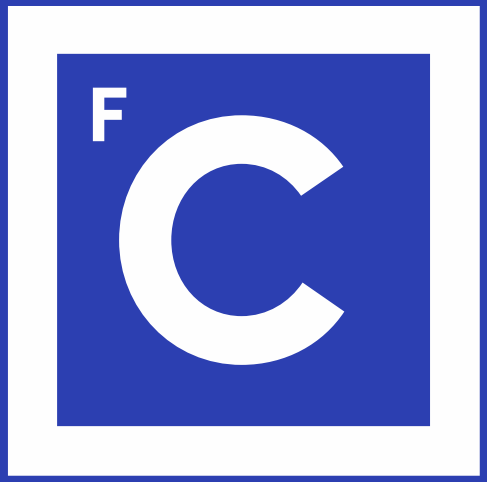


Ciências ULisboa

Faculdade
de Ciências
da Universidade
de Lisboa

Eng Energy & Environment

Environmental Impact & LCA

CHALENDGE #2

27 de Setembro (terça-feira) 14h40 e as 15h40

valorcar
valorizamos o ambiente

Pedro Pinto
Departamento Técnico

CHALENDGE #2

11 de Outubro (terça-feira) 14h40 as 15h40

valorpneu
Porque existe Amanhã

20 anos

Paulo Silva
Departamento Logistica

CHALENDGE #2

8 de Novembro (terça-feira) 14h40 as 15h40

Sogilub

Sociedade de Gestão Integrada de Óleos Lubrificantes Usados, Lda.

LCA

← ICS ← 13 ← 13.020 ← 13.020.10

ISO 14040:2006

Environmental management — Life cycle assessment — Principles and framework

Abstract

Preview

ISO 14040:2006 describes the principles and framework for life cycle assessment (LCA) including: definition of the goal and scope of the LCA, the life cycle inventory analysis (LCI) phase, the life cycle impact assessment (LCIA) phase, the life cycle interpretation phase, reporting and critical review of the LCA, limitations of the LCA, the relationship between the LCA phases, and conditions for use of value choices and optional elements.

ISO 14040:2006 covers life cycle assessment (LCA) studies and life cycle inventory (LCI) studies. It does not describe the LCA technique in detail, nor does it specify methodologies for the individual phases of the LCA.

The intended application of LCA or LCI results is considered during definition of the goal and scope, but the application itself is outside the scope of this International Standard.

LCA

← ICS ← 13 ← 13.020 ← 13.020.10

ISO 14044:2006

Environmental management — Life cycle assessment — Requirements and guidelines

Abstract

Preview

ISO 14044:2006 specifies requirements and provides guidelines for life cycle assessment (LCA) including: definition of the goal and scope of the LCA, the life cycle inventory analysis (LCI) phase, the life cycle impact assessment (LCIA) phase, the life cycle interpretation phase, reporting and critical review of the LCA, limitations of the LCA, relationship between the LCA phases, and conditions for use of value choices and optional elements.

ISO 14044:2006 covers life cycle assessment (LCA) studies and life cycle inventory (LCI) studies.

LCA – Life Cycle Assessment

LCA framework

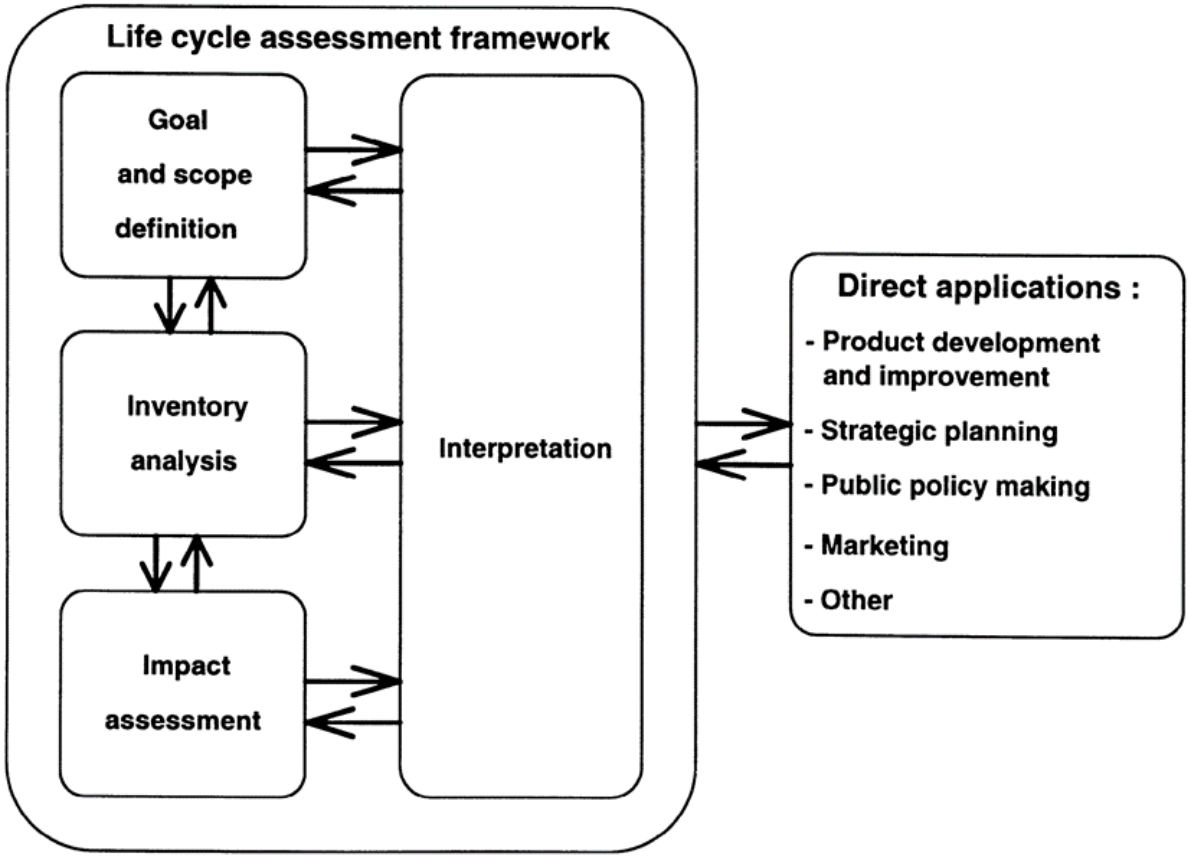


Figure 1 : Phases of an LCA

Source: ISO 14040

ELV – End-of-Life Vehicle

Collected ELV

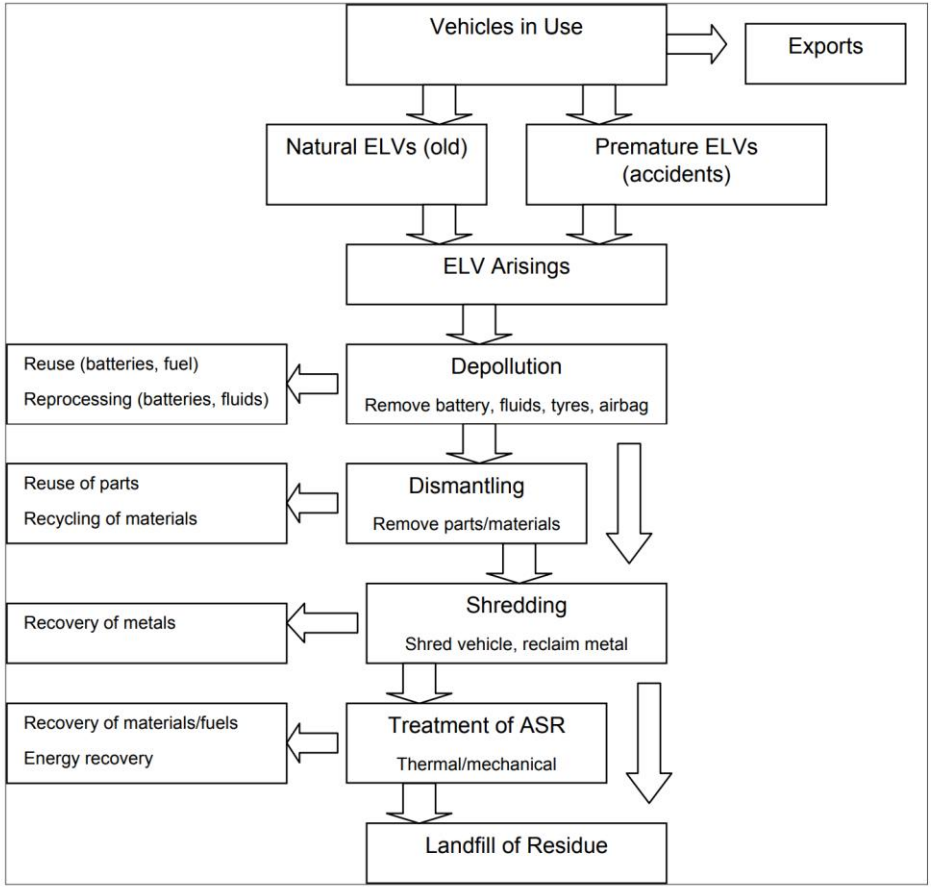
Goal & Scope:

Evaluate mass recovery rates, energy consumption (fossil and renewable) and CO_2eq emissions to the atmosphere of managing an ELV

ELV – End-of-Life Vehicle

Collected ELV

Figure 1.2: Description of ELV Arisings and Treatment



https://ec.europa.eu/environment/pdf/waste/study/final_report.pdf

ELV – End-of-Life Vehicle

Collected ELV

Functional Unit (FU):

1 ton ELV

Results are expressed by 1 ton ELV

ELV – End-of-Life Vehicle

Collected ELV

INVENTORY

DATA INTENSIVE

Mass flows;
Energy flows.

ELV – End-of-Life Vehicle

Chalendge #3

$kWh_{electricity}$/1000 kg ELV ??

MJ_{fuel}/1000 kg ELV??

MJ_{heat}/1000 kg ELV

Fossil fuel: 35 MJ/L – 38 MJ/L

With and without ASR incineration

CO_2eq emission factors - Electricity

T1. Fator de Emissão de Eletricidade – Anual

Na tabela abaixo são apresentados os fatores de emissão tendo por base apenas os combustíveis e eletricidade produzidos nesse ano.

Região	Unidade	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Continente	tCO2 eq./MWh	0.527	0.433	0.393	0.386	0.366	0.245	0.294	0.346	0.262	0.254	0.328	0.267	0.338	0.282	0.224	0.175
R.A. Madeira	tCO2 eq./MWh	0.610	0.586	0.624	0.608	0.575	0.555	0.538	0.555	0.543	0.488	0.507	0.491	0.506	0.493	0.524	0.505
R.A. Açores	tCO2 eq./MWh	0.578	0.575	0.511	0.523	0.523	0.504	0.492	0.504	0.473	0.465	0.470	0.471	0.455	0.448	0.450	0.435
Portugal	tCO2 eq./MWh	0.529	0.438	0.400	0.394	0.373	0.254	0.301	0.353	0.270	0.261	0.334	0.273	0.342	0.287	0.233	0.184

CO_2eq emission factors – Electricity

RNC2050

ROTEIRO PARA A NEUTRALIDADE CARBÓNICA 2050 (**RNC**2050)

ESTRATÉGIA DE LONGO PRAZO PARA A NEUTRALIDADE CARBÓNICA DA ECONOMIA PORTUGUESA EM 2050

REPÚBLICA PORTUGUESA AMBIENTE E TRANSIÇÃO ENERGÉTICA · FUNDO AMBIENTAL · apa

PT

QUADRO 6: Evolução da capacidade instalada do setor eletroprodutor (inclui cogerações) e da intensidade carbónica da produção de eletricidade

CAPACIDADE INSTALADA	2015	2020	2030	2040	2050
	19,9	**22,5**	**29,3 | 30,3**	**42 | 42,4**	**53,2 | 54,5**
Carvão	1,8	1,8	0,0	0,0	0,0
Gás Natural	4,8	4,9	3,5 | 4	2,3 | 2,4	0,2
Fuel Óleo	0,8	0,7	0,2	0,1	0,0
Hídrica	4,6	4,6	5,1	5,1	5,1
Hídrica com bombagem	1,6	2,5	3,4	3,4	3,4
Eólica *Onshore*	5,0	5,2	8 | 7	10	12 | 13
Eólica *Offshore*	0,0	0,0	0,3 | 0,4	0,3 | 1,2	0,2 | 1,3
Solar PV centralizado	0,3	1,4	4,6 | 5	9,9 | 9,3	14,4 | 13
Solar PV descentralizado	0,2	0,5	2,3	7,1 | 7,6	12 | 13
Geotérmica	0,0	0,1	0,1	0,1	0,0
Biomassa/Biogás/Resíduos	0,8	0,9	1,4 | 1,6	1,4	1,8 | 1,4
Baterias	0,0	0,0	0,6 | 1,2	2,3 | 1,3	4,1 | 4
Unidade: GW					
INTENSIDADE CARBÓNICA DA ELETRICIDADE PRODUZIDA EM PORTUGAL	315	245	20,47 | 36,75	4,46 | 4,28	1,69 | 1,6
Unidade: $tCO_2eq./GWh$					

CO_2eq emission factors – Natural gas

European Commission

JRC SCIENCE FOR POLICY REPORT

56.1 gCO_2/MJ

JEC Well-To-Wheels report v5

Well-to-Wheels analysis of future automotive fuels and powertrains in the European context

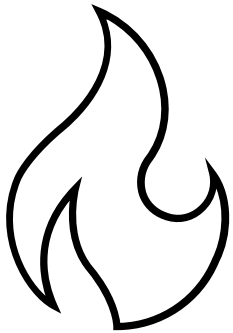
Concawe
Environmental Science for European Refining

eucar
EUROPEAN COUNCIL FOR AUTOMOTIVE R&D

European Commission

Joint Research Centre

EUR 30284 EN



Direct combustion

CO_2eq emission factors - Diesel

European Commission

JRC SCIENCE FOR POLICY REPORT

73.2 gCO_2/MJ

JEC Well-To-Wheels report v5

Well-to-Wheels analysis of future automotive fuels and powertrains in the European context

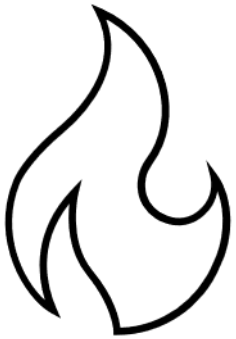
Concawe Environmental Science for European Refining

eucar EUROPEAN COUNCIL FOR AUTOMOTIVE R&D

European Commission

Joint Research Centre

EUR 30284 EN



Direct combustion

CO_2eq emission factors – Kerosene (jet fuel)

ICAO

INTERNATIONAL CIVIL AVIATION ORGANIZATION

ICAO document

CORSIA Methodology for Calculating Actual Life Cycle Emissions Values

June 2022

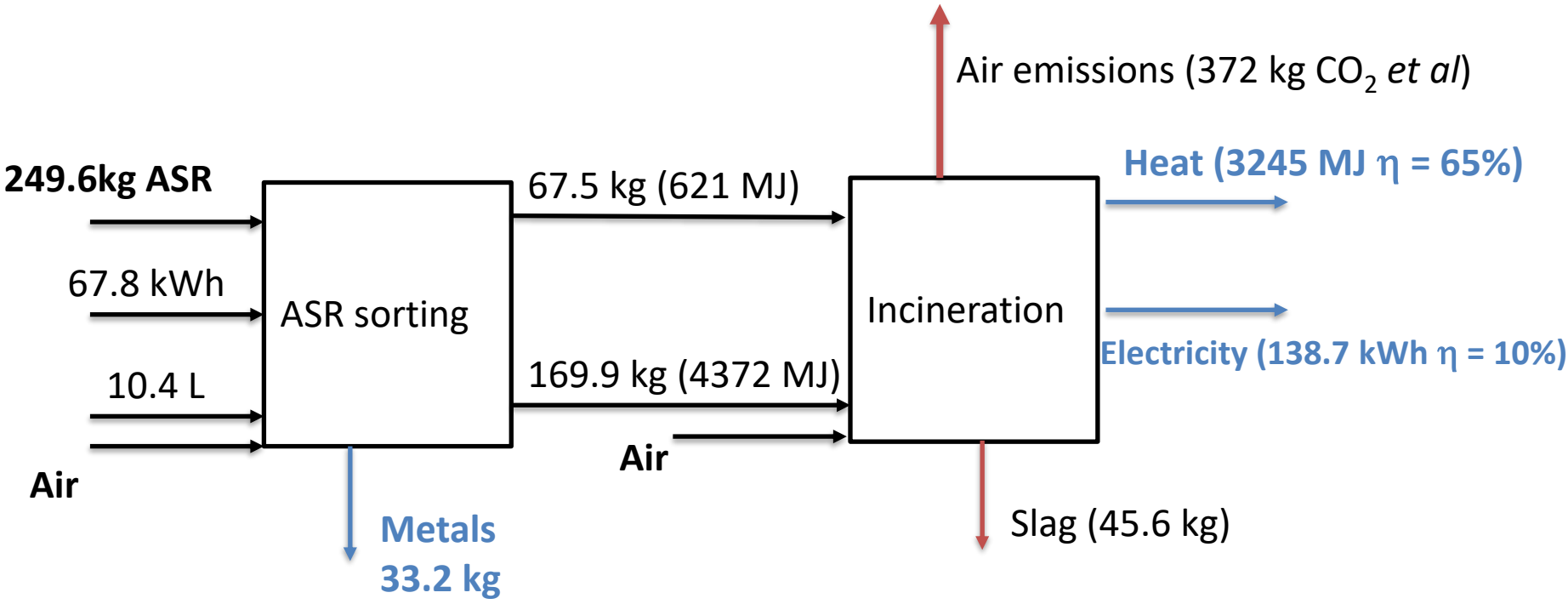
CORSIA

Carbon Offsetting and Reduction Scheme for International Aviation

74 gCO_2/MJ

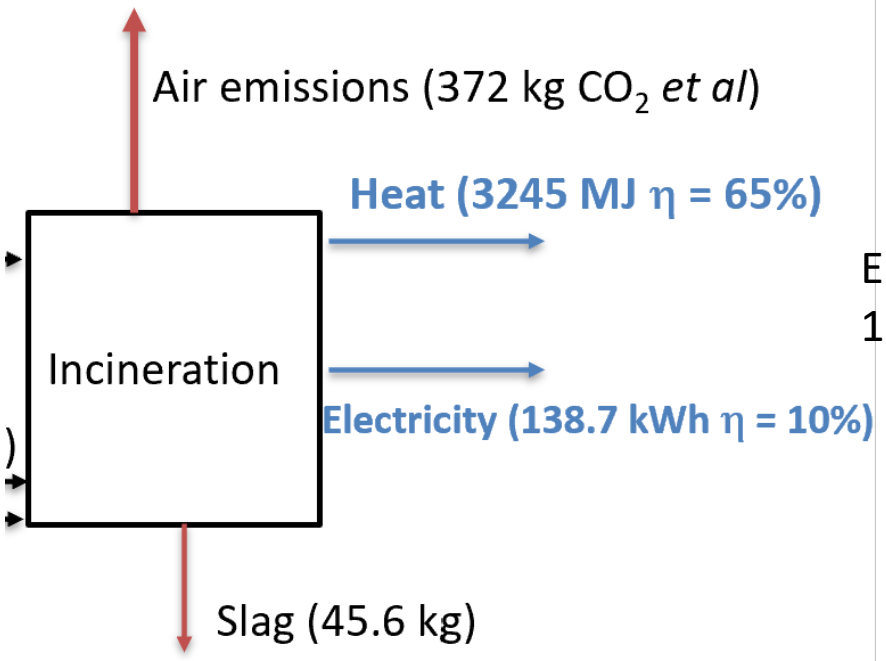
Direct combustion

CO_2eq– Electricity & Heat ASR incineration



CO_2eq– Electricity & Heat ASR incineration

Energy Allocation



Heat – 3245/(3245+138.7*3.6)*372/3245

100 gCO_2/MJ

Electricity – 138.7*3.6/(3245+138.7*3.6)*372/138.7

358 gCO_2/kWh

Allocation outputs

CO_2eq– Electricity & Heat

Energy Allocation

A seguinte equação foi utilizada para determinar as emissões alocadas à produção de Calor:

EQUAÇÃO 2.2 – EMISSÕES DE PRODUÇÃO DE CALOR - COGERAÇÃO

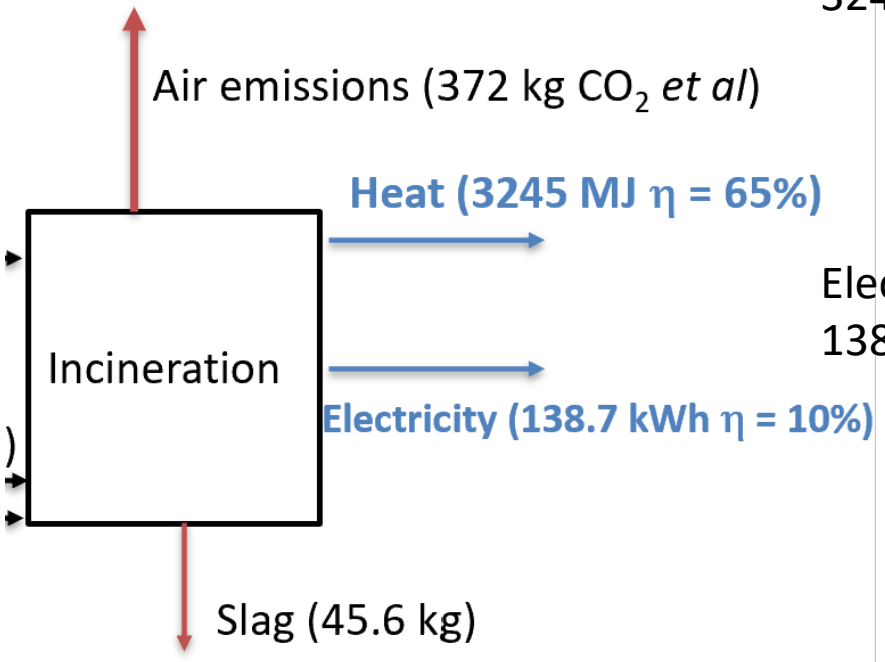
$$Emi_C = \frac{C/e_C}{C/e_C + E/e_E} \times Emi_T$$

Onde:

Emi_T	=	emissões diretas totais do sistema CHP, em kton CO_{2eq}
Emi_C	=	emissões atribuídas à produção de calor, em kton CO_{2eq}
C	=	calor produzido (energia), em tep
E	=	eletricidade gerada (energia), em tep
e_C	=	eficiência assumida da produção de calor, valor entre 0 - 1
e_E	=	eficiência assumida de produção de eletricidade; valor entre 0 - 1

CO_2eq– Electricity & Heat ASR incineration

Energy Allocation



Heat –
3245/0.65/(3245/0.65+138.7*3.6/0.1)*372/3245

57.3 gCO_2/MJ

Electricity –
138.7*3.6/0.1/(3245/0.65+138.7*3.6/0.1)*372/138.7

1341 gCO_2/kWh

Allocation inputs

ELV – End-of-Life Vehicle

EMISSIONS IN THE ATMOSPHERE

It is necessary to keep in mind that we
are not reporting the environmental impacts water and soil pollution

Challenge #4

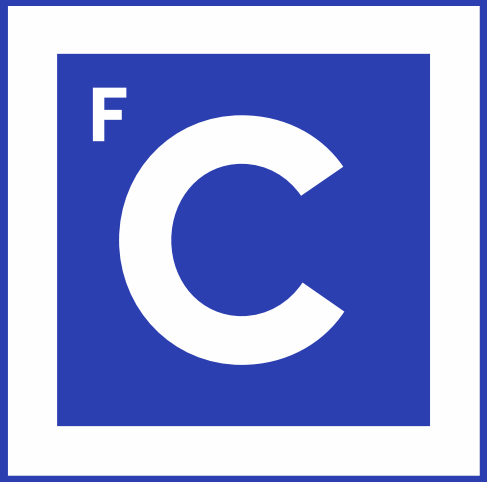
1. Use the electricity, diesel, kerosene, incineration emission factors to estimate the carbon footprint of ELV processing with and without ASR incineration (use allocation to the outputs);

2. Identify the process with higher carbon footprint;

3. Give the final values of gCO_2eq/1000 ELV for 2015,2020 and 2050, from the point of view of climate change do you think we should do ASR incineration??.

DELIVER until 25 November

Thanks



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