GREEN HOUSE GAS EMISSIONS 2022

Siat
Group

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Cover: Presco biomethanation plan and nursery
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ABSTRACT

In order to limit its carbon footprint and to comply with the RSPO requirements, the Siat group (Siat) evaluates the greenhouse gas (GHG) emissions of its activities. Results of this evaluation are then used to develop a mitigation plan. The implementation of the plan is monitored, and progress assessed on a yearly basis when the GHG assessment is repeated. From 2016 to 2022 the emissions in tons of equivalent CO_2 have slightly increased for oil palm. Starting from 2018, calculations of GHG emissions for rubber have been done using the same methodology as for oil palm. Due to the huge areas of unexploited forests inside the Siat Gabon concessions and the use of renewable energy everywhere in the group, the results in terms of total GHG emissions for the group are negative with a good sequestration of carbon.

Siat commitment in terms of GHG is in line with the Sustainable Development Goals 9.4.

METHOD

The GHG assessment is carried out using the RSPO's PalmGHG tool for Palm oil subsidiaries. For rubber subsidiaries, in the absence of a dedicated method for rubber, the simplified PalmGHG calculation has been adapted to rubber using allometric values available for rubber trees' carbon sequestration (other default values like conservation area sequestration are the same as the PalmGHG calculator). Data such as land usage, surfaces planted and surfaces of conservation areas, fertilizer and fuel usage, oil production, effluent and POME production and treatment, and electricity generation is gathered and used to calculate net carbon emissions. The results generated allow us to identify the most important emission sources and sinks and to develop a mitigation programme.

In 2020, GHG assessments were carried out for GOPDC in Ghana, Presco and SNL in Nigeria for oil palm and Siat Gabon and CHC respectively in Gabon and Ivory Coast for rubber.

Notes: Siat plantations do not have peat soil. Emissions of outgrowers (independent smallholders are captured as 3rd party).

LIST OF ABBREVIATIONS

RSPO	Roundtable on Sustainable Palm Oil	**POME**	Palm Oil Mill Effluent
GHG	Green House Gas	**PKO**	Palm Kernel Oil
CPO	Crude Palm Oil	**PKE**	Palm Kernel Expeller
PK	Palm Kernel	**OER**	Oil Extraction Rate
tCO2e	ton CO_2 equivalent	**KER**	Kernel Extraction Rate
PalmGHG	https://rspo.org/certification/palm-ghg-calculator		
SDGs	https://unstats.un.org/sdgs/indicators/indicators-list		

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The Siat Group supports the SDG

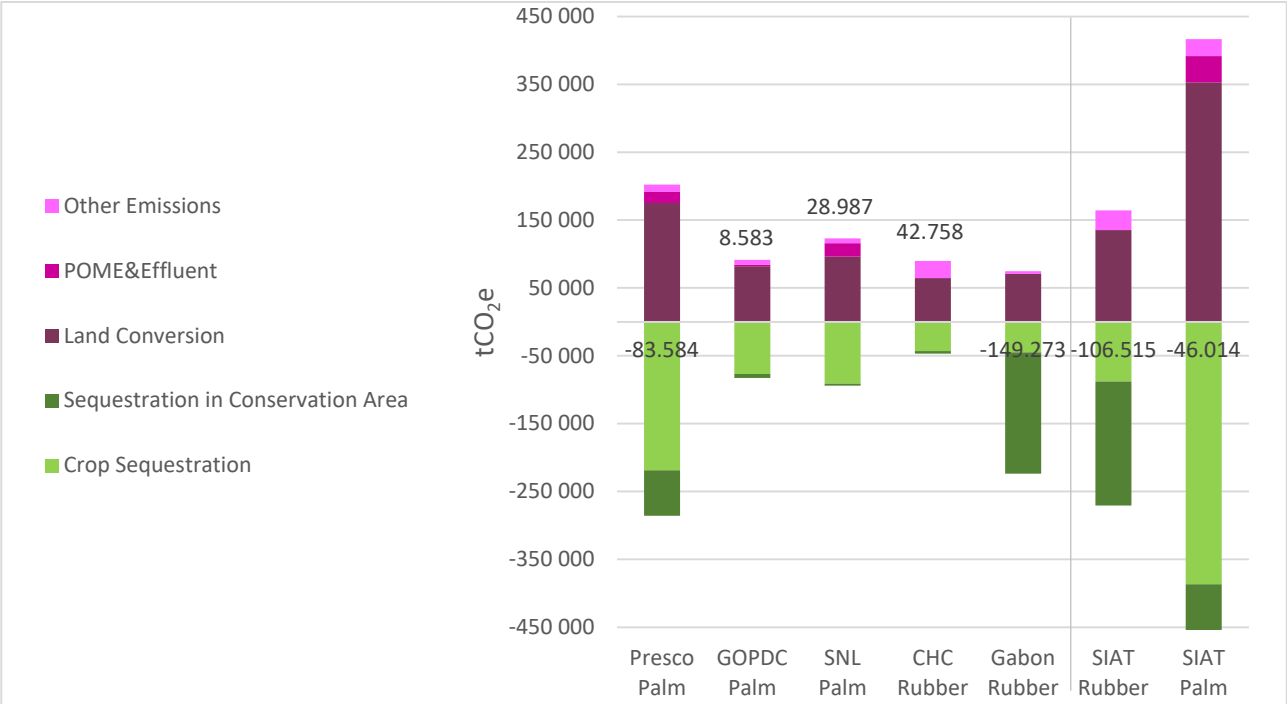
9.4

KEY FIGURES - Siat group

		2022	2021	2020	2019
Total area planted Oil palm + Rubber *	ha	56 096	63 830	65 227	67 704
Total conservation area **	ha	29 251	29 053	26 289	26 248
Land conversion	tCO_2e	488 172	407 406	372 790	389 829
Crop sequestration	tCO_2e	-474 712	-432 437	-324 401	-435 872
Net emissions Palm Oil & Dry Rubber	tCO_2e	-152 529	-150 183	-94 450	- 201 933

Net emissions tCO_2e	2022	2021	2020	2019	2018	2017
Palm Oil	-46 014	-19 190	35 836	-76 150	-16 128	-35 782
Rubber	-106 515	-130 993	-131 286	-125 784	-119 414	nc

Graph 1.1: Comparison of Siat subsidiaries' 2022 GHG emissions



*Presco, GOPDC, SNL, CHC, Siat Gabon, year of planting < 25years ** Conservation + not plantable forested areas

RESULTS – Siat

These results combine those of **GOPDC**, **Presco**, **SNL**, **CHC**, and **Siat Gabon** to give an overview of Siat's emissions.

Description	Unit	2018	2019	2020	2021	2022
Total Planted Area	ha	58 578	63 704	65 227	63 830	57 463
Conservation Area	ha	26 072	26 248	26 289	29 053	29 251
Total Planted Area oil palm*	ha	39 794	46 564	48 346	46 942	48 309
Conservation Area oil palm	ha	5 826	6 002	5 621	8 384	8 582
Oil Extraction Rate	%	19,4	20,8	20,5	22,2	21,3
Total Planted Area rubber *	ha	17 108	17 140	16 881	16 888	9 154
Conservation Area rubber**	ha	20 246	20 246	20 669	20 669	20 669
Dry rubber	t /ha	1,2	1,1	0,8	0,9	1,11

Table 1.1: Siat key indicators

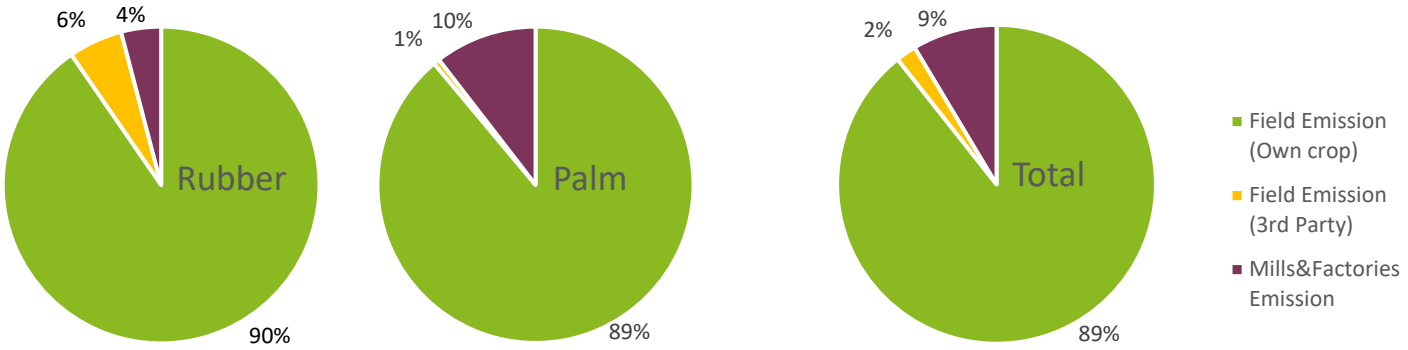
* Planted areas < 25 years old

**Unplanted areas set aside the development programme

tCO2e/t Product	2018	2019	2020	2021	2022
CPO	-0,09	-0,62	0,37	-0,13	-0,34
PK	-0,09	-0,62	0,37	-0,13	-0,34
PKO	0,98	-0,29	0,73	0,70	0,68
PKE	0,98	-0,29	0,73	0,70	0,68
Dry rubber	0,10	0,03	0,37	0,06	0,44

Table 1.2: Siat factories emissions per ton of product

Graph 1.2: Distribution of Siat's emissions (2022)



	TOTAL Own	Own Oil palm			3rd party OP	Own Rubber			3rd party Rub.
Description	tCO2e	tCO2e	tCO2e /ha	tCO2e /t FFB	tCO2e	tCO2e	tCO2e /ha	tCO2e /t rubber	tCO2e
Land Conversion	488 172	352 980	7,30	0,84	-	135 192	17,44	20,79	-
Fertilizer application	19 501	6 990	0,14	0,02	-	12 511	1,88	1,22	-
N_2O Emissions	2 016	2 016	0,04	0,00	-	8 241	1,24	0,80	-
Fuel Consumption	14 599	12 669	0,26	0,03	-	1 930	0,26	0,28	-
Crop Sequestration	-474 712	-386 758	-8,01	-0,92	-	-87 954	-11,39	-13,41	-
Sequestration in Conservation Area	-258 578	-75 868	-1,57	-0,18	-	-182 711	-20,12	-37,07	-
Total Plantation 2022	-200 762	-87 971	-1,82	-0,21	2 635	-112 791	-10,69	-27,39	9 647
Total Plantation 2021	-204 948	-72 579	-1,55	-0,17	2 635	-132 369	-25,10	-57,39	2 503
Total Plantation 2020	-141 431	-9 695	-0,20	-0,02	3 704	-131 735	-24,96	-41,08	6 124
Total Plantation 2019	-255 393	-128 771	-2,77	-0,34	5 901	-126 622	-24,57	-32,65	46 469
Total Plantation 2018	-188 797	-65 513	-1,66	-0,19	7 333	-122 284	-24,01	-25,44	59 042

Table 1.3: Siat plantation emissions – sources and sinks (2018 to 2022)

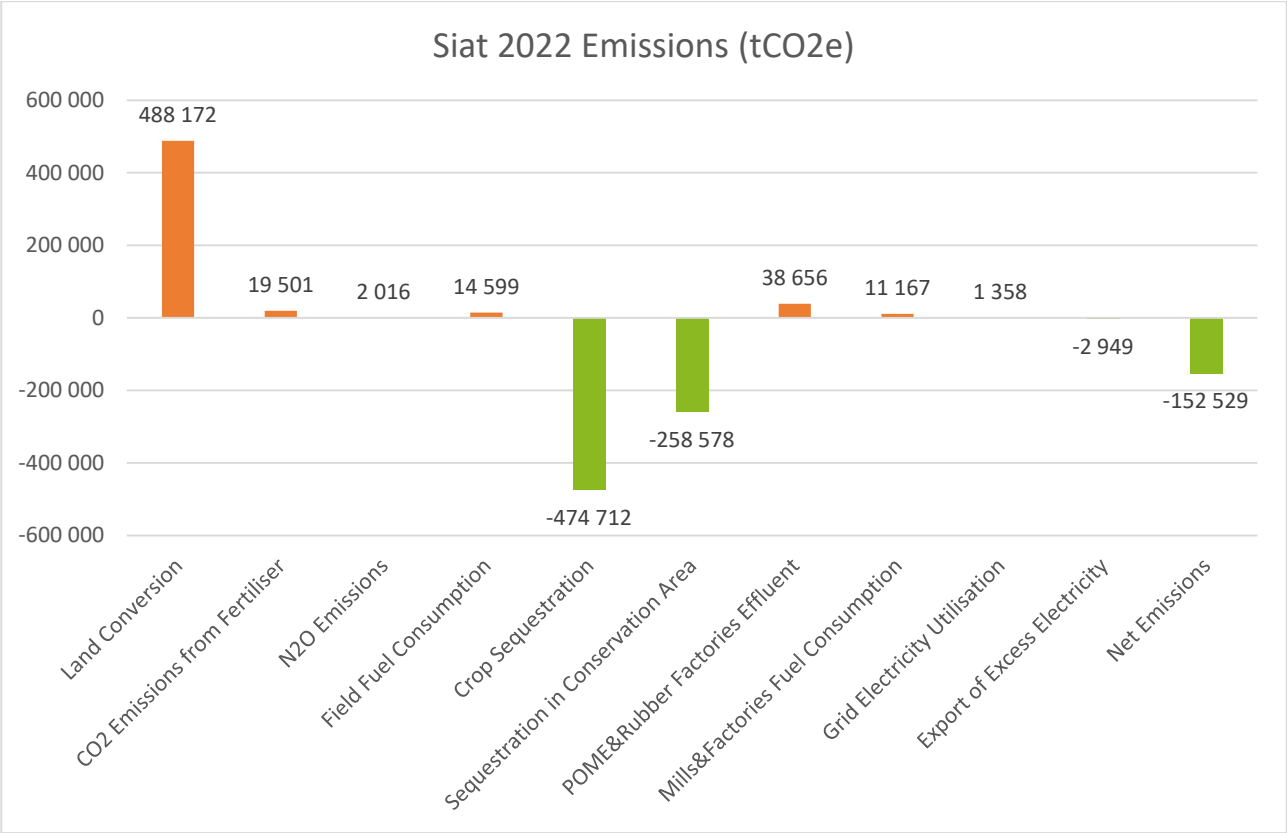
	TOTAL	Oil palm		Rubber	
Description	tCO2e	tCO2e	tCO2e /t FFB	tCO2e	tCO2e /t rubber
POME & Effluent	38 656	38 607	0,08	49	0,01
Fuel Consumption	11 167	4 101	0,01	7.066	0,94
Grid Electricity Utilization	1 358	1 358	0,00	0	0,00
Export of Excess Electricity to Housing & Grid	-2 949	-2 109	0,00	-840	-0,13
Total Factory 2022	48 233	41 957	0,09	6 276	0,82
Total Factory 2021	54 765	53 389	0,11	1 376	0,10
Total Factory 2020	45 980	45 531	0,10	449	0,03
Total Factory 2019	53 459	56 621	0,12	838	0,03
Total Factory 2018	51 894	36 283	0,09	2 509	0,10

Table 1.4: Siat palm oil mills & rubber factories emissions (2018 to 2022)

*The evaluation of rubber GHG effluent faces a lack of references

Emission Source	tCO2e
PK from own mill	-5 531
PK from other sources	761
Fuel consumption	1 049
Total crusher 2022	-3 721
Total crusher 2021	5 441
Total crusher 2020	13 926
Total crusher 2019	-5 572
Total crusher 2018	24 522

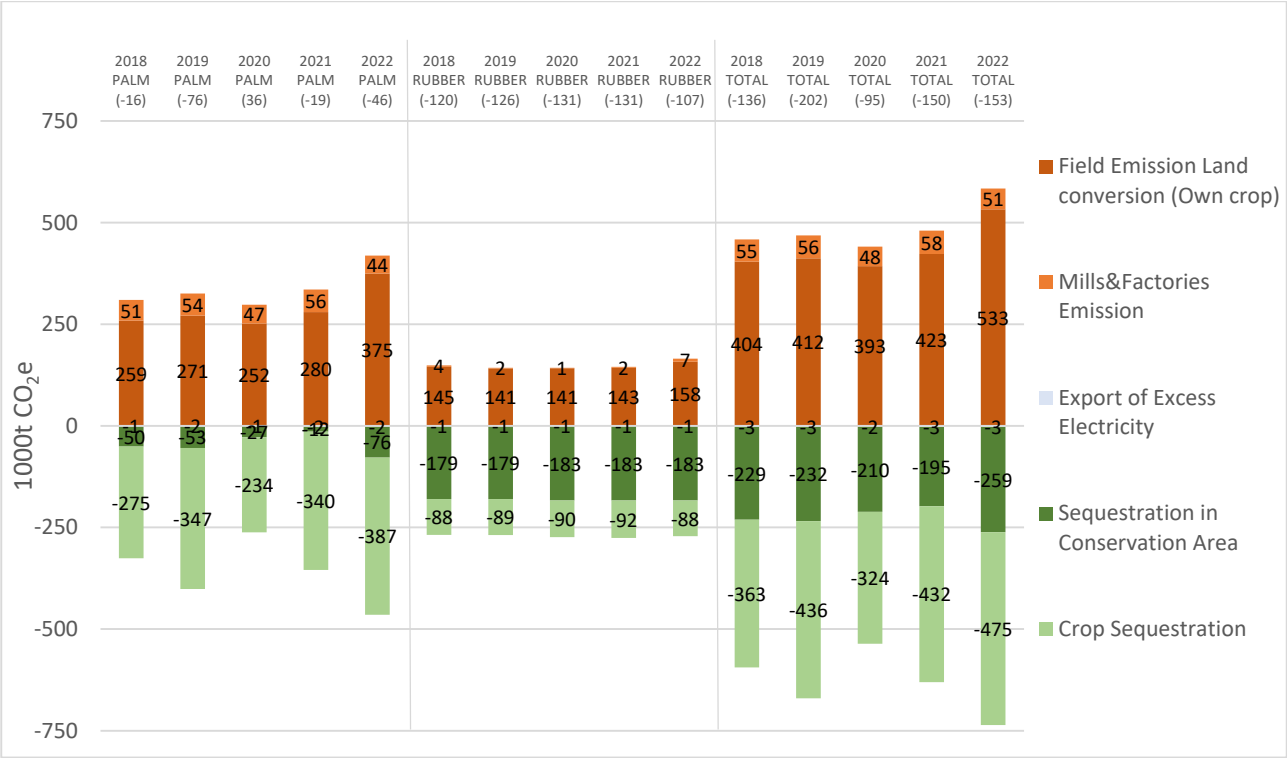
Table 1.5: Siat crusher emissions (2018 to 2022)



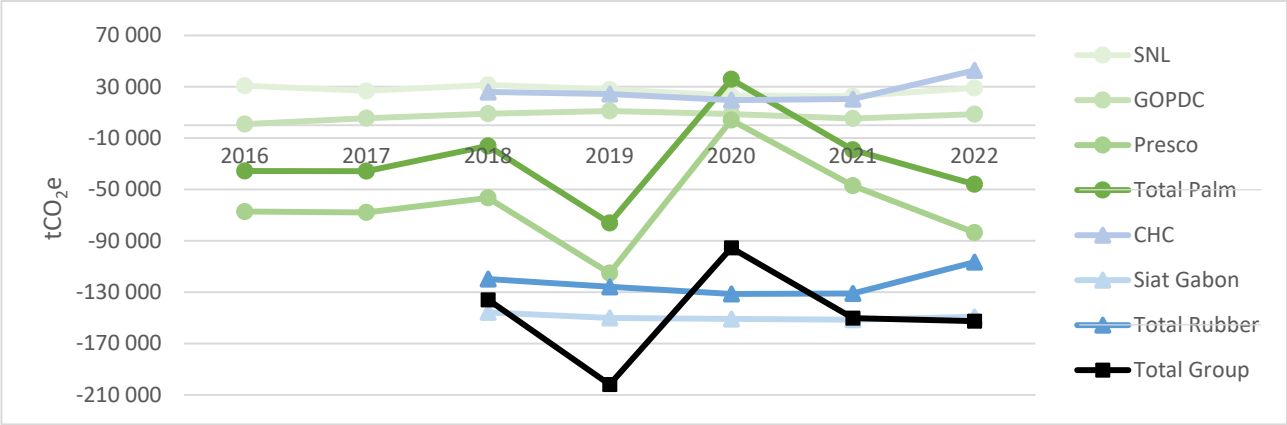
Graph 1.3: Summary of Siat emissions – sources and sinks (2022)

The emissions from the above table 1.5 are not included in the total net emissions of the graphs 1.2 and 1.3 as the RSPO has not yet made it compulsory for mills to estimate their palm kernel crusher emissions (this to allows companies to compare mill to mill results). Nevertheless, we choose to start assessing them before the obligation comes into effect.

Siat contributes to sequestering carbon through its plantations (crop sequestration) and conservation areas particularly in Siat Gabon and Presco, whilst its mill emissions are limited by the installation of biomethanation plants. Nevertheless, Siat will strive to improve further its emission results in the years to come.



Graph 1.4: Emission comparison (2018 to 2022) for palm oil, rubber, and result of the Siat group



Graph 1.5: Emission comparison (2016 to 2022) per subsidiary per year

RESULTS BY SUBSIDIARY

RESULTS – GOPDC

Description	2017	2018	2019	2020	2021	2022
Total Planted Area (ha)	7 831	8 059	7 994	7 994	7 994	8 202
Conservation Area (ha)	640	673	673	673	683	683
OER (%)	21,7	21,8	21,7	21,5	23,3	22,4

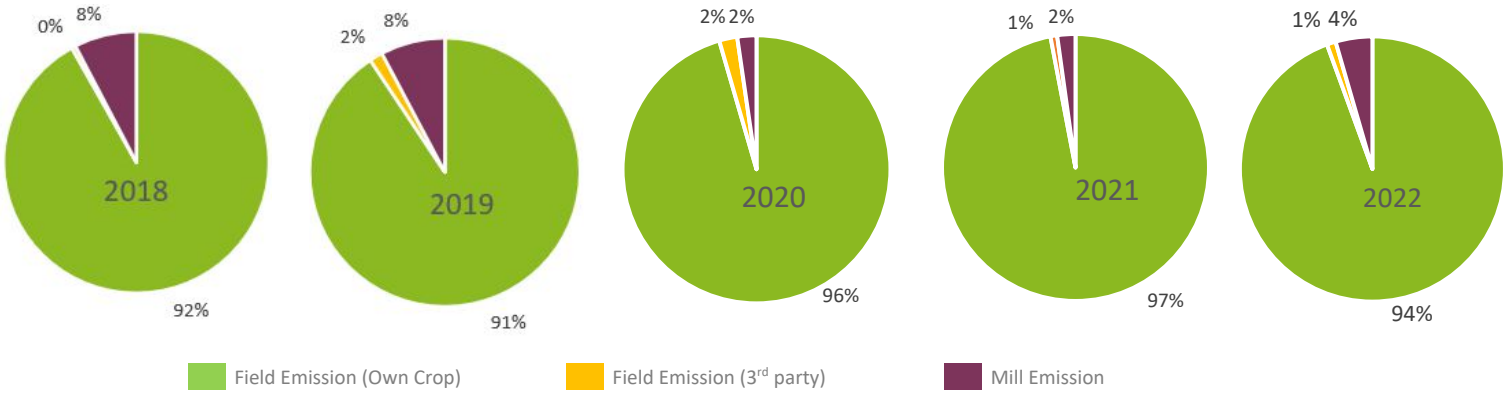
Net emissions	tCO2e
2022	8 583
2021	5 243
2020	8 683
2019	11 179
2018	8 955
2017	5 459

Table 2.1: GOPDC key indicators (2017 to 2022)

tCO2e /t Product	2017	2018	2019	2020	2021	2022
CPO	0,31	0,31	0,36	0,31	0,16	0,26
PK	0,31	0,31	0,36	0,31	0,16	0,26
PKO	0,43	0,63	0,38	0,34	0,33	0,30
PKE	0,43	0,63	0,38	0,34	0,33	0,30

Table 2.2: GOPDC emissions per ton of product (2017 to 2022)

Graph 2.1: Distribution of GOPDC's emissions (2018 to 2022)



	Own			3rd party
Description	**tCO2e total**	**tCO2e /ha**	**tCO2e /t FFB**	**tCO2e total**
Land Conversion	81 820	9,98	0,69	-
Fertilizer application	1 743	0,21	0,01	-
N_2O Emissions	410	0,05	0,00	-
Fuel Consumption	4 332	0,53	0,04	-
Crop Sequestration	-76 766	-9,36	-0,64	-
Sequestration in Conservation Area	-6 039	-0,74	-0,05	-
Total Plantation emissions 2022	5 501	0,67	0,05	1 006
Total Plantation emissions 2021	4 492	0,56	0,04	707
Total Plantation emissions 2020	6 673	0,83	0,06	1 922
Total Plantation emissions 2019	4 442	0,56	0,04	1 489
Total Plantation emissions 2018	2 766	0,34	0,03	434
Total Plantation emissions 2017	2 581	0,33	0,03	4 144

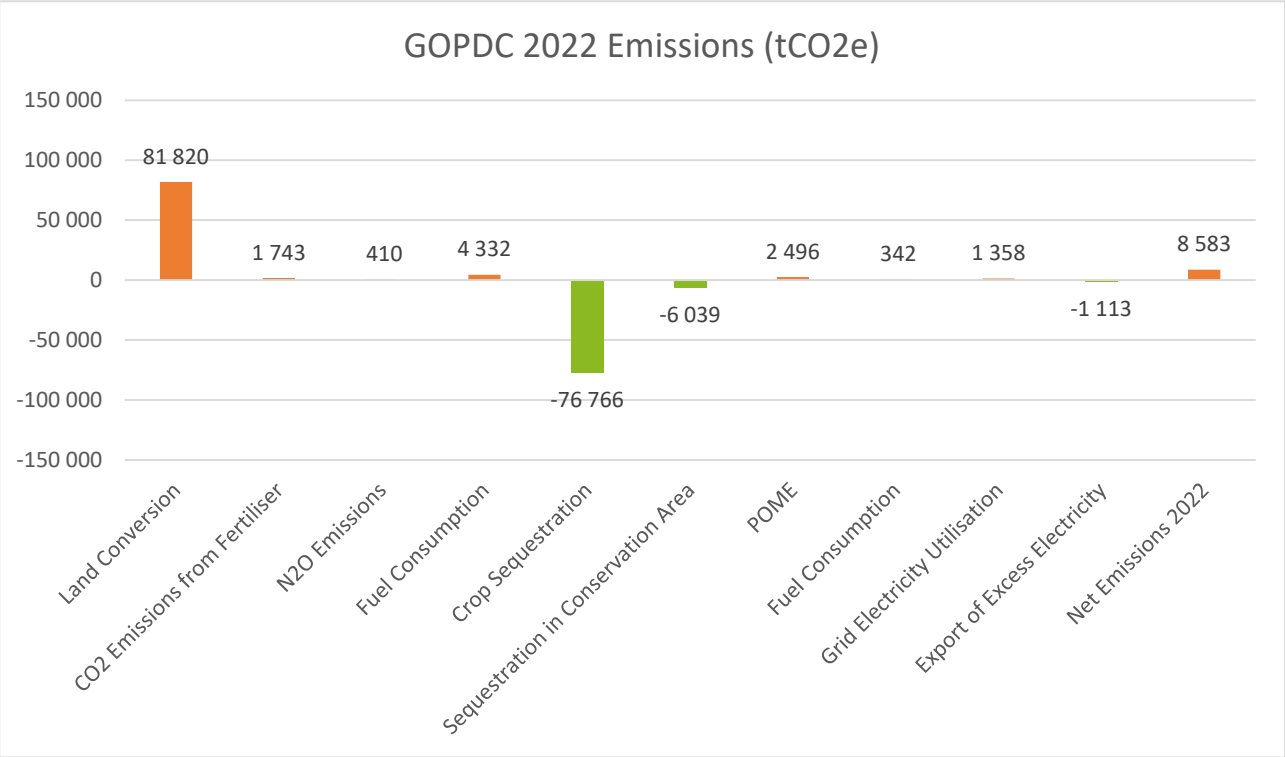
Table 2.3: GOPDC plantation emissions – sources and sinks (2022)

Description	tCO2 total	tCO2e /t FFB
POME	2 496	0,02
Fuel Consumption	342	0,00
Grid Electricity Utilization	1 358	0,01
Export of Excess Electricity to Housing	-1 113	-0,01
Total Mill emissions 2022	3 082	0,02
Total Mill emissions 2021	751	0,00
Total Mill emissions 2020	2 010	0,01
Total Mill emissions 2019	6 737	0,05
Total Mill emissions 2018	6 189	0,06
Total Mill emissions 2017	2 879	0,02

Table 2.4: GOPDC mill emissions (2022)

Emission Source	tCO2e total
PK from own mill	1 437
PK from other sources	152
Fuel consumption	52
Total crusher emissions 2022	1 642
Total crusher emissions 2021	947
Total crusher emissions 2020	1 685
Total crusher emissions 2019	1 777
Total crusher emissions 2018	3 277
Total crusher emissions 2017	2 481

Table 2.5: GOPDC crusher emissions (2022)



Graph 2.2: Summary of GOPDC emissions – sources and sinks (2022)

The results show that the most important source of emissions is land conversion. However, these emissions are compensated by the carbon sequestered by the oil palms, as well as the conservation areas spread across the plantation. Fertilizer usage and fuel consumption on the plantation are also sources of emissions.

At the mill, the palm oil mill effluent (POME) is the biggest source of emissions, although these emissions are already greatly decreased using a biodigester to treat the POME and produce biogas for energy generation.

The GOPDC mill continues to increase its usage of renewable energy, thereby decreasing its emissions linked to grid electricity usage. Part of the energy produced is used in the worker housing and offices.

RESULTS - Presco

Description	2017	2018	2019	2020	2021	2022
Total Planted Area (ha)	16 388	16 553	23 348	24 036	23 525	25 212
Conservation Area (ha)	4 810	4 818	5 006	5 006	7 378	7 576
OER (%)	22,2	22,4	22,8	21,9	23,1	23,1

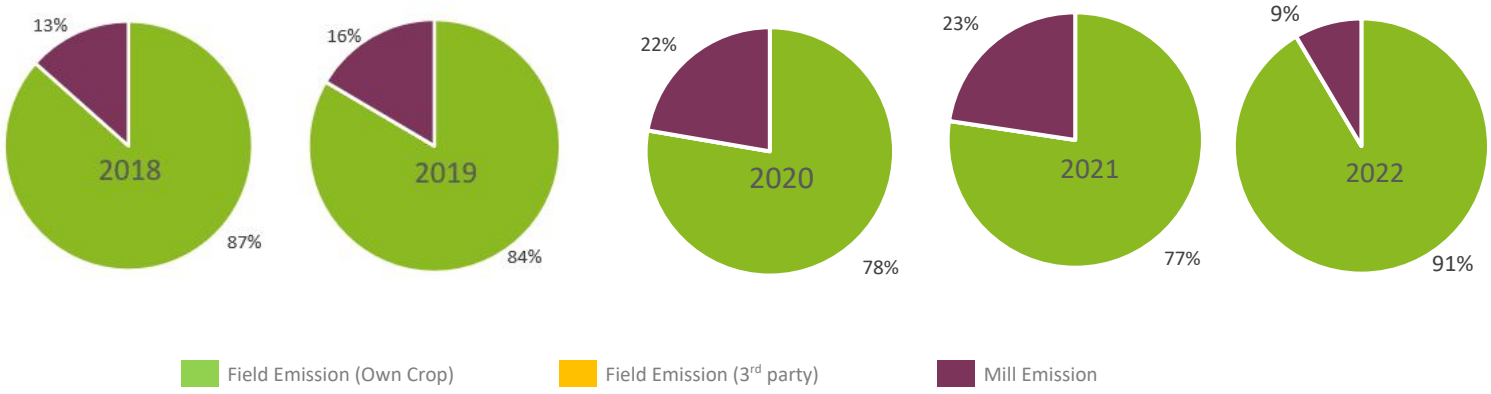
Net emissions	tCO2e
2022	-83 584
2021	-47 122
2020	4 028
2019	-115 181
2018	-56 567
2017	-67 947

Table 3.1: Presco key indicators (2017 to 2022)

tCO2e /t Product	2017	2018	2019	2020	2021	2022
CPO	-1,45	-1,10	-2,04	0,08	-0,71	-1,31
PK	-1,45	-1,10	-2,04	0,08	-0,71	-1,31
PKO	-1,43	-1,08	-2,02	0,10	-0,68	-1,29
PKE	-1,43	-1,08	-2,02	0,10	-0,68	-1,29

Table 3.2: Presco emissions per ton of product (2017 to 2022)

Graph 3.1: Distribution of Presco's emissions (2018 to 2022)



	Own			3rd party
Description	tCO2e total	tCO2e /ha	tCO2e /t FFB	tCO2e total
Land Conversion	175 014	6,94	0,76	na
Fertilizer application	3 245	0,13	0,01	na
N_2O Emissions	1 129	0,04	0,01	na
Fuel Consumption	5 879	0,23	0,03	na
Crop Sequestration	-218 859	-8,68	-0,95	na
Sequestration in Conservation Area	-66 972	-2,66	-0,90	na
Total Plantation emissions 2022	-100 563	-3,99	-0,44	na
Total Plantation emissions 2021	-80 329	-3,41	-0,34	na
Total Plantation emissions 2020	-20 893	-0,87	-0,10	na
Total Plantation emissions 2019	-137 778	-5,90	-0,69	na
Total Plantation emissions 2018	-73 622	-4,45	0,38	na
Total Plantation emissions 2017	- 76 151	-4,65	-0,45	na

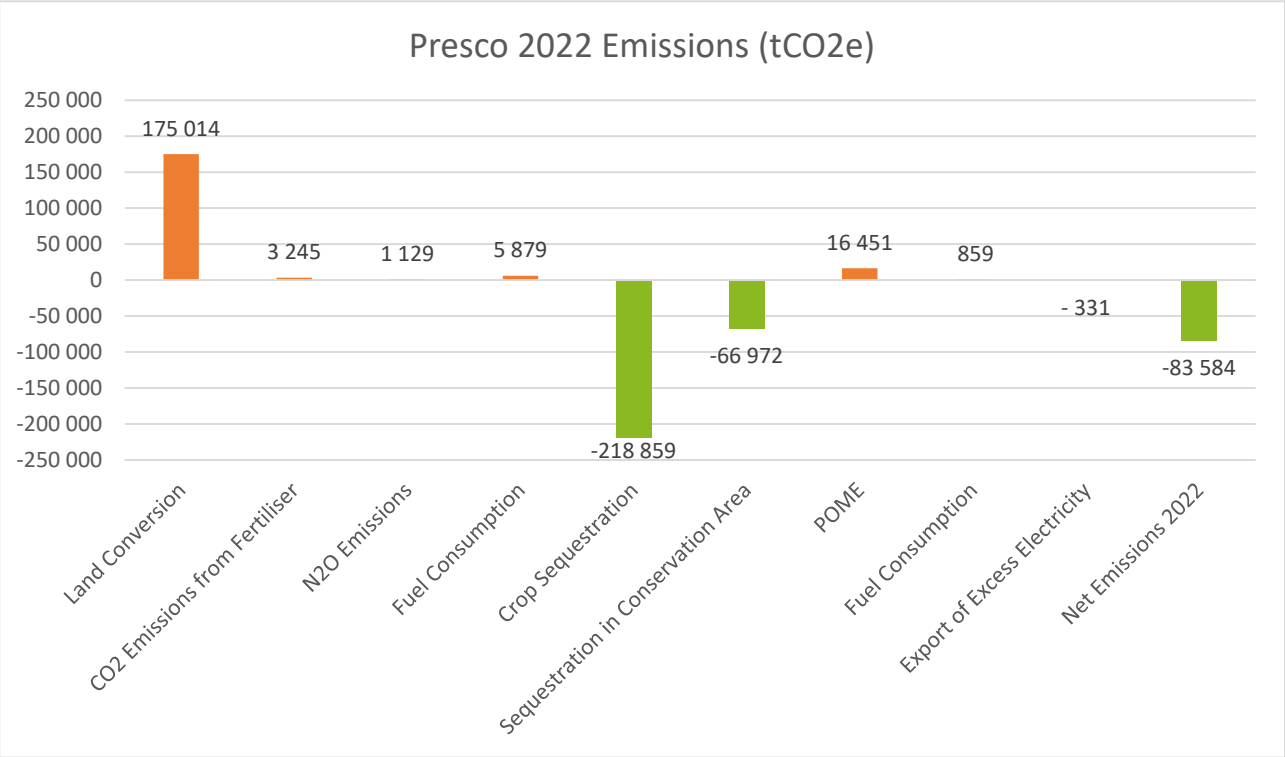
Table 3 3: Presco plantation emissions – sources and sinks (2022)

Description	tCO2 total	tCO2e /t FFB
POME	16 451	0,07
Fuel Consumption	859	0,00
Grid Electricity Utilization	0	0,00
Export of Excess Electricity to Housing	-331	0,00
Total Mill emissions 2022	16 979	0,08
Total Mill emissions 2021	33 207	0,14
Total Mill emissions 2020	22 597	0,12
Total Mill emissions 2019	22 597	0,11
Total Mill emissions 2018	17 055	0,09
Total Mill emissions 2017	8 203	0,05

Table 3 4: Presco mill emissions (2022)

Emission Source	tCO2e total
PK from own mill	-14 078
PK from other sources	0,00
Fuel consumption	272
Total crusher emissions 2022	-13 806
Total crusher emissions 2021	-6 211
Total crusher emissions 2020	792
Total crusher emissions 2019	-17 307
Total crusher emissions 2018	-9 030
Total crusher emissions 2017	-13 163

Table 3.5: Presco crusher emissions (2022)



Graph 3.2: Summary of Presco emissions – sources and sinks (2022)

At Presco the highest contributor of emissions, land conversion emissions, is largely compensated by crop sequestration and sequestration in conservation areas. The sequestration in conservation areas is more important here than in GOPDC and SNL as Presco has a large conservation area, a big part of which is situated in its Ologbo estate, this area have increased in 2022 with new conservation areas in the Sakponba estate and its extension. Sakponba estate has been planted on grassland which gives Presco a better sequestration potential.

Furthermore, as in GOPDC, emissions resulting from POME are limited by treatment in a biomethanation plant.

RESULTS - SNL

Description	2017	2018	2019	2020	2021	2022
Total Planted Area (ha)	15 231	14 858	15 222	15 478	15 423	14 895
Conservation Area (ha)	431	352	335	335	335	335
OER (%)	14,1	13,3	14,4	17,8	15,4	16,1

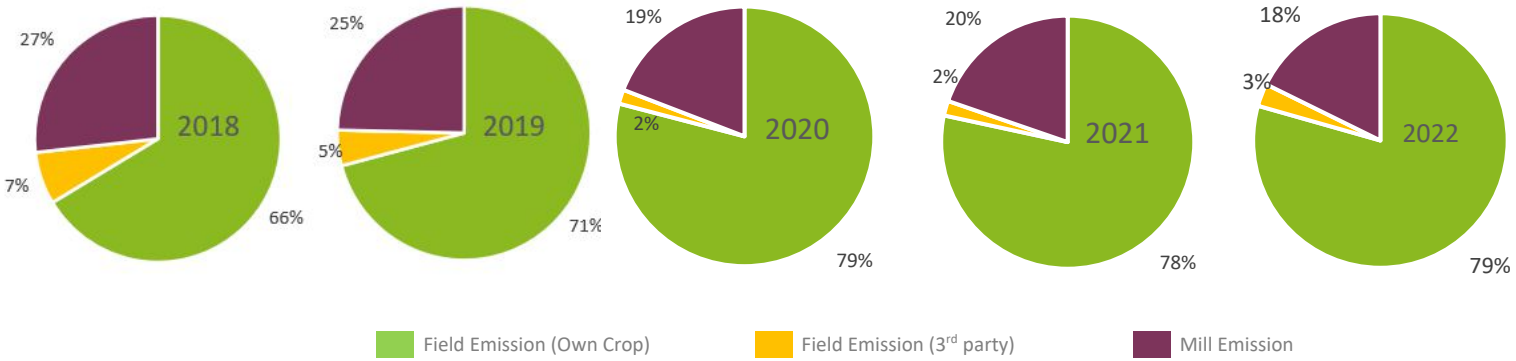
Net emissions	tCO2e
2022	28 987
2021	22 689
2020	23 124
2019	27 853
2018	31 484
2017	26 706

Table 4.1: SNL key indicators (2017 to 2022)

tCO2e /t Product	2017	2018	2019	2020	2021	2022
CPO	0,92	1,84	1,50	1,26	1,32	1,62
PK	0,92	1,84	1,50	1,26	1,32	1,62
PKO	1,84	2,67	1,64	1,86	1,98	1,92
PKE	1,84	2,67	1,64	1,86	1,98	1,92

Table 4.2: SNL emissions per ton of product (2017 to 2022)

Graph 4.1: Distribution of SNL's emissions (2018 to 2022)



	Own			3rd party
Description	**tCO2e total**	**tCO2e /ha**	**tCO2e /t FFB**	**tCO2e total**
Land Conversion	96 146	6,46	1,33	-
Fertilizer application	2 002	0,13	0,03	-
N_2O Emissions	476	0,03	0,01	-
Fuel Consumption	2 458	0,17	0,03	-
Crop Sequestration	-91 134	-6,12	-1,26	-
Sequestration in Conservation Area	-2 857	-0,19	-0,04	-
Total Plantation emissions 2022	7 091	0,48	0,10	3 671
Total Plantation emissions 2021	3 258	0,21	0,05	1 928
Total Plantation emissions 2020	4 524	0,28	0,06	1 782
Total Plantation emissions 2019	4 566	0,30	0,07	4 412
Total Plantation emissions 2018	5 343	0,34	0,09	6 899
Total Plantation emissions 2017	1 505	0,10	0,02	3 276

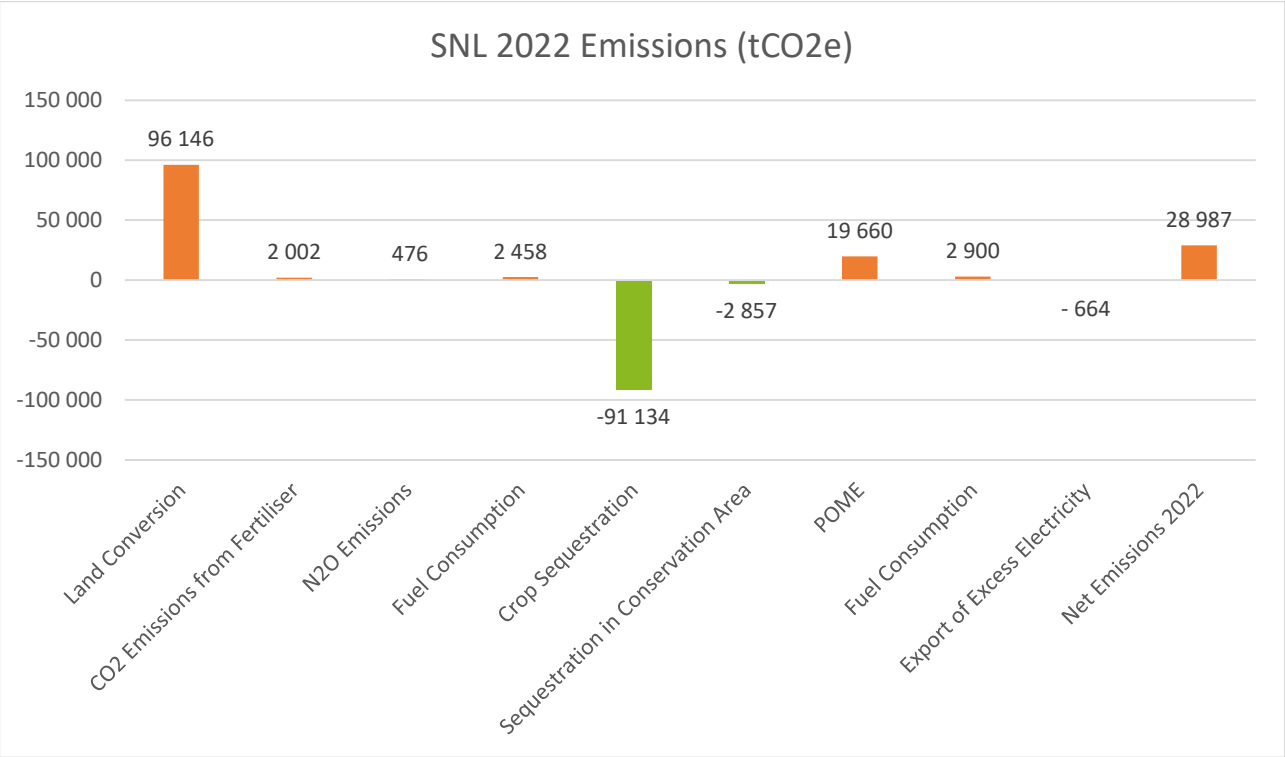
Table 4 3: SNL plantation emissions – sources and sinks (2022)

Description	tCO2 total	tCO2e /t FFB
POME	19 660	0,20
Fuel Consumption	2 900	0,03
Grid Electricity Utilization	0	0
Export of Excess Electricity to Housing	-664	-0,01
Total Mill emissions 2022	21 896	0,21
Total Mill emissions 2021	19 431	0,20
Total Mill emissions 2020	18 600	0,20
Total Mill emissions 2019	23 287	0,20
Total Mill emissions 2018	26 141	0,19
Total Mill emissions 2017	25 201	0,20

Table 4 4: SNL mill emissions (2022)

Emission Source	tCO2e total
PK from own mill	7 110
PK from other sources	609
Fuel consumption	725
Total crusher emissions 2022	8 444
Total crusher emissions 2021	10 706
Total crusher emissions 2020	11 449
Total crusher emissions 2019	9 959
Total crusher emissions 2018	30 312
Total crusher emissions 2017	24 665

Table 4.5: SNL crusher emissions (2022)



Graph 4.2: Summary of SNL emissions – sources and sinks (2022)

The results for SNL show that most emissions come from the POME and land conversion. This differs from GOPDC and Presco where biomethanation plants were installed to treat the POME and use the methane produced as an energy source. SNL does not yet have such an installation and therefore its POME emissions are much higher.

As for GOPDC and Presco, SNL's land conversion emissions are almost entirely compensated by the carbon crop sequestration and the sequestration in conservation areas.

RESULTS - CHC

Description	2018	2019	2020	2021	2022
Total Planted Area (ha)	5 179	5 188	5 196	5 204	5 210
Conservation Area (ha)	10	10	433	433	433
Dry rubber t / ha	1,84	1,90	1,34	1,90	1,55
Net emissions without 3rd party tCO2e	25 885	24 294	19 565	20 387	44 758
Net emissions with 3rd party tCO2e *	76 566	58 808	25 689	20 387	52 404

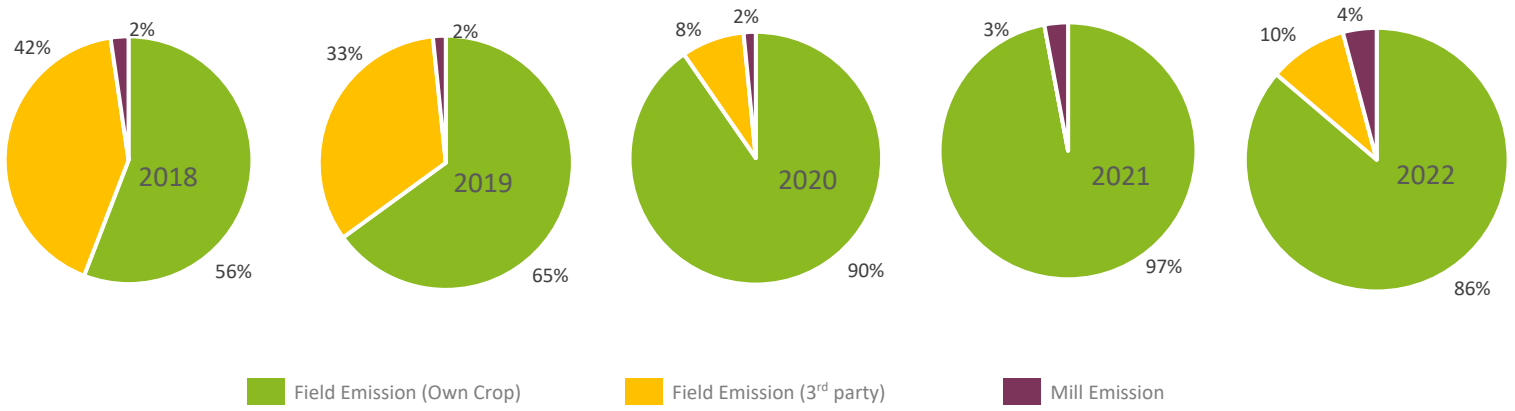
* no 3rd party in 2021

Table 5.1: CHC key indicators (2018 to 2022)

tCO2e / t Dry rubber	2018	2019	2020	2021	2022
Dry rubber without 3rd party	2,71	2,47	2,81	2,06	5,31
Dry rubber with 3rd party *	3,15	2,88	3,06	2,06	5,60

Table 5.2: CHC emissions per ton of product (2018 to 2022)

Graph 5.1: Distribution of CHC's emissions (2018 to 2022)

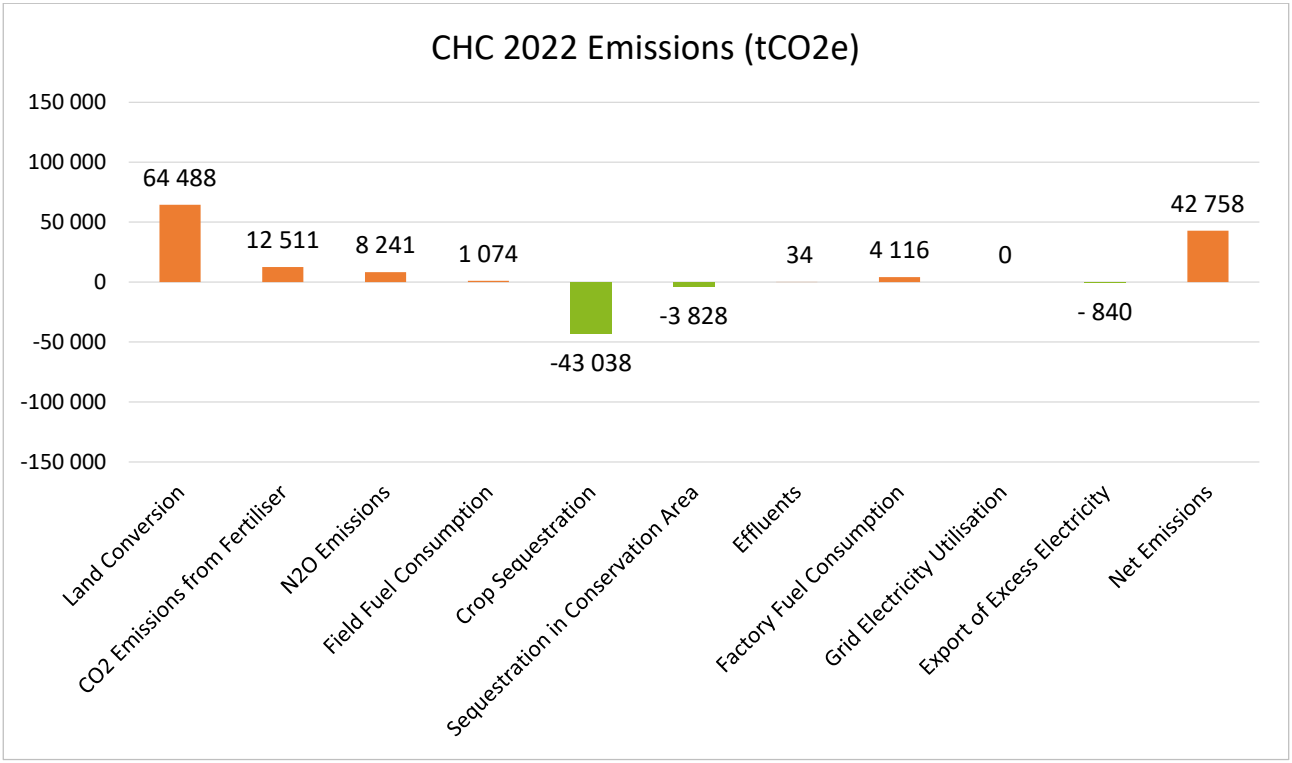


	Own			3rd party
Description	**tCO2e total**	**tCO2e /ha**	**tCO2e /t rubber**	**tCO2e total**
Land Conversion	64 488	17,07	11,04	-
Fertilizer application	12 511	3,31	2,14	-
N_2O Emissions	8 241	2,18	1,41	-
Fuel Consumption	1 074	0,28	0,18	-
Crop Sequestration	-43 038	-11,39	-7,37	-
Sequestration in Conservation Area	-3 828	-1,01	-0,66	-
Total Plantation emissions 2022	39 448	10,44	6,75	9 647
Total Plantation emissions 2021	19 141	4,60	2,42	0
Total Plantation emissions 2020	19 283	4,84	3,61	6 124
Total Plantation emissions 2019	23 598	6,17	3,25	34 514
Total Plantation emissions 2018	24 078	6,30	3,42	50 681

Table 5 3: CHC plantation emissions – sources and sinks (2022)

Description	**tCO2 total**	**tCO2e /ha**	**tCO2e /t rubber**
Effluent	34	0,01	0,00
Fuel Consumption	4 116	1,09	0,51
Grid Electricity Utilization	0	0,00	0,00
Export of Excess Electricity to Housing & Grid	-840	-0,22	-0,10
Total factory emissions 2022	3 310	0,88	0,41
Total factory emissions 2021	1 246	0,30	0,13
Total factory emissions 2020	282	0,07	0,04
Total factory emissions 2019	696	0,18	0,07
Total factory emissions 2018	1 807	0,35	0,19

Table 5.4: CHC factory emissions (2022)



Graph 5.2: Summary of CHC emissions – sources and sinks (2022)

The results for CHC show that most emissions come from the land conversion. Crop sequestration does not compensate the land conversion.

Effluent emissions are underestimated due to a lack of data in literature regarding such type of emissions.

Factory emissions have slightly increased due to a higher fuel consumption linked with less use of cogeneration.

Electricity production from cogeneration is not included as it is self-consumption, it's the same for oil palm, only exported excess electricity is accounted for.

Note that only plantation above 25 years old are considered. Older plantations have a balanced land conversion versus sequestration rate.

RESULTS – Siat Gabon

Description	2018	2019	2020	2021	2022
Total Planted Area (ha)	11 928	11 953	11 684	11 684	3 943*
Conservation Area (ha)	20 236	20 236	20 236	20 236	20 236
Dry rubber t / ha	0,98	0,79	0,63	0,46	0,53
Net emissions without 3rd party tCO2e	-145 298	-150 077	-150 851	-151 380	-149 273
Net emissions with 3rd party tCO2e**	-136 937	-138 123	-150 851	-148 877	-149 273

Table 6.1: Siat Gabon key indicators (2018 to 2022)

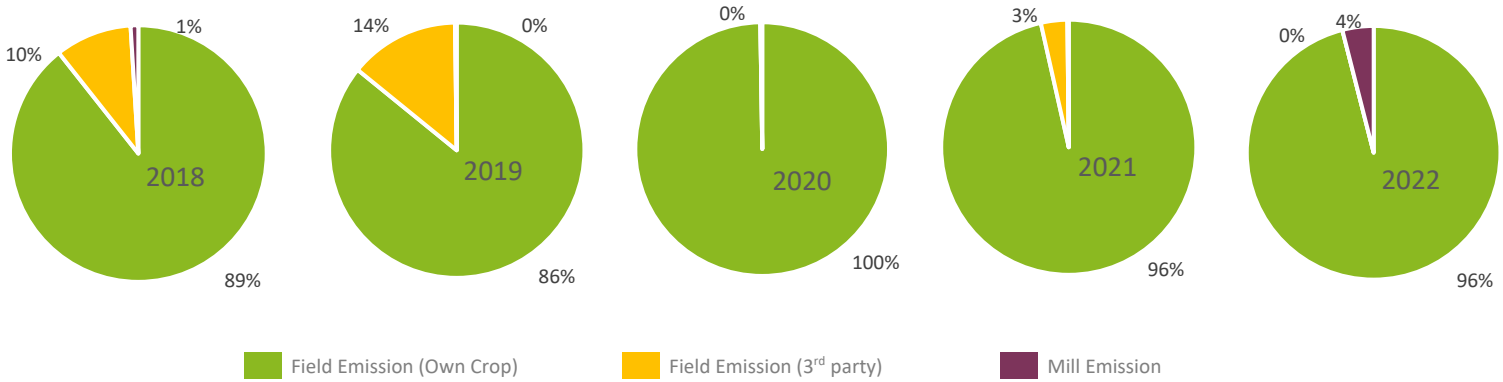
tCO2e / t Dry rubber	2018	2019	2020	2021	2022
Dry rubber without 3rd party	-12,45	-15,97	-20,60	-28,40	-71,08
Dry rubber with 3rd party**	-10,82	-12,91	-20,60	-27,09	-71,08

* No 3rd party in 2020 and 2022

** Only plantations younger than 25 years

Table 6.2: Siat Gabon emissions per ton of product (2018 to 2022)

Graph 6.1: Distribution of Siat Gabon's emissions (2018 to 2022)



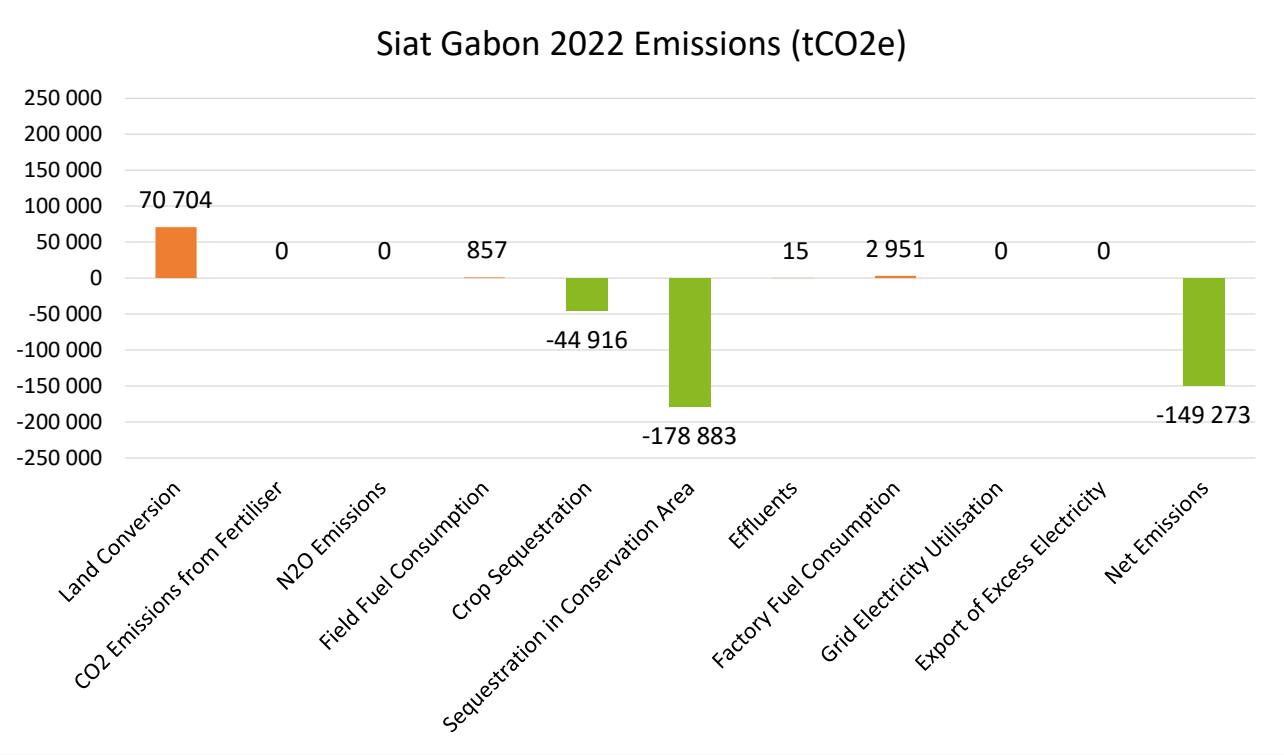
	Own			3rd party
Description	tCO2e total	tCO2e /ha	tCO2e /t rubber	tCO2e total
Land Conversion	70 704	17,93	33,67	-
Fertilizer application*	0	0,00	0,00	-
N_2O Emissions	0	0,00	0,00	-
Fuel Consumption	857	0,22	0,41	-
Crop Sequestration	-44 916	-11,39	-21,39	-
Sequestration in Conservation Area	-178 883	-45,36	-85,19	-
Total Plantation emissions 2022	-152 239	-38,61	-72,50	0**
Total Plantation emissions 2021	-151 510	-38,33	-83,03	2 503
Total Plantation emissions 2020	-151 018	-38,21	-60,96	0**
Total Plantation emissions 2019	-150 220	-37,92	-48,23	11 955
Total Plantation emissions 2018	-146 362	-37,17	-37,98	8 361

* No fertilizers from 2019 to 2022 ** No 3rd party in 2020 and 2022

Table 6 3: Siat Gabon plantation emissions – sources and sinks (2022)

Description	tCO2 total	tCO2e /ha	tCO2e /t rubber
Effluent	15	0,00	0,00
Fuel Consumption	2 951	0,75	0,47
Grid Electricity Utilization	0	0,00	0,00
Export of Excess Electricity to Housing & Grid	0	0,00	0,00
Total factory emissions 2022	2 966	0,75	0,48
Total factory emissions 2021	130	0,01	0,02
Total factory emissions 2020	167	0,01	0,02
Total factory emissions 2019	142	0,01	0,02
Total factory emissions 2018	703	0,06	0,06

Table 6.4: Siat Gabon factory emissions (2022)



Graph 6.2: Summary of Siat Gabon emissions – sources and sinks (2022)

The good result of Siat Gabon is due to the sequestration in conservation areas. Due to the mainly forested landscape, the land conversion's emissions will increase a lot if any new land clearing starts. Likewise, sequestration in conservation areas will decrease drastically if illegal logging occurs inside the undeveloped areas. Fortunately, boundaries of the concessions give a legal protection to the land inside the certificate of occupancy.

Effluent's emissions are underestimated due to a lack of data regarding such type of emissions in the literature.

Electricity production from cogeneration is not included as it is self-consumption, the same applies for oil palm, only exported electricity is accounted for.

MONITORING AND MITIGATION

Based on the above results and aiming towards continuous improvement, Siat group subsidiaries develop and implement greenhouse gas mitigation plans. The actions detailed in the plans will contribute to decreasing overall emissions. These include:

Commitment and Action	Responsibility
Approving Policies and allocate resources.	Chief Executive Officer
Not converting High Conservation Value (HCV) and High Carbon Stock Areas (HCSA) in new planting developments.	Chef Agric Officer
Forbidding burning in any cases and for land preparation particularly.	Chef Agric Officer
Carrying out leaf sampling and analysis on a yearly basis to assess quantities of fertilizer required and adjust to the actual needs of the crops so as to avoid applying fertilizer in excess.	Research & Development
Carrying out experiments to assess optimal fertilizer dosage to use on oil palms for a maximized yield, thereby also adjusting fertilizer usage to actual needs.	Research & Development
Maintaining and increasing conservation areas.	H&S Environment
Improving KPI and on time GHG follow up.	Group ESG Officer

Where a biogas plant or cogeneration plant are running

Ensuring that it always operates at its optimum level to capture the maximum CH4 before effluent is released.	Factory Manager
Avoiding flaring by installing machines that run on gas	Group Factory engineer
Implementing fertigation projects: using sludge from the biogas reactors and treated effluent for oil palm fertilizing and irrigation.	Chief Operation Officer
Carrying out regular maintenance to ensure that the boiler and turbine constantly operate at optimum efficiency in order to avoid using grid electricity or generators for power production.	Factory Manager

USE OF RENEWABLE ENERGY

Table 8.1: Use of renewable energy:

Electric resources used and renewable energy production (2018 to 2022)

	Renewable source	Year	Total MWh used per year	Renewable energy produced	% of renewable energy used
GOPDC	Cogeneration & Biomethanation	2018	11 917	7 811	66%
		2019	12 039	5 980	50%
		2020	10 453	3 131	30%
		2021	10 805	2 793	26%
		2022	10 116	2 456	24%
Presco	Cogeneration & Biomethanation	2018	10 857	8 837	81%
		2019	10 599	6 960	66%
		2020	12 448	10 053	81%
		2021	13 117	6 743	51%
		2022	12 907	8 122	63%
SNL	Cogeneration	2018	7 745	6 295	81%
		2019	6 052	4 558	75%
		2020	5 956	4 276	72%
		2021	6 131	4 572	75%
		2022	5 281	1 559	30%
CHC	Cogeneration	2018	10 895	7 125	65%
		2019	9 817	8 235	83%
		2020	5 433	5 367	99%
		2021	5 781	4 399	76%
		2022	4 706	526	11%
Siat Gabon	Cogeneration	2018	6 658	5 655	85%
		2019	6 342	5 783	91%
		2020	5 001	3 741	75%
		2021	2 602	2 027	78%
		2022	nc	nc	nc

The Siat Group decided to promote the use of renewable energy as an alternative to fossil energy: operating in rural areas where access to state supplied energy is not always possible, the Siat Group previously relied heavily on fossil energy to run its operations. For financial reasons, and as part of its environmental strategy, Siat has developed an ambitious renewable energy program. For the oil palm subsidiaries, in addition to the use of steam boilers and steam turbines that run on solid waste, the group has invested in biogas plants that treat effluent in bio digesters to produce methane used as an energy source. The two rubber factories get their electricity supply from their own cogeneration plants that are fed with wood coming from old rubber plots.

In 2018, 74% of the energy for factories was renewable energy, 70% in 2019, 68% in 2020 and 53% in 2021 (the decrease is mainly due to technical issues with turbines maintenance).

SOURCES AND DEFAULT DATA

Description	Value	Units
Previous land use		
Undisturbed forest	983	tCO2e /ha
Disturbed forest	470	tCO2e /ha
Shrubland	169	tCO2e /ha
Grassland	18	tCO2e /ha
Tree crops	275	tCO2e /ha
Annual/food crop	31	tCO2e /ha
Oil palm	234	tCO2e /ha
Rubber	285	tCO2e /ha
Data		
Conservation sequestration values	8,84	tCO2e /ha.yr
POME	13,1	Kg CH4 /t POME
Factory effluents	0,15	t CO2e /m^3 of wastewater
Diesel	3,12	Kg CO2e /l

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www.rspo.org/certification/palmghg/ghg-assessment-procedure - New Development GHG Calculator-English.

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