling and production processes based on secondary materials, thereby reducing environmental and societal impact related to primary materials. Various methods exist to quantify CDW streams (see Wu et al., 2014), but the application of CDW forecasting methods is not yet common practice in waste and resource management. Lifetime Analysis (LA) seems to be a useful approach, comprising a practical bottom-up analysis of building materials and their expected replacements. Especially for countries with a high expected need for future construction activities and high material demand, LA is a potentially useful though scarcely tested method to forecast secondary material supply. Examples of these countries can be the rapidly emerging and developing countries, but can also be densely built and developed countries like The Netherlands, where current construction and demolition rates reflect a replacement of existing dwellings in cycles of 200 years, while buildings are designed and expected to function for only about 50 years (Mulder et al., 2015). Our study aimed to provide insight in the benefits and drawbacks of LA in resource planning, addressing three main questions: (1) How can future CDW streams be modelled realistically? (2) Can this model deliver useful insights into the supply of (secondary) materials? (3) Can the forecasted supply of materials be coupled with the expected demand for (secondary) construction materials? The combination of CDW forecasting and resource management was evaluated by means of a regional case study in the architecturally diverse and strategically important Metropole Region of Amsterdam (MRA). In the case study, the material flows of the main components (e.g. foundation, walls, windows) of the most common dwelling type (the terrace house) were inventoried, taking into account several architectural styles. The expected replacement times of these materials were modelled over a period of 50 years, based on economic trends and technical characteristics. This resulted in a forecast of diverse waste streams becoming available at different moments in the next decades. Results showed a distinction between bulk streams (amongst others: calcium silicate bricks) and smaller streams (amongst others: glass), and the temporal variations in expected supply of these materials. Combined with construction forecasts, several demolition scenarios were developed which explored the potential match between supply and demand. For example, the largest waste stream from CDW was stony material which is currently used as foundation material in infrastructure, but this market is expected to be saturated in the coming decades and therefore other applications for this waste material have to be explored. The kind of modelling as applied in this study can be translated to other urban cases, but the results of this study should be considered with care with respect to the scope of materials included, the exact years of demolition and the location dependent characteristics. The list of analysed materials in this study was limited due to time constraints, though sufficient materials are inventoried to illustrate the potential of this type of modelling. The exact year of demolition as used in the scenarios is a variable parameter which can be altered to find matches between supply and demand. It is recommended to expand the study area to other regions and countries, which enable tailored policy and business development and validation of results.

References: