Exercise 4b.2: Lifecycle Assessment of insulation materials (2/2)

Estimated time requirement: 20 minutes

Introduction

This second part on lifecycle assessments (LCA) will focus on the material with the biggest global warming potential: flax insulation.

Please form groups of four to five persons and work on the task below.

Part	Tasks	Time
4	Simplified overview of the life cycle of flax insulation products is presented in the figure in the background information, as well as Inventory results for emissions to air for the three insulation materials. Analyze the provided information and discuss possible reasons for the high impact potential of flax. Identify lifecycle stages that have particular high impact. Note your findings on worksheet 3.	20 min

Flax insulation

- Based on flax plant (*Linum usitatissimum*)
- Large-scale agricultural production
- Large amounts of additive material needed to achieve the requested and desired technical properties (mostly polyester, also diammonium hydrogen phosphate and borax)
- Binder materials are melted and then mixed with flax raw material during production process
- Finished insulation material: no uniform product
- Used in construction sector: most sold product based on recycling material

Background information

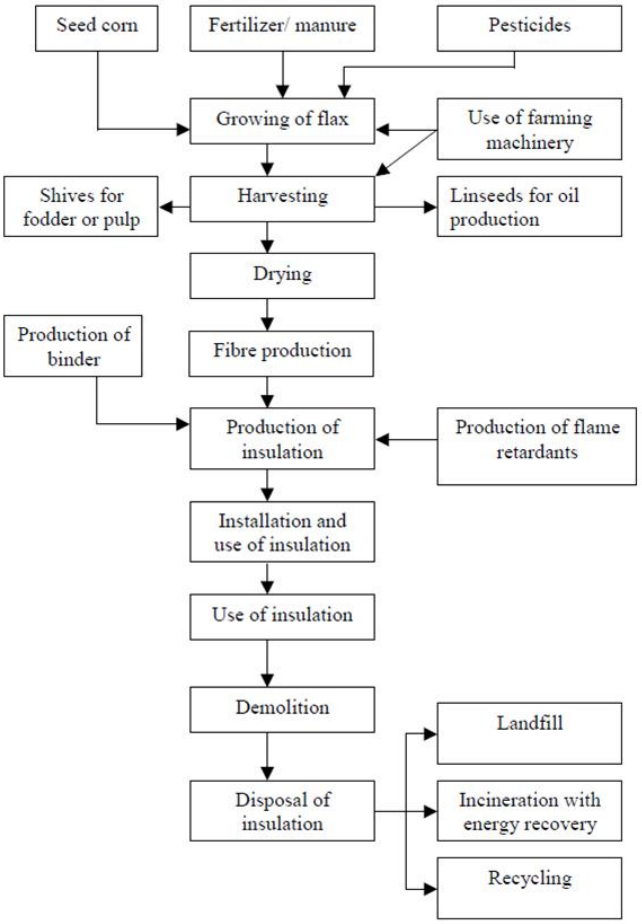

Figure 1: Simplified overview of the life cycle of flax insulation products (Source: Schmidt et al. 2003)

Table 1: Inventory results for emissions to air for the three insulation materials

Emission to air	Unit	Stone wool	Flax	Paper wool
CO_2 (fossil)	g	1421	2142	805
CO	g	105	2.0	1.0
SO_x	g	6.08	11.57	2.88
No_x	g	2.47	7.44	3.74
N_2O	g	0.02	0.41	0.01
CH_4	g	1.04	4.19	0.57
HCl	g	0.06	0.04	0
H_2S	g	0.03	0	0
Ammonia	g	2.37	0.02	0
Hydrocarbons (except CH_4)	g	0.21	2.2	1.22
VOC	g	0.7	0.85	0.39
Particulates	g	1.19	1.54	5.08

Worksheet 3

Task 4: Analyze the provided information and discuss possible reasons for the high impact potential of flax. Identify lifecycle stages that have particular high impact.

- **The global warming potential differs by almost factor 3 between the least contributing material (paper wool) and the most contributing (flax).**
- **It may be somewhat surprising that flax insulation, which in principle is based on a renewable resource, has the largest contribution.**
- **A number of reasons for this:**
    - **Large-scale agricultural production of flax requires artificial fertilizer; whose production is relatively energy intensive (causing emissions of carbon dioxide)**
    - **Production of fertilizer further emissions occur: dinitrogen oxide (N_2O) (a strong greenhouse gas)**
        - **Evaporation of N_2O of the fields**
    - **Binder and flame retarding materials added use relatively large amounts of fossil fuels for their production**
    - **Production process itself also contributes through emissions from its energy consumption. The energy is used to melt the binder materials before mixing with the flax raw material.**
- **Contribution to global warming potential of stone wool:**
    - **main contribution for stone wool insulation comes from the production process where fossil fuels are used for production of energy.**
    - **Production of stone raw materials is not very demanding in terms of energy consumption and there are no other emissions during their production that have a global warming potential.**
    - **Binder materials are only used in very small amounts and besides emissions from energy consumption there are no other known emissions that contribute to global warming in significant amounts.**
- **Contribution to global warming potential of paper wool:**
    - **Although the raw material for paper wool, old newsprint, primarily is based on renewable resources, its production still demands an input of fossil fuels and causes accordingly also emissions of carbon dioxide, which is the main contributor (more than 55%) in this system.**
    - **Other significant sources are production of aluminum hydroxide and the final production, each contributing with 10-15%.**