Avoided material marginals

LCI data for KISS waste excel model

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Material marginals

Materials retrieved from the sorting of waste replace production from virgin material. In the projects carbon footprint balance the replacement is calculated depending on type of material and where in the production chain of virgin material the sorted waste materials will be replacing virgin materials.

The KISS waste model base the calculation for carbon footprint on the amount of primary energy used for heat and electricity for the production of virgin material. The carbon footprint of electricity will be calculated using the world marginal for electricity developed in TOPWASTE (Salvucci and Münster, 2015) Specific details of the different material marginal are accounted for in the following and in table 1.

1. Paper and Cardboard

Paper and cardboard (see description in C. Cimpan 2015) is replacing biomass. The actual biomass marginal is uncertain. Therefore the model have the option of selecting the biomass marginal depending on the future investigated.

2. Glass

When re-using glass from waste collection the glass cullets are added to the production of new glass and re-melted. The energy used for melting the glass cullets is less than for melting the raw materials. Therefore the savings will be proportional to the difference in energy use and of course savings of raw materials for the production. Production of virgin glass also releases a significant amount of CO_2 due to the use of limestone that is heated in the production. This is to be included when modelling carbon footprint.

3. Plastic

Plastic contain a large amount of feedstock energy. The replaced plastic materials will only replace the energy in the feedstock

4. Ferrous and Nonferrous metals (metal mix), copper and aluminum

The mix of metals will similarly to glass replace virgin materials and the metals will be remelted when re-used. Therefore the replacing of metals will result in energy savings corresponding to the difference between the energy use for melting raw materials and the energy use for re-melting. And off course the energy use for producing raw materials is also saved.

5. Fertilizers (N, P, K)

Digestate from biogas production can be used as fertilizer on agricultural fields. When it is used for this it will replace production of new fertilizers corresponding to its content of N, P and K.

Tabel 1. Overview of selected data from Ecoinvent for the modelling avoided of marginal materials in KISS

Material and names of the processes used from Simapro 8.04	Avoided energy use [MJ/kg] (Ecoinvent 3.3)	Type of Energy	Price DKK/kg	Other materials kg CO_2 eq/kg
Paper and News paper	Modelled based on substitution of biomass		952	
Cardboard	Modelled based on substitution of biomass		874	
Glass - Packaging glass, white, GLO without cullets, Conseq, U - Minus glass cullet, sorted (ROW) packaging glass production, Conseq, U	(15,49-3,88)=11,61	Heat	180	0,668 from Lime
Mixed Plastic - Polyethylene low density granulate RER, Conseq, U	79,4	Heat	-	
Metal mix - Pig Iron, GLO production, Conseq U	22	Heat	2345	
Aluminum - Primary, ingot GLO production, Conseq U	183	Electricity	8566	
Nitrogen - Nitrogen fertilizer as N RER, urea ammonium nitrate, Conseq U	66,6	Heat	4,11	
Phosphate - Single super phosphate as P2O5 production, RER, Conseq U	27,1	Heat	14,25	
Potassium - Potassium Sulphate RER production, Conseq U	7,95	Heat	5,70	
Copper - Copper ROW production, primary, Conseq, U	67,7	Electricity	17	

6. References

Ciprian Cimpan (2015) Foreground systems report. System descriptions and LCI data for the KiSS model

Raffaele Salvucci and Marie Münster (2015) TOPWASTE Background Energy Scenarios

Wenzel, H. and L. Hamelin (2015) Identifying marginal biomass supply under varying future framework conditions

Eco Invent database 3.3 (2015), (http://www.ecoinvent.org/home/)