LCA MODELLING OF CEMENT CONCRETE WASTE MANAGEMENT

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Recycling of Construction and Demolition Waste (CDW) could be seen as a proper solution to improve environmental performances and conserve natural resources. Keeping a balance between economic pressures and environmentally friendly practices would play an important role in a circular economy with local material recovery and a recycling industry sector. This balance would ensure a sustainable future to this industry as well as essential quality improvements and developments of market for value added products, which are needed to make recycled materials economically viable.

Therefore, environmental assessment of circular economy through life cycle assessment has given rise to further research questions, which have to be answered. Replacing natural resources with recycled materials may cause some indirect environmental impacts (either positive or negative) on other products' life cycles through economic market mechanisms. In fact, according to Ekvall (2000) "indirect effects depend on how the market for recycled materials reacts to a change in supply or demand for the recycled materials, this in turn depends on political constraints, price elasticities, etc. in the market for recycled materials."

Different system models have been developed to assess environmental effects of recycling, through markets mechanisms, using partial equilibrium economic models. However, they are generally applied to global markets, such as metals or fuels. Construction materials are usually managed and handled at local scale. At this scale, market equilibrium will not follow general market equilibrium rules, but will highly depend on local regulations and local technical practices and recycling facilities.

Our general aim is to develop a LCA model of cement concrete waste management at local level including market mechanisms in order to identify action levers for both economic and environmental improvements. In this presentation, through a simple example we compare environmental performances between two scenarios of cement concrete waste management: recycling into road construction or inert landfill. For recycling, we use two system modeling. One system model will use a classical substitution assumption without market mechanism. A second one will take into account a simple market mechanism based on qualities requirements, and thus further existing usage of natural and recycled aggregates. This study will serve setting the basic assumptions to develop a more generic conceptual model, based on material flow analysis, qualities of materials, and economic market mechanisms. This model is applied to the case study of Loire-Atlantique in France, using local economic and flow data.