Recycling Construction and Demolition Waste (CDW) and conserving natural resources have become an essential issue in Europe due the huge amounts of waste generated and primary materials consumed every year in the construction sector. The aim of this PhD thesis was to evaluate the environmental performance of Cement Concrete Demolition Waste (CCDW) management in a given territory and to compare the current situation in this territory with different scenarios. The question was whether recycling would improve the environmental performance of waste management in the territory and minimize the dependence on primary materials. The territory understudy was *Loire-Atlantique* on the west coast of France. Recycled Cement Concrete (RCC) recycled from CCDW was considered to be a technically viable alternative to basic quality natural aggregates (A1- dependent co-product of the quarry process) to be used for the foundations of constructions or the sub-base of roads. Our territorial model of CCDW management was an expanded system including different processes and multiple reference flows such as: quarry process with its three co-products, recycling process, landfilling and stock of the demand-constrained materials. A combination of different methods was applied to evaluate the environmental performance of the territorial CCDW management in terms of 12 environmental impacts: Life Cycle Assessment (LCA), Materials Flow Analysis (MFA) and a local market mechanism model. LCA was used to estimate the potential environmental impacts of the territorial CCDW management. MFA provided us with information concerning the production and consumption of materials in the territory, associated with the territorial waste management and accumulation of the materials in the territory (this issue is usually ignored in LCA studies). The local market mechanism model enabled us to investigate the possible decision procedures and parameters of buyers in the "basic quality aggregates" market. We then studied how they made choices between A1 and RCC in this market. As a consequence of these decisions, the waste stream towards the waste management system and the dynamics of the stock of materials were investigated. In this model, the real location of the market's suppliers (quarries and recycling facilities) in the territory were found and used.

The environmental assessment results showed that the quarry process in the territory is the main contributor to the environmental impacts of the system we studied. The recycling process of CCDW had much lower environmental impacts compared to the quarry process. Transport was found to be negligible for all environmental impacts compared to other processes in the territory. The local market mechanism model revealed that the current mechanisms in the basic quality aggregate market were mainly structured based on the prices of the resources (A1 and RCC) and the buyers' degree of confidence in the quality of RCC. Comparative environmental assessment results indicated that increasing the share of RCC in the market did not have substantial environmental benefits (except for the fossil cumulative energy demand, urban land occupation and depletion of the abiotic resource indicators). This was mainly due to the fact that, the lower environmental impacts of CCDW recycling were offset by the impacts of the stock of unused A1. Although replacing A1 with RCC in the foundations minimized the waste streams to landfills, it did not avoid A1 production in the quarry.

In order to decrease the dependence on primary materials in the construction sector, the quality of RCC needs to be improved to replace high quality natural aggregates (the determining co-product of the quarry process) in high-grade applications. In addition, it is required to work on the buyers' confidence in the quality of RCC. However, an environmental analysis is required to determine whether using RCC as high quality aggregates would significantly improve the environmental performance in the territory, especially if some modifications are required to obtain a better quality of RCC.

Key words: Construction and Demolition Waste (CDW) management, system expansion, Consequential Life Cycle Assessment (LCA), Material Flow Analysis (MFA), local market mechanism, modeling market mechanism, territorial impacts, circular economy.