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ADV_LCA_hw4

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1.

Inputs					
Flow	Category	Type	Unit	Amount	CO2 Output
Transport, pipeline, natural gas	II	Product flow	$t{\cdot}km$	0.534	1.39×10^{-4}
Transport, combination truck, average fuel mix	III	Product flow	$t{\cdot}km$	0.059	0
Natural gas, processed, at plant	I	Product flow	m^3	0.298	3.91×10^{-2}
Natural gas, extracted	I	Product flow	m^3	0	1.70×10^{-2}
Output					
Electricity, natural gas, at power plant	None	Product flow	MJ	1	
CO2 emissions	air/ unspecified	Elementary Flow	Kg	0.584	

I: Mining, Quarrying, and Oil and Gas Extraction

II: Transportation and Warehousing

III: Transportation and Warehousing

Total CO2 emissions =

Direct emission from the electricity generation unit process+$\Sigma\ Emissions\ from\ every\ flow$

$$= 0.584 + 0.534\ t{\cdot}km \times 1.39 \times 10^{-4}\frac{kg}{t{\cdot}km} + 0.059 t{\cdot}km \times 0$$

$$+0.298 m^3 \times 3.91 \times 10^{-2}\frac{kg}{m^3}$$

= 0.60 kg / 1 MJ electricity generated

2.

Inputs					
Flow	Category	Type	Unit	Amount	CO2 Output
Diesel, at refinery	I	Product flow	m^3	3.33×10^{-1}	0
Transport, barge, average fuel mix	II	Product flow	$t{\cdot}km$	9.45×10^{-3}	0
Transport, combination truck, average fuel mix	III	Product flow	$t{\cdot}km$	1.75×10^{-3}	0
Transport, pipeline, unspecified petroleum products	IV	Product flow	$t{\cdot}km$	1.37×10^{-2}	0
Transport, train, diesel powered	V	Product flow	$t{\cdot}km$	1.12×10^{-3}	1.9×10^{-2}
Output					
Electricity, diesel, at power plant	None	Product flow	MJ	1	
CO2 emissions	air/ unspecified	Elementary Flow	Kg	9.79×10^{-1}	

I: Petroleum and Coal Products Manufacturing

II: Inland Water Transportation

III: General Freight Trucking

IV: Other Pipeline Transportation

V: Rail Transportation

Total CO2 emissions =

Direct emission from the electricity generation unit process+$\Sigma\ Emissions\ from\ every\ flow$

$$= 0.979\ kg + 1.12 \times 10^{-3}\ t{\cdot}km \times 1.9 \times 10^{-2} \frac{kg}{t{\cdot}km}$$

= 0.979 kg / 1 MJ electricity generated

3.

Inputs					
Flow	Category	Type	Unit	Amount	CO2 Output
Transport, combination truck, average fuel mix	I	Product flow	$t{\cdot}km$	2.46×10^{-2}	0
Transport, train, diesel powered	II	Product flow	$t{\cdot}km$	1.06×10^{-2}	1.9×10^{-2}
Output					
Electricity, biomass, at power plant	None	Product flow	MJ	1	
CO2, fossil	air/ unspecified	Elementary Flow	Kg	4.04×10^{-2}	

I: General Freight Trucking

II: Rail Transportation

Direct emission from the electricity generation unit process+$\Sigma\ Emissions\ from\ every\ flow$

$$= 4.04 \times 10^{-2}\ kg + 1.06 \times 10^{-2}\ t{\cdot}km \times 1.9 \times 10^{-2} \frac{kg}{t{\cdot}km}$$

= 0.041 kg / 1 MJ electricity generated

4.

a. The result for biomass electricity is much smaller than one of others. There may be two reasons. Firstly, the efficiency of biomass is lower than one of naturals and diesel. On the other hand, the microorganisms needs electron for its syntheses process, then electricity generated should decrease.

b. It is not fair. Since this process not only emits carbon dioxide, but also can microorganisms take up a part of carbon dioxide for its metabolism process. In other word, coal, diesel and natural gas is not sustainable resource, compared to biomass.

c. They do all use the same approaches to estimate the total CO2 emissions from generating 1 MJ of electricity, basing on the data obtained in the LCA website. Secondly, transportation is considered for these (coal, natural gas, diesel and biomass).

On the other hand, biomass do not have manufacturing and process stage, compared to other categories. Secondly, the CO2 generated by microorganism metabolism should be considered and this part can be offset by CO2 in atmosphere.