

NR	SCENARIO	Fuel Consumption per Monthly (lt)
1	CURRENT STATUS (CEMENT FACTORY TRANSPORTATION FUEL CONSUMPTION)	56.019
2	PLANNING PROJECT (HURMA INCINERATION PLANT TRANSPORTATION FUEL CONSUMPTION)	30.504

Fuel Saving (lt/Month) 25.515

(1) CARBON EMISSION GAINS DUE TO FUEL SAVING

Density of Fuel-Oil (kg/m ³)	835
Annual Fuel Savings (lt/year)	306.180
Annual Fuel Savings (kg/year)	255.660,30

CO₂ Emission Calculation for Energy Sources

$$CO_2 \text{ emisyonları} = \sum_{k=1}^n (FV_k * NKD_k * EF_k * (1 - BO)_k * YF_k)$$

Kaynak akışı	Faaliyet Verisi (FV)		Net Kalorifik Değer (NKD)		Emisyon Faktörü (EF)		Biyokütle Oranı (BO)		Yükseltgenme Faktörü (YF)		Emisyonlar [t CO ₂]
Yakıt akışı	Değer	Birim	Değer	Birim	Değer	Birim	Değer	Birim	Değer	Birim	
Motorin	1.000	t	43,0	GJ/t	0,0741	t CO ₂ /GJ	0	%	100	%	1.000 t x 43,0 GJ/t x 0,0741 t CO ₂ /GJ x 1 x 1 = 3.186,3
Doğal Gaz	10.000.000	Nm ³	0,036	GJ/Nm ³	0,0561	t CO ₂ /GJ	0	%	100	%	10.000.000 Nm ³ x 0,036 GJ/Nm ³ x 0,0561 t CO ₂ /GJ x 1 x 1 = 20.196,0
Antrasit	100.000	t	27,1	GJ/t	0,0991	t CO ₂ /GJ	0	%	100	%	100.000 t x 27,1 GJ/t x 0,0991 t CO ₂ /GJ x 1 x 1 = 268.561,0
Odun Atığı	30.000	t	---	---	1,832	t CO ₂ /t	95,4	%	100	%	30.000 t x 1,832 t CO ₂ /t x (1-0,954) x 1 = 2.528,2
Toplam	(3.186,3 + 20.196,0 + 268.561,0 + 2.528,2) t CO ₂										= 294.471,5

Carbon Emission for 1 ton Fuel- oil (t CO₂) 3,1863

CARBON (t CO₂) (TRANSFER)

814,61

(2) CARBON EMISSION GAINS DUE TO ELECTRICITY GENERATION

Nameplate Capacity for Generator (MWh)	5
Approximate Internal Consumption (MWh)	1,5
Net Electricity Generation Capacity (MWh)	3,5
Generator Working Hour Per Year	8.000
Total Electricity Generation per Year (MWh/Year)	28.000
Carbon Emission (t CO ₂) for 1 MWh Electricity	0,437

CARBON (t CO₂) (ENERGY)

12.236

TOTAL CARBON EMISSION SAVING PER YEAR :

13.051

Global Warming Potentials for Non-CO2 Greenhouse Gases

Table 5.6: Global Warming Potentials

Gas	Global Warming Potential
CH ₄	21 tCO _{2(eşd)} / t CH ₄
N ₂ O	298 t CO _{2(eşd)} / t N ₂ O
CF ₄	7390 t CO _{2(eşd)} / t CF ₄
C ₂ F ₆	12200 t CO _{2(eşd)} / t C ₂ F ₆
HFC's (Hydroflocarbons)	140-11700 t CO _{2(eşd)} / t HFC or PFC
PFC's (Perfluorocarbons)	
SF ₆ (Sulfur Hegzaflorid)	23900 t CO _{2(eşd)} / t SF ₆

Incineration within new Project

Emission Parameter	Output mg/m3	Output kg/hr	tons/year	tons CO2 eq
O ₂	423,75	16,95	148	0
N ₂	20,3125	0,81	7	2.121
CO ₂	9,375	0,38	3	3
SO ₂	26,5625	1,06	9	0
ASH	0,625	0,03	0	0
HCL	7,8125	0,31	3	0
H ₂ O	20,3125	0,81	7	0
TOTAL:		0,81	7	2.124

CURRENT STATUS (CEMENT FACTORY TRANSPORTATION FUEL CONSUMTION)

	Nr	Name of WWTP	Daily Sludge Withdrawal (tons/day)	Monthly Sludge Withdrawal (tons/month)	Distance Between AAT and AS Cement (km)	Time per One Lap (hour)	Number of Laps per month (each)	Monthly road amount (km/month)
CENTER	1	HURMA WWTP	140	4.200	70	3,55	183	25.565
	2	LARA WWTP	70	2.100	82	4,03	91	14.974

WEST	3	BELDİBİ WWTP	8	240	90	4,35	10	1.878
	4	GÖYNÜK WWTP	5	150	94	4,51	7	1.226
	5	KEMER WWTP	10	300	103	4,87	13	2.687
	6	ÇAMYUVA WWTP	10	300	110	5,15	13	2.870
	7	TEKİROVA WWTP	5	150	117	5,43	7	1.526
	8	KUMLUCA WWTP	10	300	155	6,95	13	4.043
	9	FİNİKE WWTP	1	30	165	7,35	1	430
	10	DEMRE WWTP	2	60	200	8,75	3	1.043
	11	KAŞ WWTP	3	90	205	8,95	4	1.604
	12	KALKAN WWTP	2	60	224	9,71	3	1.169
	13	ELMALI WWTP	5	150	105	4,95	7	1.370
	14	KORKUTELİ WWTP	10	300	47	2,63	13	1.226

EAST	15	BELEK-1 WWTP	15	450	90	4,35	20	3.522
	16	SERİK WWTP	20	600	100	4,75	26	5.217
	17	BELEK-2 WWTP	15	450	95	4,55	20	3.717
	18	BOĞAZKENT WWTP	5	150	98	4,67	7	1.278
	19	ÇOLAKLI WWTP	8	240	117	5,43	10	2.442
	20	KUMKÖY WWTP	40	1.200	120	5,55	52	12.522
	21	MANAVGAT WWTP	40	1.200	132	6,03	52	13.774
	22	OKURCALAR WWTP	10	300	160	7,15	13	4.174
	23	İNCEKUM WWTP	10	300	165	7,35	13	4.304
	24	TÜRKLER WWTP	5	150	175	7,75	7	2.283
	25	KONAKLI WWTP	10	300	178	7,87	13	4.643
	26	ALANYA WWTP	20	600	185	8,15	26	9.652
	27	OBA WWTP	10	300	194	8,51	13	5.061
	28	MAHMUTLAR WWTP	9	270	200	8,75	12	4.696
	29	GAZİPAŞA WWTP	1	30	235	10,15	1	613
	30	AKSEKİ WWTP	1	30	206	8,99	1	537

GENERAL TOTAL			500	15.000				140.048
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TOTAL Amount of Fuel (lt) : 56.019

BASIC INPUTS

Truck Trailer Fuel Amount (per km):	0,4	lt
Average Speed :	50	km/h
Truck transport capacity :	23	tons
Driver's daily working hour:	9	hours

PLANNING PROJECT (HURMA INCINERATION PLANT TRANSPORTATION FUEL CONSUMPTION)

	Nr	Name of WWTP	Daily Sludge Withdrawal tons/day	Monthly Sludge Withdrawal tons/month	Distance Between WWTP AND HURMA WWTP	Time per One Lap (hour)	Number of Laps per month (each)	Monthly road amount (km/month)
CENTER	1	HURMA WWTP	140	4.200	0			0
	2	LARA WWTP	70	2.100	41	2,39	91	7.487

WEST	3	BELDİBİ WWTP	8	240	18	1,47	10	376
	4	GÖYNÜK WWTP	5	150	24	1,71	7	313
	5	KEMER WWTP	10	300	33	2,07	13	861
	6	ÇAMYUVA WWTP	10	300	39	2,31	13	1.017
	7	TEKİROVA WWTP	5	150	49	2,71	7	639
	8	KUMLUCA WWTP	10	300	88	4,27	13	2.296
	9	FİNİKE WWTP	1	30	103	4,87	1	269
	10	DEMRE WWTP	2	60	127	5,83	3	663
	11	KAŞ WWTP	3	90	179	7,91	4	1.401
	12	KALKAN WWTP	2	60	197	8,63	3	1.028
	13	ELMALI WWTP	5	150	124	5,71	7	1.617
	14	KORKUTELİ WWTP	10	300	65	3,35	13	1.696

EAST	15	BELEK-1 WWTP	15	450	52	2,83	20	2.035
	16	SERİK WWTP	20	600	54	2,91	26	2.817
	17	BELEK-2 WWTP	15	450	60	3,15	20	2.348
	18	BOĞAZKENT WWTP	5	150	63	3,27	7	822
	19	ÇOLAKLI WWTP	8	240	80	3,95	10	1.670
	20	KUMKÖY WWTP	40	1.200	84	4,11	52	8.765
	21	MANAVGAT WWTP	40	1.200	96	4,59	52	10.017
	22	OKURCARLAR WWTP	10	300	115	5,35	13	3.000
	23	İNCEKUM WWTP	10	300	124	5,71	13	3.235
	24	TÜRKLER WWTP	5	150	134	6,11	7	1.748
	25	KONAKLI WWTP	10	300	141	6,39	13	3.678
	26	ALANYA WWTP	20	600	147	6,63	26	7.670
	27	Oba WWTP	10	300	155	6,95	13	4.043
	28	MAHMUTLAR WWTP	9	270	162	7,23	12	3.803
	29	GAZİPAŞA WWTP	1	30	196	8,59	1	511
	30	AKSEKİ WWTP	1	30	167	7,43	1	436

GENERAL TOTAL	500	15.000				76.260
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TOTAL Amount of Fuel (lt) : 30.504

BASIC INPUTS		
Truck Trailer Fuel Amount (per km):	0,4	lt
Average Speed :	50	km/h
Truck transport capacity :	23	tons
Driver's daily working hour:	9	hours

During the excavation phase, it is planned to use

- 1 excavator for hard ground excavation,
- 2 JCBs for hard ground excavation,
- trucks (25 tons capacities) for transportation

Construction period : 36 months.
(During the construction phase, it is planned to work for total of 1095 days, 8 hours a day.)

Estimated excavation amount :	30.000 m ³
Estimated Soil Density:	1,50 ton/m ³
Excavation Amount	45.000 tons

(1) Fuel Consumption of Excavation Trucks:

Number of truck trips :	45.000 ton / 25 ton truck capacity =	1800 laps
On-site Transportation Distance (round trip) :	1,00 km	
Truck fuel per kilometer :	0,75 liter	
Total Truck diesel consumption :	1.355 liters	

(2) Fuel Consumption of Excavator:

Excavator working hours : (2 excavator, 6 months, 8 hour/day)	2.880 hours
Excavator hourly fuel consumption :	25 liters/hour
Total Excavator diesel consumption :	72.000 liters

(3) Fuel Consumption of Excavator- Loader:

Excavator-Loader working hours : (1 excavator-loader , 3 years, 8 hour/day) (1 excavator-loader , 1 years 8 hour/day)	11.680 hours
Excavator-Loader hourly fuel consumption :	12 liters/hour
Total Excavator-Loader diesel consumption :	140.160 liters

Total Diesel Consumption : **213.515 liters**

Diesel Density : 835 kg/m³

Total Diesel Consumption : 178,29 tons

For 1 ton Diesel- Carbon Emission : 3,186 t CO₂

Carbon Emissions for Construction Works : **568,02 t CO₂**

CONSTRUCTION PERIOD CARBON FOOTPRINT CALCULATION

During the excavation phase, it is planned to use
- 3 pieces excavators for hard ground excavation,
- 5 pieces JCBs for soft ground excavation,
- trucks (25 tons capacities) for transportation

Total Construction Period :	36 months.
Estimated Excavation Amount :	22.729 m ³
Estimated Soil Density:	1,50 ton/m ³
Excavation Amount	34.094 tons

(1) Fuel Consumption of Excavation Trucks:

Number of Truck Trips :	1364 laps
On-site Transportation Distance (round trip) :	1,00 km
Truck Fuel per Kilometer :	0,75 liter
Total Truck diesel consumption :	1.027 liters

(2) Fuel Consumption of Excavator:

Excavator Working Hours : (3 excavator, 2 months, 8 hour/day)	1.440 hours
Excavator Hourly Fuel Consumption :	25 liters/hour
Total Excavator Diesel Consumption :	36.000 liters

(3) Fuel Consumption of Excavator- Loader:

Excavator-Loader Working Hours : (5 excavator-loader , 4 months, 8 hour/day)	4.800 hours
Excavator-Loader Hourly Fuel Consumption :	12 liters/hour
Total Excavator-Loader Diesel Consumption :	57.600 liters

Total Diesel Consumption :	94.627 liters
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Diesel Density :	835 kg/m ³
Total Diesel Consumption :	79,01 tons
For 1 ton Diesel- Carbon Emission :	3,186 t CO ₂
Carbon Emissions for Construction Works :	251,74 t CO₂