ҚАЗАҚСТАН РЕСПУБЛИКАСЫ ЭКОЛОГИЯ ЖӘНЕ ТАБИҒИ РЕСУРСТАР МИНИСТРЛІГІ

«Жасыл даму» акционерлік қоғамы

БҰҰ КӨНК Хатшылығының халықаралық сарапшылар тобының ұсынымдарын ескере отырып, CRF және SEF форматтарындағы есептік электрондық кестелерді дайындау бойынша есеп

Астана қ., 2023 жыл

КЕЛІСУ ПАРАҒЫ

«БҰҰ КӨНК Хатшылығының халықаралық сарапшылар тобының ұсынымдарын ескере отырып, CRF және SEF форматтарындағы есептік электрондық кестелерді дайындау бойынша есеп»

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Кіріспе

Қазақстан Республикасының БҰҰ КӨНК бойынша негізгі міндеттемелерінің бірі БҰҰ КӨНК Хатшылығына Монреал хаттамасымен реттелмейтін Парниктік газдар көздері мен сіңіргіштер абсорбциясынан антропогендік шығарындыларының кадастры жөніндегі ұлттық баяндама мен Жалпы пішіндегі есептілік (бұдан әрі – ЖПЕ) есептік кестелерінен тұратын Парниктік газдарды түгендеу бойынша ұлттық есепті жыл сайын ұсыну болып табылады.

Қазақстан 2009 жылы Киото хаттамасын ратификациялағаннан кейін БҰҰ КӨНК хатшылығына Кадастры жөніндегі ұлттық баяндама мен ЖЭФ-ның (Common Reporting Format – CRF) есептік кестелері түрінде Парниктік газдарды түгендеудің ұлттық есептерін ұсына бастады. Бұл ҚР-ның БҰҰ КӨНК бойынша негізгі міндеттемелерінің бірі. БҰҰ КӨНК-тің халықаралық талаптарына сәйкес парниктік газдарды түгендеу екі жылға бұрын жылжып жүргізіледі (статистиалық деректер өткен жылға беріледі, деректерді жинау және өңдеуге бір жыл кетеді). Барлық КҰБ мен ЖПЕ-нің электронды кестелері БҰҰ КӨНК хатшылығының веб-сайтында (www.unfccc.int) орналастырылған.

ЖПЕ-нің кестелері Парниктік газдарды түгендеу жөніндегі ұлттық есепті ұсынатын барлық елдер үшін бірыңғай форматта 5 сектор: Энергетика, Өнеркәсіптік процестер және өнімді пайдалану, Ауыл шаруашылығы, Орман шаруашылығы және жерді пайдаланудың басқа түрлері, Қалдықтар бойынша әзірленген. ЖПЕ-нің кестелеріне тікелей парниктік әсері бар алты негізгі газдар (көміртегі диоксиді (CO_2), метан (CH_4), азота тотығы (N_2O), гидрофторкөміртектер (ГФК), перфторкөміртектер (ПФК) және күкірт гексафториды (SF_6)) кіреді. Сондай-ақ көздердің кейбір санаттары үшін жанама парниктік әсері бар көміртегі тотығы (CO), азот тотығы (NO_x) мен метан емес ұшпа органикалық қосылыстар (МЕҰОҚ) және күкірт диоксиді (SO_2) төрт ПГ эмиссияларының бағалауы жүргізіледі.

Парниктік газдар шығарындалары мен сіңіргіштерінің есептеулері БҰҰ КӨНК Тараптар Конференциясында (бұдан әрі – ТК) қабылданып және келісілген және БҰҰ КӨНК-ке 1-қосымша елдері үшін Парниктік газдарды түгендеу бойынша ұлттық есептерді дайындау жөніндегі Басқарушы қағидаттарында (КӨҮСТ БҚ) мазмұндалған Климаттың өзгеруі жөніндегі үкіметаралық сарапшылар тобының әдіснамасы негізінде жүзеге асырылады.

2015 жылдан бастап ТК19 шешіміне сәйкес Қазақстанды қоса алғанда, 1-қосымша елдері парниктік газдар бойынша есептеулерді Парниктік газдарды түгендеудің жаңа басшылық қағидаттарына (КӨҮСТ БҚ, 2006 ж.) сәйкес жүзеге

асырылады. Бұл уақытқа дейін КӨҮСТ БҚ, 1996 ж. қолданылды. Сондай-ақ 2015 жылдан ЖПЕ (Common Reporting Format) есептік электронды кестелері жаңа бағдарламалық жасақтамаға (CRF Reporter) сәйкес ұсынылады.

1990-2020 жылдар кезеңінің ЖЭФ кестесі Киото хаттамасының I-қосымшаға кірген Тараптар үшін жылдық кадарстрлар жөнінде баяндаманы ұсыну үшін БҰҰ КӨНК басшылық қағиттарын қайта қарау жөніндегі 24/CP.19 (FCCC/CP/2013/10/Add.3) шешіміне сәйкес әзірленді. Жалпы пішіндегі есептілік кестелері осы шешімің II-қосымшасына сәйкес дайындалды, ал жаһандық жылыну әлеуетінің мәні III-қосымшадан алынды.

2019 жылғы қыркүйекте БҰҰ КӨНК Хатшылығының РСТ жүргізген 1990-2017 жылдарға арналған ҚҰБ-ға шолу нәтижелері бойынша Парниктік газдарды түгендеу жөніндегі ұлттық есепті бойынша халықаралық сарапшылардың ұсынымдары ұсынылды.

Осы есеп 2023 жылғы 13 наурыздағы Қызметтерді мемлекеттік сатып алу туралы №13 шартқа Техникалық ерекшелікке сәйкес дайындалған және БҰҰ КӨНК Хатшылығының халықаралық сарапшылар тобының әрбір сектор бойынша ұсынымдарын ескере отырып, CRF және SEF форматтарындағы ЖПЕ кестелеріне сипаттаманы қамтиды. Есептің қосымшасында жалпы пішіндегі есептілік (CRF) кестелері берілген.

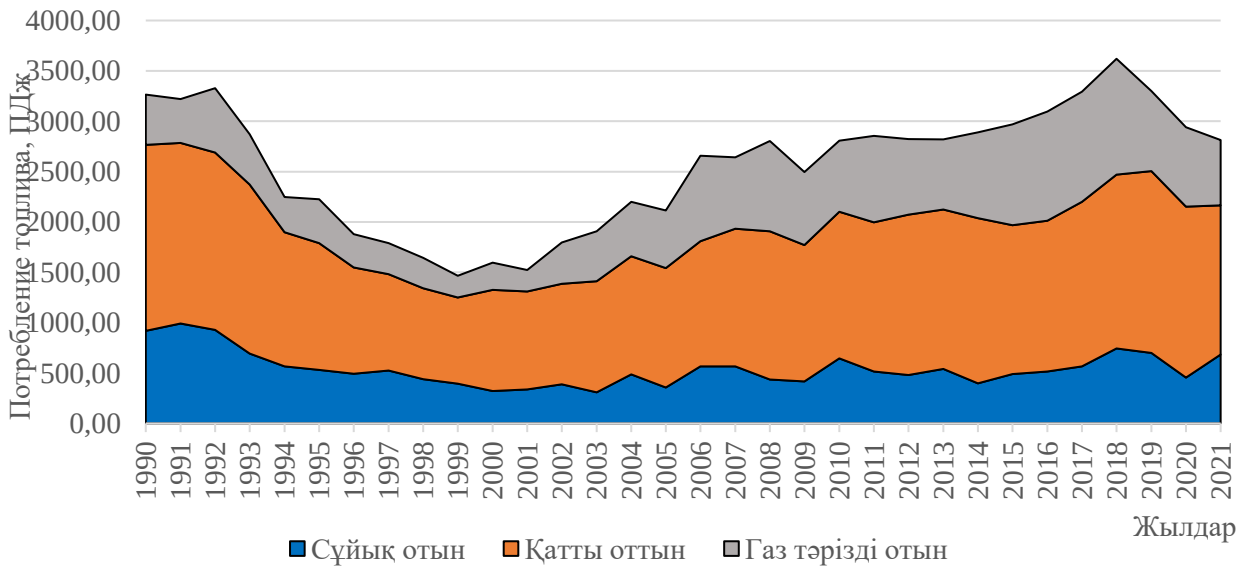
«Энергетика» секторының ОФО (CRF) кестелерінің сипаттамасы

"Энергетика" секторындағы парниктік газдар шығарындылары секторлық тәсіл бойынша 1990 за 2021 жж.

2021 жылы базалық тәсіл бойынша" Энергетика " секторында отын тұтынудың жалпы көлемі **2814,08** ПДж құрады. 1990 жылғы парниктік газдар шығарындыларымен салыстырғанда отын тұтыну көлемі 13,8% - ға, 2020 жылғы деңгеймен 4,3% - ға төмендеді (2-кесте).

2020 жылғы базалық тәсіл бойынша парниктік газдар шығарындылары "Энергетика" секторында **229,078** млн.тонна CO2 құрады, бұл 1990 жылғы деңгейден 14,29% - ға және 2020 жылғы деңгейден 0,4% - ға артық.

Сұйық отынды тұтынуда, атап айтқанда шикі мұнайды нақты тұтынудың төмендеуінде, **396,526** ПДж-дан **129,065** ПДж-ға дейін айтарлықтай өзгерістер байқалады.өндірілетін шикі мұнай мөлшерінің төмендеуі. 2021 жылы сұйық отыннан парниктік газдар шығарындылары **50,337 млн. тонна CO2** экв құрады. Бұл көрсеткіш 1990 жылғы деңгейден 21,86% - ға және 2021 жылғы деңгейден 45,64% - ға артық. Қатты отынды тұтынуда шығарындылардың шамалы төмендеуі байқалады: **1697,045** ПДж-дан **1483,45** ПДж-ға дейін. 2021 жылы қатты отын тұтынудан парниктік газдар шығарындыларын азайту бұл энергетикалық және көмір экспортының артуына байланысты, бұл өз кезегінде қатты отынның нақты тұтынылуына әсер етті.



1 - сурет-базалық тәсіл бойынша "Энергетика" секторындағы 1990 за 2020 үшін CO2 шығарындыларының динамикасы 1990 за 2021 үшін, Pj

2021 жылғы парниктік газдар шығарындылары сияқты, сұйық отын шығарындыларының азаюы автомобиль бензині мен дизель отынын тұтынудың

төмендеуімен де байланысты. Автомобиль бензині жағдайында айтарлықтай өзгеріс экспорттың ұлғаюымен байланысты, бұл парниктік газдар шығарындыларын есептеу үшін қолданылатын формула негізінде отынның осы түрін нақты тұтынуға тікелей әсер етті.

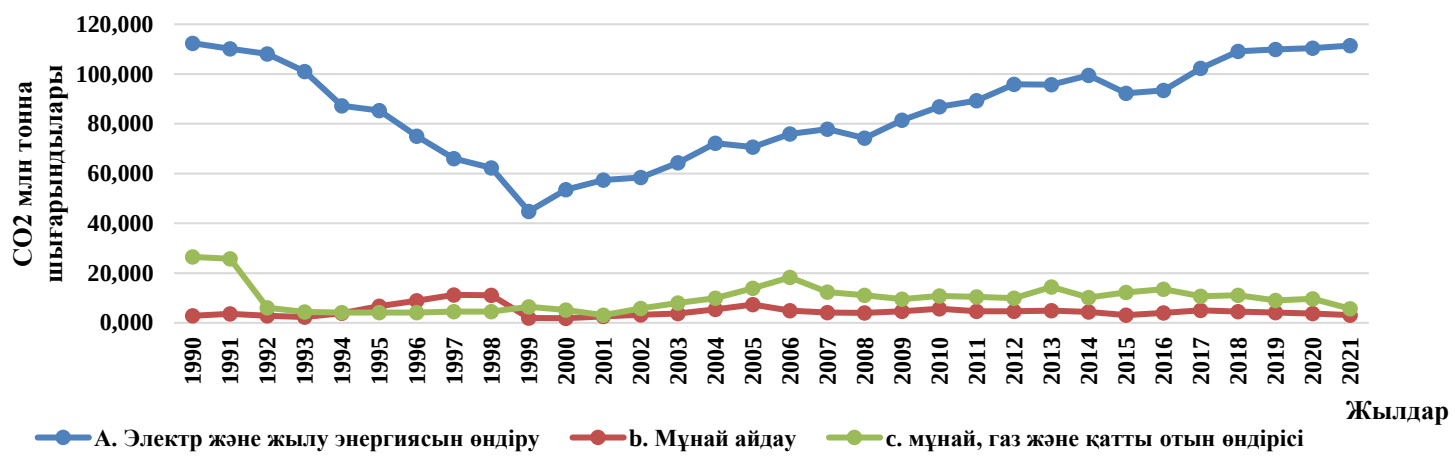
1-кесте-1990 за 2021 үшін базалық тәсіл бойынша "Энергетика" секторындағы отын тұтыну және CO2 шығарындыларының динамикасы.

Год	**Всего,**	**По видам топлива, ПДж**			**Всего CO_2,**	**Выбросы CO_2 по видам топлива, млн тонн**		
	ПДж	**Жидкое топливо**	**Твердое топливо**	**Газообразное топливо**	**млн тонн**	**Жидкое топливо**	**Твердое топливо**	**Газообразное топливо**
1990	**3265,13**	917,51	1847,9	499,72	**267,277**	64,423	175,081	27,773
1991	**3221,67**	990,65	1794,12	436,91	**266,025**	68,145	173,369	24,511
1992	**3329,64**	930,01	1758,81	640,81	**270,932**	65,05	169,933	35,95
1993	**2869,02**	693,35	1679,11	496,55	**238,709**	48,36	162,492	27,857
1994	**2245,91**	565,12	1332,22	348,57	**188,39**	40,415	128,42	19,555
1995	**2223,7**	531,6	1258,26	433,84	**184,015**	38,319	121,358	24,339
1996	**1879,2**	492,21	1056,1	330,88	**155,822**	35,385	101,875	18,562
1997	**1788,58**	523,86	956,93	307,78	**147,364**	37,858	92,239	17,267
1998	**1643,65**	439,84	901,44	302,37	**135,527**	31,692	86,872	16,963
1999	**1464,34**	395,2	855,14	214	**121,235**	28,375	81,043	11,816
2000	**1596,97**	321,48	1003,17	272,31	**131,583**	22,767	93,632	15,184
2001	**1521,5**	337,27	973,46	210,77	**127,13**	23,919	91,565	11,646
2002	**1796,33**	388,91	997,72	409,69	**144,41**	27,638	94,063	22,709
2003	**1906,84**	308,43	1103,59	494,82	**152,182**	21,634	103,823	26,725
2004	**2200,9**	486,3	1174,44	540,17	**173,974**	34,623	111,637	27,714
2005	**2113,6**	356,87	1184,81	571,92	**166,473**	24,975	111,465	30,034
2006	**2656**	565,24	1245,09	845,66	**202,264**	40,155	117,02	45,088
2007	**2642,12**	565,34	1366,15	710,63	**205,068**	39,772	127,548	37,747
2008	**2803,11**	434,77	1473,57	894,77	**215,264**	29,368	136,607	49,289
2009	**2496,62**	416,51	1353,73	726,38	**193,253**	27,84	126,897	38,517
2010	**2805,89**	646,01	1455,72	704,16	**220,183**	45,854	136,168	38,161
2011	**2853,72**	514,69	1482,65	856,38	**222,537**	36,239	139,323	46,976
2012	**2824,06**	480,58	1591,87	751,61	**223,81**	34,002	149,534	40,275
2013	**2820,1**	539,99	1584,41	695,7	**223,868**	37,994	148,59	37,284
2014	**2890,15**	398,34	1639,92	851,89	**227,692**	27,746	153,2	46,746
2015	**2968,29**	489,3	1479,41	999,58	**223,257**	30,433	137,789	55,036
2016	**3096,8**	515,07	1495,96	1085,77	**231,316**	32,192	139,664	59,461
2017	**3293,33**	565,52	1633,94	1093,87	**247,506**	35,29	152,267	59,948
2018	**3619,97**	744,21	1727,13	1148,63	**272,339**	48,028	161,174	63,136

2019	**3298,27**	701,1	1803,66	793,51	**257,555**	45,55	168,577	43,427
2020	**2941,5**	454,2	1697,04	790,25	**228,055**	27,363	158,155	42,536
2021	**2814,08**	682,55	1483,45	648,08	**229,078**	50,337	142,842	35,899

"Энергетика" секторындағы парниктік газдар шығарындылары секторлық тәсіл бойынша 1990 за 2021 жж.

2006 жылғы IPCC басшылығына сәйкес Энергетика секторының парниктік газдар шығарындыларын секторлық тәсіл (CO2, CH4, N2O, NOx, CO, NMVOC және SO2) бойынша бағалау экономикалық қызметтің келесі санаттары бойынша жүргізілді: **1.A. 1 ОФО энергетика өнеркәсібі, 1.A. 2 ОФО өңдеу өнеркәсібі және құрылыс, 1.A.2 ОФО көлігі, 1.A.4 ОФО басқа секторлар, 1.A. 5 ОФО басқа көздер.**



2-сурет-негізгі көздер бойынша (секторлық тәсіл, млн. тонна) 1990 за 2021 үшін "энергетика өнеркәсібі" санатындағы CO2 шығарындылары.

"Энергетика" секторындағы парниктік газдар шығарындыларының негізгі көзі "энергетика өнеркәсібі" санаты болып табылады: 2020 жылы осы санаттағы отынның жалпы шығыны **1375,88** ПДж құрады, бұл 1990 жылға қарағанда 17,07% – ға, 2020 жылға қарағанда 6,11% - ға артық (2-кесте). 2020 жылы "энергетика өнеркәсібі" санатындағы парниктік газдардың жалпы шығарындылары **120,699** млн. тонна CO2 –экв құрады. (4-сурет), бұл 1990 жылғы деңгейден 15,22% - ға және 2019 жылғы деңгейден 2,9% - ға аз.

Санат **"1.A. 2 ОФО өңдеу өнеркәсібі және құрылыс"** Қазақстан Республикасының аумағында жұмыс істейтін өнеркәсіп салаларында отынды жағудан парниктік газдар шығарындыларын қамтиды. Бұл санатқа мыналар жатады: **"1.A. 2a қара металлургия", 1.A. 2b "түсті металлургия", " 1.A. 2C химия өнеркәсібі", " 1.A. 2D целлюлоза-қағаз өнеркәсібі", " 1.A. 2e тамақ өнеркәсібі "және" 1.A. 2F металл емес минералды өнімдер өндірісі", " 1.A.**

2G барлық басқа салалар". Осы санаттағы негізгі тұтынылатын отын-қатты отын, 2021 жылы тұтынылған отынның жалпы санының 39,4% - ы, 2021 жылы осы санаттағы отынның жалпы тұтынуы 495,848 ПДж құрады, бұл 1990 жылғы деңгейден 52,81% - ға және 2020 жылғы деңгейден 35,68% - ға артық. "Өңдеу өнеркәсібі және құрылыс" санатындағы парниктік газдар шығарындылары 2021 жылы **41,133** млн. тонна CO2-экв құрады. (Кесте 2). Парниктік газдар шығарындыларының бұл көрсеткіші 1990 жылы есептелген шығарындылар деңгейіне қарағанда 54,14% - ға және 35,99% - ға жоғары. 2019 деңгейіне қатысты.

"1.А. 4 Ofo басқалары " кіші санаттарды қамтиды: 1.А. 4а **"коммерциялық / институционалдық сектор", 1.А. 4В "тұрғын үй секторы"** және 1.А. 4с **"ауыл/орман/балық шаруашылығы"**. 2021 жылғы "басқа секторлар" санатындағы тікелей парниктік газдардың жиынтық шығарындылары 1990 жылға есептелген шығарындылар деңгейінен 0,9%-ға аз, ал 2021 жылы парниктік газдар шығарындыларының деңгейінен 27,2% - ға артық.осы санаттағы парниктік газдар шығарындыларының жалпы саны **40,574** млн. тонна CO2-экв құрады. (Кесте 2). Парниктік газдар шығарындыларының көп бөлігін екі отын шығарады – қатты (45,71%) және газ тәрізді отын (36,33%). "Басқа секторлар" санатындағы шығарындылардың негізгі көзі-1.А. 4b "тұрғын үй секторы". Осы санаттағы отынның жалпы тұтынуы 2021 жылы 327,104 ПДж құрады немесе осы ішкі санаттағы жалпы тұтынылған отынның 77,87% құрады.

"1.санаттағы тікелей парниктік газдардың жиынтық шығарындылары.А. 5 басқа көздер " 2021 жылы **18,956** млн. тонна CO2–экв құрады. (3-кесте) бұл 1990 жылғы шығарындылар деңгейінен шамамен 2,1 есе және 2020 жылғы деңгейден 22,89% - ға аз.2021 жылғы "басқа көздер" кіші санатындағы отынның жалпы шығыны 258,111 ПДж құрады, оның көп бөлігі қатты отынға (59,58%) тиесілі.

2-кесте-1990 за 2020 секторлық тәсіл бойынша "Энергетика" секторындағы отын тұтыну және CO2 шығарындыларының динамикасы.

Год	**Всего,**		**Энергетическая промышленность**		**Обрабатывающая промышленность и строительство**		**Другие сектора**		**Прочие источники**	
	ПДж	**Млн тонн CO2–экв.**	ПДж	Млн тонн CO2–экв.	ПДж	Млн тонн CO2–экв.	ПДж	Млн тонн CO2–экв.	ПДж	Млн тонн CO2–экв.
1990	**2874,626**	**242,098**	1659,194	142,369	233,967	18,862	562,194	49,386	114,192	8,934
2020	**2715,457**	**224,694**	1465,566	124,318	320,268	26,631	405,220	32,430	255,333	22,279
2021	**3050,232**	**246,528**	1375,876	120,699	495,848	41,133	556,691	40,574	258,111	18,956

Халықаралық сарапшылар тобының ұсынымдарына сәйкес"

Энергетика " секторы бойынша ұлттық түгендеуді жақсарту

1990-2019 жж. Монреаль хаттамасымен реттелмейтін парниктік газдар көздерінен антропогендік шығарындылар кадастры және сіңіргіштердің сіңірілуі туралы Қазақстан Республикасының ұлттық баяндамасына жүргізілген

талдаулар бойынша ұсынылған құжаттарға сәйкес. халықаралық сарапшылар тобы "Энергетика" секторы үшін ескертулерді үш негізгі санатқа бөлуге болады: белгілеу кілттерін ("NO", "NE" және "IE") дұрыс пайдалануға қатысты сіңдіру жалпы CRF форматындағы кесте, кокстелетін көмірді тұтынуға қатысты ескертулер ("1" санаты бойынша ескертулер.А. 5 басқа көздер") және 1990-1998 жылдардағы ПГ шығарындыларын қайта есептеу.

Парниктік газдардың антропогендік шығарындыларын есептеудің ағымдағы Ұлттық баяндамасында климаттың өзгеруінің халықаралық сарапшылар тобы пайдаланудың дұрыстығына күмән келтірген белгілеудің барлық кілттеріне талдау және қайта қарау жүргізілетін болады.

Кокстелетін көмірді пайдалану жөніндегі деректер "АрселорМиталл Теміртау"АҚ кәсіпорындарына берілген деректер негізінде қайта қаралды және қайта есептелді. Бұл кәсіпорын қара металлургия қажеттіліктері үшін кокстелетін көмірді жалғыз ірі тұтынушы ретінде әрекет етеді. Осы фактіге сүйене отырып, 2014-2019 жылдардағы бірқатар деректерді қайта есептеу туралы шешім қабылданды.

1990-1998 жылдар кезеңінде отын тұтыну бойынша сенімді статистикалық деректердің болмауына байланысты деректерді қайта есептеу мүмкін болмады. ҚР ҰЭМ Ұлттық статистика бюросына құжат ұсынылды: 1990 жылғы отын-энергетикалық теңгерім, бірақ бұл құжатта "Энергетика"секторында парниктік газдарды ұлттық түгендеу бойынша есеп айырысуды жүргізу үшін талап етілетін Қазақстан Республикасының аумағында отын тұтыну бойынша толық статистикалық деректер ұсынылмаған. Осы фактіні назарға ала отырып, 1990 жылғы ПГ шығарындыларын қайта есептеуді жүргізу 2006 жылғы IPCC басшылық қағидаттарына жауап бермейді.

«Көлік» санатындағы ОФО (CRF) кестелерінің сипаттамасы

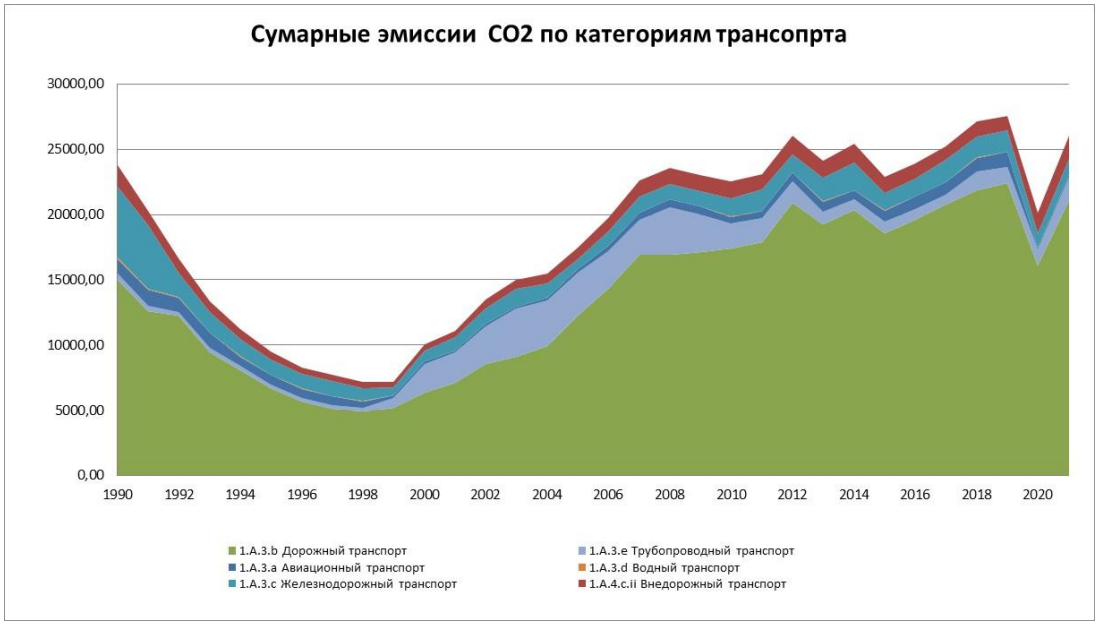
«Көлік» санаты

2021 жылы елдің ЖІӨ-дегі көлік үлесі шамамен 5,9% құрады. Көліктің әрбір түрінің аумақтық, климаттық жағдайларға және тасымалданатын жүктердің ерекшеліктеріне, сондай-ақ жүзеге асырылатын тасымалдау қашықтығына байланысты тиімді пайдалану саласы болады. ҚР СЖжРА Ұлттық статистика бюросының мәліметі бойынша , соңғы жылдары елімізде көлік тасымалының көлемі тұрақты түрде өсті, COVID19 пандемиясына байланысты шектеу шараларының сақталуына қарамастан, мұндай үрдіс жүктер үшін сақталды, алайда Жолаушылар тасымалы біршама шектеулі. Үлкен қысқартулар авиациялық (халықаралық қатынастар), теміржол (халықаралық және ішінара ішкі қатынастар), теңіз көлігі (Каспий теңізіндегі жолаушылар тасымалы), жеке автомобиль тасымалдары (халықаралық транзит) болды.

1990 жылдан бастап 30 жыл ішінде бұл кіші санаттың құрылымы айтарлықтай өзгерді. Осылайша, теміржол көлігі салымының үлесі 23% - дан 4% - ға дейін төмендеді, су көлігі 0,9% - дан 0,7% - ға дейін төмендеді, құбыр көлігі 2% - дан 7% - ға дейін өсті. Авиация жыл сайынғы өсу қарқынының төмендігіне қарамастан, соңғы екі жылды қоспағанда, шамамен 4% үлесті алады.

Парниктік газдардың жалпы шығарындылары 2021 жылы 25166,48 тонна CO_2эквр құрады. Ең үлкен эмиссияларды 20,81 CO_2жол көлігі жасады.

Санаттардың әрқайсысы үшін эмиссиялар бойынша неғұрлым егжей-тегжейлі деректер 1-суретте көрсетілген.

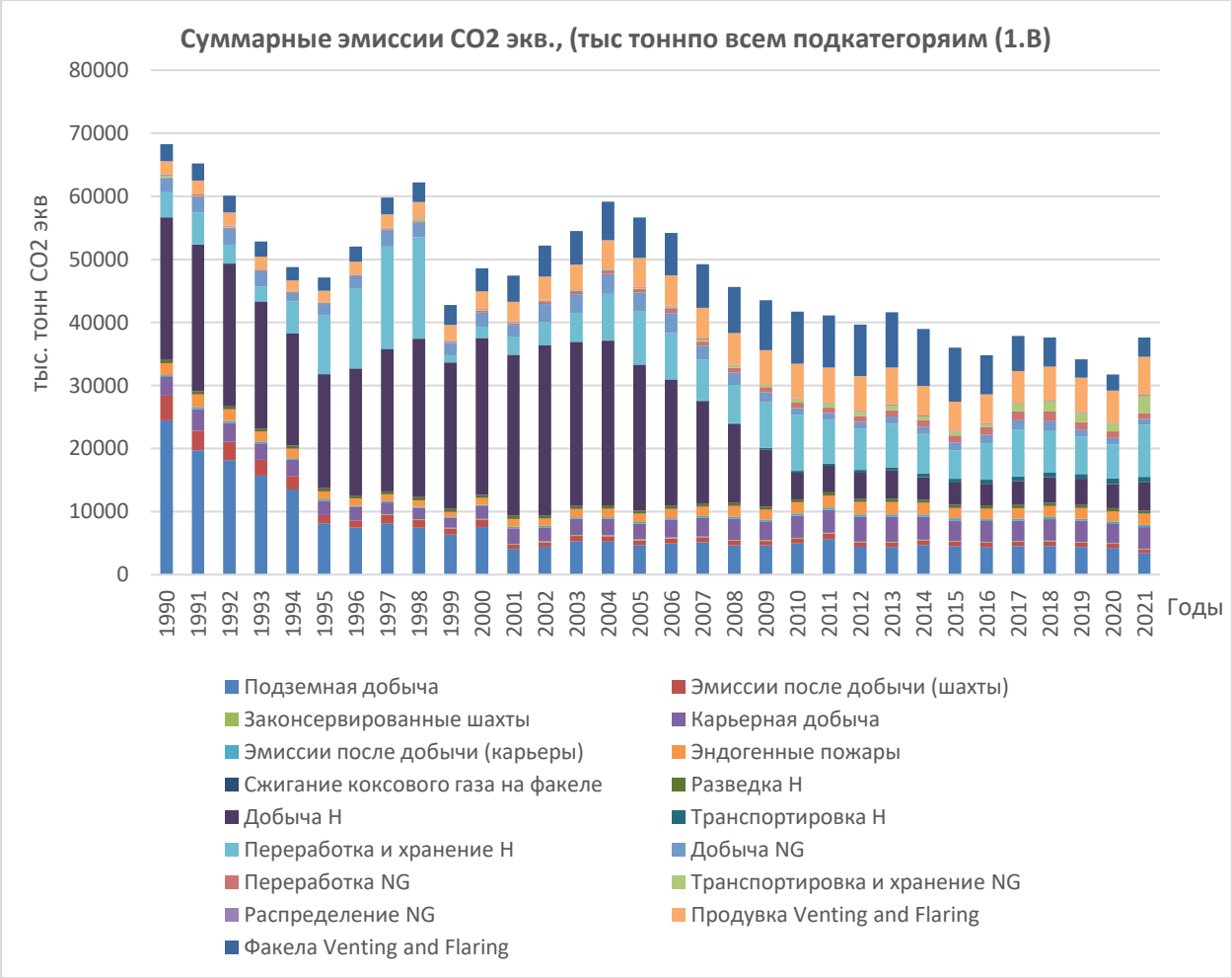


3 - сурет. 1990-2021 жылдардағы көлік секторынан парниктік газдар шығарындылары. (Гг CO_2)

«Ұшпа эмиссиялар» санаты

"Ұшпа эмиссиялар" санаты екі үлкен кіші санатқа бөлінеді:" Қатты отындар", олардың барлық эмиссиялары номенклатуралық белгілеу бойынша ЕЖФ кестелерінде (1.B.1) және "Сұйық, газ тәрізді отындар", олар үшін нәтижелер ЕЖФ кестелерінде (1.B.2) көрсетіледі. Ұсынылған санаттардың әрқайсысында төменде егжей-тегжейлі ұсынылатын бірқатар ішкі санаттар бар.

1990 жылғы базалық жылы ұшпа эмиссиялардан эмиссия көлемі 73047,67 мың тонна CO_2 экв, 2021 жылы 46628,4 мың тонна CO_2экв құрады, осылайша, осы сектордағы эмиссиялардың азаюы 36,1% құрады. Ұшпа эмиссиялар "Энергетика"секторында 1990 жылы 16,8% және қазіргі уақытта шамамен 6,5% құрады. 1 - суретте "Ұшпа эмиссиялар" санатындағы парниктік газдардың жалпы шығарындылары, сондай-ақ 1990 және 2021 жылғы салыстырмалы диаграмма ұсынылған, онда әрбір ішкі санаттың үлесін жалпы эмиссиялар сомасына салыстыру үшін көрсетілген. Қазіргі уақытта мұнай мен газ өндірісінің базалық 1990 жылмен салыстырғанда жалпы өсуіне қарамастан, эмиссиялар төмендегенін көруге болады. Бұл позиция өзін-өзі түсіндіруді қажет ететін бірнеше себептерге байланысты.



4 - сурет. CO_2 экв жиынтық эмиссиялары., (мың тонна) барлық кіші санаттар бойынша (1.B)

Көмір өндіру кіші санатында қатты отыннан Ұшпа эмиссияларды 1990 жылғы базалық және 2021 жылғы салыстырылатын эмиссиялар арасында қайта бөлу орын алды. Жер асты өндірісінің үлесі 73% - дан 35% - ға дейін және өндіруден кейінгі процестердің нәтижесінде 11% - дан 6% - ға дейін айтарлықтай өзгергенін көруге болады (3.5.4-сурет). Сонымен қатар, карьерлік өндірістен эмиссиялардың үлесі 1990 жылғы 9% - дан 2021 жылғы 36% - ға дейін айтарлықтай өсті. Тиісінше, өндірістен кейінгі процестерден эмиссиялардың үлесі 1990 жылғы 1% – дан 2021 жылы 4% - ға дейін және эндогендік өрттерден- 1990 жылғы 6% - дан 2021 жылы 18% - ға дейін өсті. Сондай-ақ, 1997 жылдан бастап шығарындылар көздеріне жабық шахталардан көбірек эмиссиялар қосылатынын қосамыз. Бүгінгі таңда сарапшылардың барлығы он үш жабық шахта туралы деректері бар екеніне қарамастан, олардың қатты отыннан жалпы теңгерімдегі эмиссияларының үлесі 2021 жылы 1 % (66,6 мың тонна CO_2) құрады.

Мұнай кіші санаты үшін негізгі эмиссиялар мұнай өндіру санатынан келеді, базалық жылы шамамен 83% және 2021 жылы 32% (51% - ға төмендеу). Маңыздылығы бойынша екінші санат - мұнай өңдеу, ол базалық жылы 15% және 2021 жылы 59% құрады, яғни бұл санат эмиссиялар бойынша жетекші орынға ие болады, бұл қайта өңделетін өнім көлемінің ұлғаюымен түсіндіріледі (қайта өңдеудің өсуі екі есеге жуық өсті).

Қазақстанда газ өндіру өте шектеулі және таза газ өте аз өндіріледі, көп жағдайда күкірт қосылыстары көп мұнай ілеспе газ бар. 1990 жылы Қазақстанда 7123 млн $м^3$ табиғи газ өндірілді, ал 2021 жылы өндірудің көлемі төрт есеге жуық өскеніне қарамастан 26746,6 млн $м^3$ (73% өсім)газ өндірілді.

Жалпы эмиссиялар 1990 жылы 27099,28 мың тонна CO_2 эквивалентінен 14067,5 мың тонна CO_2 эквивалентіне дейін азайды, 2021 жылы төмендеу 48,1% құрады.

Халықаралық сарапшылар тобының ұсынымдарына сәйкес "Ұшпа шығарындылар" санаты бойынша ұлттық түгендеуді жақсарту

Бұл санат өте күрделі, өйткені ол үшін кейбір бастапқы деректер ұлттық статистикада көрсетілмейді, сондықтан кейбір деректер кәсіпорындарда сұралады. Алайда, кәсіпорындар да өз деректерін нақтылай алады, бұл Кокс газын пайдалану категорияларында болғандай мәжбүрлі қайта есептеулерге әкеледі.

Бастапқы деректердің, сондай-ақ ұсыныстардың жақсаруымен парниктік газдардың ішкі санаттардан шығарындылары алғаш рет есептелді: тастанды жерасты шахталары қатты отынның трансформациясы және басқа көздер.

Есептеулердің сапасын жақсарту және деректердегі олқылықтарды жою мақсатында ГЭР ұсынымдары бойынша 2019 жылы кіші санаттарда қайта есептеулер, мұнай барлау жүргізілді.

Барлық дерлік ішкі санаттардағы кілттер NO-дан NA-ға өзгертілді, ал ішкі санаттағы мұнай барлау IE кілті есептік деректермен ауыстырылды.

Кейбір кіші санаттар үшін мұнай және газ өндіру санаттары үшін өлшем бірліктеріне өзгерістер енгізілді, бұл ескерту Мұнай және газ өндіру және қайта өңдеу санаттарына қатысты.

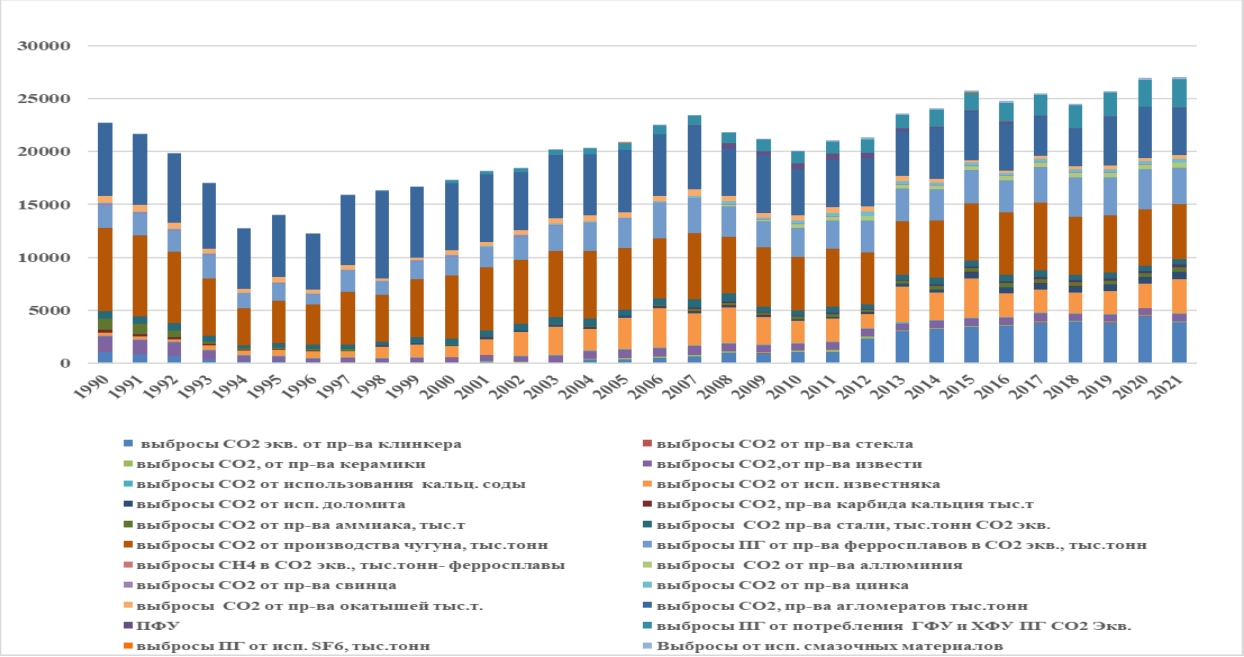
«Өнеркәсіптік процестер және өнімдерді пайдалану (ӨПӨП)» ҰТЕ 2021 CRF кестелерінің секторының қысқаша сипаттамасы

«Өнеркәсіптік процестер және өнімдерді пайдалану» (ӨПӨП) секторындағы парниктік газдар (ПГ) шығарындыларын түгендеу минералды материалдар өндірісінің шығарындыларын бағалауды қамтиды (2.A), химия өнеркәсібі (2.B), металлургия өнеркәсібі (2.C), еріткіштер мен энергетикалық емес отын өнімдерін пайдалану (2.D), электрондық өнеркәсіп (2.E), ОРВ фторланған алмастырғыштарын қолдану (2.F), басқа өнімдерді өндіру және пайдалану (2.G).

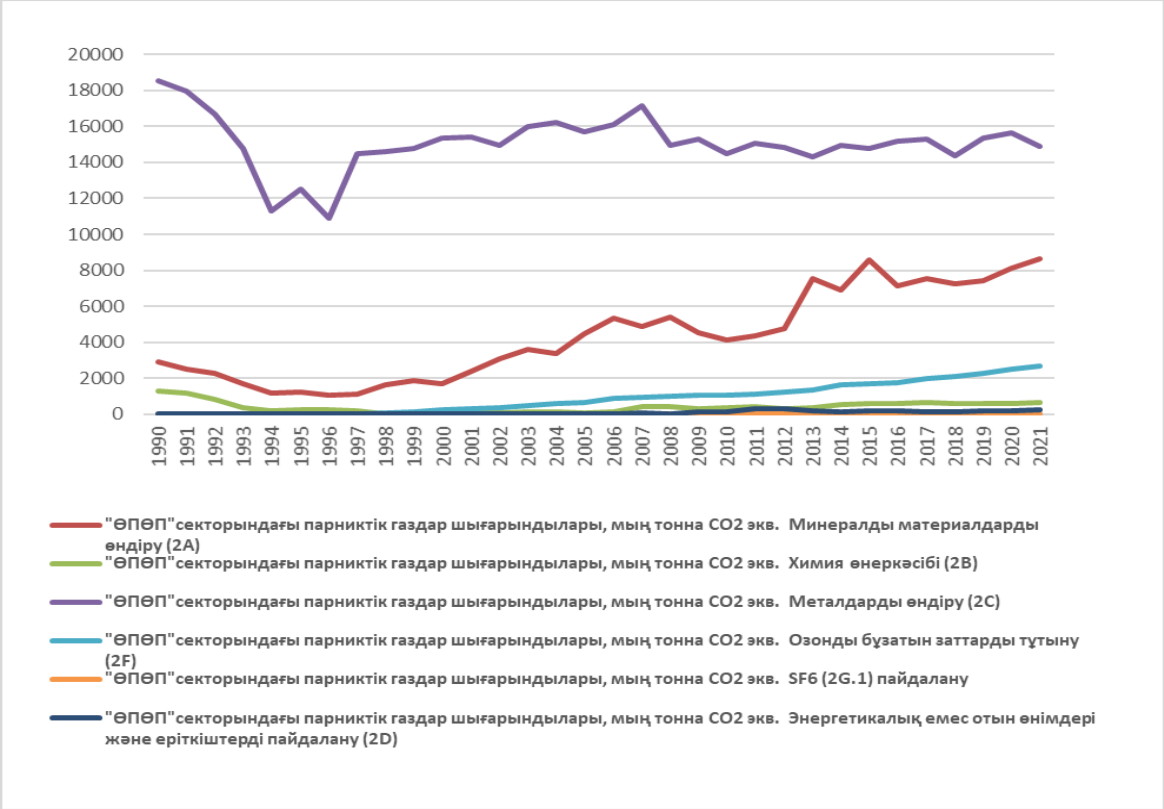
ПГ Қазақстандық түгендеу осы тізімдегі алты санатты қамтиды-бұл минералды материалдар өндірісінен шығарындыларды бағалау (2.A), химия өнеркәсібі (2.B), металлургия өнеркәсібі (2.C), еріткіштер мен энергетикалық емес отын өнімдерін пайдалану (2.D), фторланған ОБЗ алмастырғыштарын қолдану (2.F), сондай-ақ күкірт гесафторидін қолдану (2.G.1). Бұл тарауда Қазақстанда бар ПГ (CO2 және CH4) шығарындыларының барлық өнеркәсіптік көздері ұсынылған. Қазақстан Республикасында кейбір өндірістік процестер жоқ, олар 2006 ж. ӘН КӨЖҮАТ әдістемесіне сәйкес шығарындылардың елеулі көздері болып табылады. Бұл адипин қышқылы, табақ шыны өндірісі, күйе өндірісі, Магнезияның металлургиялық емес өндірісі, капролактам, глиоксал және глиоксил қышқылы өндірісі, титан диоксиді өндірісі және целлюлоза-қағаз өнеркәсібі. Қазақстанда ГФУ, ПФУ және SF_6 өндірісі де жоқ. "ӨПӨП" бөлімі осы заттарды тоңазытқыш жабдықтарында, кондиционерлерде, көбік материалдарын өндіруде және т. б. пайдаланудан ПФУ, ГФУ және SF_6 эмиссияларын бағалауды қамтиды. Республика аумағында пайдаланылатын бұл заттар негізінен еуропалық және қытайлық өндірушілерден импортталады.

НДК2021 түгендеу қорытындысы бойынша ӨПӨП секторы бойынша парниктік газдардың жиынтық эмиссиялары 2021 жылы **27144,677 тонна CO_2-экв құрады.** Бұл 2020 жылғы эмиссиялардан небәрі 0,42% - ға, ал 1990 жылғы ӨПӨП секторы бойынша ПГ шығарындыларынан 19,4% - ға артық (4.1-сурет және 4.1-кесте). 4.1-суреттің деректері «ӨПӨП» секторында парниктік газдар шығарындыларының айтарлықтай төмендеуі 90-жылдардың бірінші жартысында болғанын көрсетеді. Орташа алғанда, 1994-1998 жылдар аралығында парниктік газдар базалық жыл шығарындыларынан шамамен 60% төмен болды. Сонымен қатар, 1996 жылы осы кезеңдегі өнеркәсіптік өндірістің тоқырауына байланысты сектордағы эмиссиялар 1990 жылғы деңгейден едәуір

төмендеді. Өнеркәсіптегі эмиссиялардың өсуі 1997 жылы басталып, 2017 жылы ең жоғары деңгейге жетіп, базалық жыл деңгейінен асып түсті.



5-сурет – 1990-2021 жылдардағы «Өнеркәсіптік процестер және өнімдерді пайдалану» секторының парниктік газдар шығарындыларының динамикасы.



6-сурет – 1990-2021 жылдардағы «ӨПӨП» секторы бойынша парниктік газдардың жалпы шығарындыларына сектор санаттарының қосқан үлесі.

3-кесте – 1990-2021 жылдар кезеңіндегі «ӨПӨП» секторының ПГ шығарындыларының мәні, мың тонна CO_2 экв.

Жылдар	«ӨПӨП» секторы бойынша ПГ шығарындылары, мың тонна CO2 экв.						
	«ӨПӨП» секторы бойынша шығарындыларды ң барлығы	Минералды материалдар (2A)	Химия өнеркәсібі (2B)	Металдар өндірісі (2C)	ОБЗ тұтыну (2F)	SF6 пайдалану (2G. 1)	Энергетикалық емес отын өнімдері және еріткіштерді пайдалану (2D)
1990	22737,402	2901,759	1270,418	18562,866	0	0	2,361
1991	21713,797	2525,169	1203,377	17983,009	0	0	2,242
1992	19795,848	2246,26	845,901	16701,561	0	0	2,125
1993	16820,647	1677,112	379,113	14762,042	0,372	0	2,007
1994	12685,166	1194,904	171,004	11316,121	1,248	0	1,888
1995	13990,088	1228,076	228,279	12527,569	4,452	0	1,711
1996	12257,188	1084,965	274,901	10890,041	5,688	0	1,593
1997	15771,28	1117,233	176,902	14466,359	9,312	0	1,475
1998	16338,772	1628,561	28,655	14580,728	99,471	0	1,357
1999	16797,105	1863,478	33,322	14768,429	130,636	0	1,239
2000	17341,32	1689,17	27,558	15350,463	273,008	0	1,121
2001	18159,778	2387,277	51,461	15424,861	295,706	0	0,472
2002	18413,385	3057,763	55,938	14961,359	337,735	0	0,59
2003	20194,539	3622,944	114,651	15993,944	462,588	0	0,413
2004	20326,221	3387,695	117,172	16232,993	587,999	0,007	0,354
2005	20853,668	4458,852	54,948	15694,279	643,64	1,653	0,295
2006	22447,704	5342,589	123,47	16087,191	889,531	1,687	0,236
2007	23434,429	4853,595	416,4101	17168,484	946,838	1,695	47,406
2008	21829,098	5406,298	423,361	14962,642	1019,574	1,715	15,507
2009	21339,742	4506,297	315,286	15289,485	1068,897	1,735	158,041
2010	20224,289	4135,187	358,839	14497,696	1072,993	1,735	157,839
2011	21323,773	4345,026	442,805	15064,649	1144,648	1,749	324,893
2012	21530,106	4789,132	333,482	14814,886	1259,572	1,827	331,207
2013	23716,069	7517,013	361,497	14305,885	1328,219	1,925	201,529
2014	24141,789	6926,702	510,258	14978,253	1619,868	2,009	154,698
2015	25801,093	8579,29	572,565	14771,577	1698,535	2,013	177,112
2016	24870,976	7142,046	602,443	15167,891	1740,315	2,062	216,22
2017	25563,975	7522,897	628,417	15283,214	1968,387	2,097	158,963
2018	24535,745	7254,743	613,843	14383,748	2119,498	2,152	161,759
2019	25535,759	7419,648	569,239	15375,982	2258,361	2,319	167,211
2020	27031,372	8118,531	586,141	15623,479	2529,75	2,304	171,166
2021	27144,677	8626,526	680,221	14889,484	2706,491	2,370	239,585

Халықаралық сарапшылар тобының ұсынымдарына сәйкес «өнеркәсіптік процестер және өнімдерді пайдалану» секторы бойынша ұлттық түгендеуді жақсарту

Жыл сайынғы хдк шолу қорытындысы бойынша (2021 ж. Хдк шолу) ГЭР-нің ескертулері мен ұсынымдары бойынша "ППИП" секторы бөлімінде жақсартулар орындалды:

1) ҚР-да целлюлоза-қағаз өнеркәсібі бойынша ақпарат толықтырылды;

2) секторалдық тараулардың құрылымына өзгерістер енгізілді, атап айтқанда, 2-санаттың сипаттамасы енгізілді.E "электрондық өнеркәсіп";

3) 2-санаттағы өнімдерді пайдалану сипаттамасы енгізілген.F OPB және электр жабдықтарын алмастырғыш ретінде 2.G. 1, және 2.G. 3-өнімдерді пайдаланудан N2O шығарындылары металлургиялық процестердің шығарындылары бөлімінен бөлек бөлімдерге ауыстырылды.

4) сондай-ақ жалпы ҚДК бойынша мынадай өзгерістер енгізілді:

- ҚҚҚ 2 (I) кестесіне қызмет туралы деректер бойынша ақпарат енгізілген;

- 2B.2 "азот қышқылы өндірісі"; 2c.1B "шойын өндірісі"; 2C.1e "түйіршіктер өндірісі"; 2c.1F "агломераттар өндірісі"; 2.C. 2" ферроқорытпа өндірісі"; 2.C. 3 "алюминий өндірісі" Бүкіл уақыт қатарында қайта есептеулер жүргізілді;

- 2-санаттағы ОФО кестелеріне.D.3. "Өзгелері "" мочевина түрлендіргіштерін пайдалану "кіші санаты енгізілді,өйткені IPCC РП сәйкес, 2006 ж. осы кіші санаттағы эмиссияларды есепке алу" ППИ " секторында жүргізіледі, бірақ бұл ретте осы кіші санат бойынша Сипаттама 1-санаттағы көлік бөліміне енгізілген."Энергетика" секторы а.;

- Ұлттық баяндаманың тиісті бөлімдерінде қайта есептеулердің себептері мен нәтижелерінің толық сипаттамасы келтірілген, сондай-ақ 2020 және 2021 жылдардағы парниктік газдар түгендеуіндегі алынған өзгерістердің салыстырмалы кестелері келтірілген.

«Ауыл шаруашылығы» секторының ОФО (CRF) кестелерінің сипаттамасы

Парниктік газдарды түгендеу бойынша жүргізілген жұмыстардың нәтижесінде "ауыл шаруашылығы" секторындағы ОФО (CRF) кестелері 100% толтырылды. Толтырылған ақпарат Бастапқы ақпаратты, парниктік газдар шығарындыларының коэффициенттерін және есептеу нәтижелерін қамтиды. Сонымен қатар, кестелерде белгілі бір параметрлерді таңдаудың түсіндірмелері бар әртүрлі түсініктемелер, сондай-ақ нота кілттері бар.

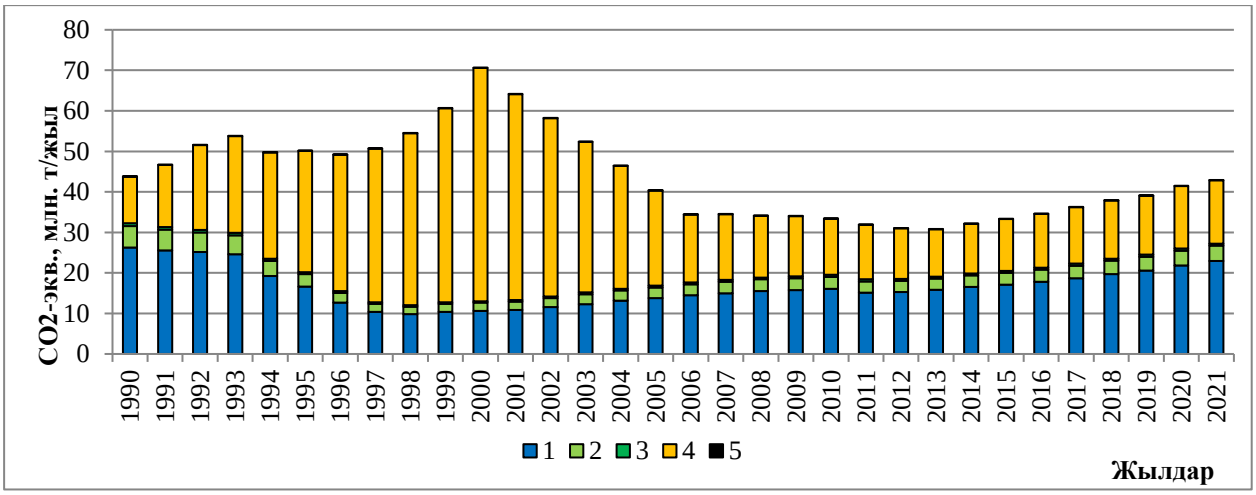
"Ауыл шаруашылығы" секторындағы парниктік газдар шығарындыларын түгендеу мынадай қызмет санаттары бойынша 1990 за 2021 жылдарға арналған парниктік газдар шығарындыларын есептеу нәтижелерін қамтиды:

- ауыл шаруашылығы жануарларының ішкі ашытуындағы метан шығарындылары (CH4) (CRF 3A санаты);
- метан (CH4) және азот оксиді (N2O) шығарындылары, көңді жинау, сақтау және пайдалану жүйелерінен (3B CRF санаты);
- күріш өсірудегі метан шығарындылары (CH4) (3C CRF санаты);
- өңделетін топырақтан азот оксиді (N2O) шығарындылары (3D CRF санаты);
- мочевинамен ұрықтандыру кезінде көмірқышқыл газының (CO2) шығарындылары (3H CRF санаты).

"Ауыл шаруашылығы" секторы Энергетика секторынан кейінгі парниктік газдар шығарындыларының екінші үлкен көзі болып табылады. Ұлттық шығарындылардан сектордағы парниктік газдар шығарындыларының үлесі 1990 жылғы 11,5% - дан 2021 жылы 12% - ға дейін өсті.

2021 жылғы сектордағы парниктік газдардың жиынтық эмиссиясы 42,845 млн. тонна CO2 экв құрады. ал 1990 жылмен салыстырғанда 1,016 млн.тоннаға (6%) азайды. 2020 жылмен салыстырғанда 2021 жылғы шығарындылар 1,426 млн.тоннаға (2%) өсті. Эмиссияның ең төменгі мәндері 2013 жылы байқалды (30,774 млн.тонна).

7-суретте және 4-кестеде IPCC жіктемесіне сәйкес қызмет санаттары бойынша "Ауыл шаруашылығы" секторынан парниктік газдар эмиссиясын есептеудің егжей-тегжейлі нәтижелері келтірілген.



1 - ішкі ашыту; 2-көңді басқару; 3-күріш өсіру; 4 - өңделетін топырақ;
5-мочевинаны қолдану.

7-сурет – «Ауыл шаруашылығы» секторындағы қызметтен парниктік газдар эмиссиясы 1990...2021 жж.

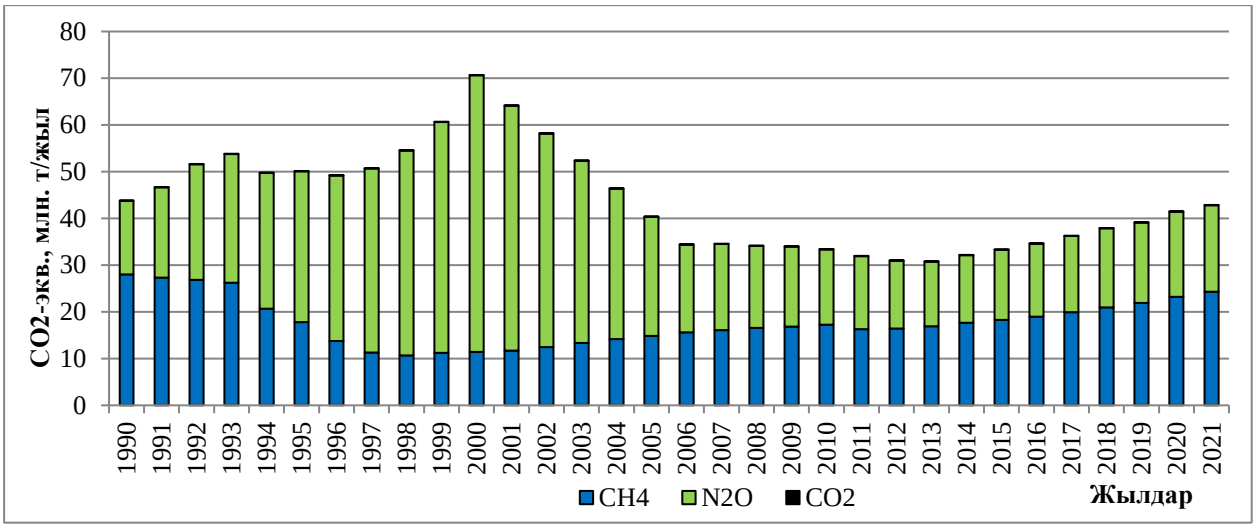
1990 жылдан 2000 жылға дейін байқалған шығарындылардың жалпы өсуі, ең алдымен, топырақтағы Органикалық заттардың минералдануы нәтижесінде азот оксиді шығарындыларының динамикасымен байланысты. Топырақтағы көміртектің күрт төмендеуі өңделген жерлерден айтарлықтай шығарындыларға әкелді, осыған байланысты 90-шы жылдары болған мал шаруашылығы шығарындыларының азаюы онша маңызды емес болып көрінеді. 2000 жылдары республикадағы экономикалық жағдайдың жақсаруына байланысты мал басы мен егіс алқаптары тұрақты өсуді көрсетеді, осының есебінен секторда ПГ жалпы эмиссиясының біркелкі өсуі байқалады.

4-кесте – «Ауыл шаруашылығы» секторындағы қызметтен 1990...2021 жылдарға парниктік газдар эмиссиясы, мың тонна CO_2 экв.

Жылдар	**Ішкі ашыту**	**Көңді басқару**	**Күріш өсіру**	**Өңделген топырақ**	**Мочевинаны қолдану**	**Барлығы**
	3A	**3B**	**3C**	**3D**	**3H**	**3**
1990	26245,50	5342,65	651,00	11514,72	104,40	43858,27
1991	25592,75	5136,43	624,75	15263,56	91,36	46708,85
1992	25167,00	4836,12	603,75	20961,32	78,31	51646,50
1993	24613,50	4694,50	567,00	23887,68	65,27	53827,95
1994	19261,00	3688,40	535,50	26262,74	52,23	49799,87
1995	16616,75	3100,22	441,50	29946,02	39,19	50143,68
1996	12717,50	2303,88	472,50	33679,96	26,14	49199,98
1997	10420,50	1921,64	435,75	37932,42	13,10	50723,41

Жылдар	Ішкі ашыту	Көңді басқару	Күріш өсіру	Өңделген топырақ	Мочевинаны қолдану	Барлығы
	3A	3B	3C	3D	3H	3
1998	9834,50	1844,31	385,25	42441,16	0,06	54505,28
1999	10416,50	1970,81	372,75	47837,94	0,17	60598,17
2000	10601,25	2045,49	378,50	57597,44	0,08	70622,76
2001	10853,25	2099,72	363,25	50791,12	0,07	64107,41
2002	11564,50	2256,20	357,00	43978,84	0,06	58156,60
2003	12325,75	2434,04	439,00	37148,68	0,06	52347,53
2004	13169,00	2517,71	423,75	30273,82	0,24	46384,52
2005	13811,75	2609,71	445,75	23446,64	0,25	40314,10
2006	14497,50	2718,64	460,00	16705,88	0,13	34382,15
2007	15005,75	2814,09	458,75	16246,96	0,15	34525,70
2008	15533,00	2877,54	396,50	15317,20	0,56	34124,80
2009	15748,25	2917,75	456,25	14852,32	0,23	33974,80
2010	16077,50	2962,53	493,50	13848,06	0,68	33382,27
2011	15146,50	2780,99	489,75	13469,60	2,47	31889,31
2012	15322,00	2738,12	488,25	12426,60	0,72	30975,69
2013	15841,25	2765,95	472,00	11690,54	0,20	30769,94
2014	16514,75	2849,95	500,25	12238,86	0,55	32104,36
2015	17085,00	2931,24	518,75	12769,30	0,27	33304,56
2016	17808,00	3016,82	495,00	13246,10	0,59	34566,51
2017	18652,00	3148,61	548,75	13877,86	1,97	36229,19
2018	19682,50	3316,21	532,75	14321,88	2,54	37855,88
2019	20545,50	3445,13	546,00	14563,26	3,11	39103,00
2020	21853,00	3612,55	537,00	15412,56	3,67	41418,78
2021	22947,50	3770,52	507,25	15615,20	3,67	42844,14

Секторда 2021 жылға арналған парниктік газдар эмиссиясының негізгі үлесі метанға (CH_4) тиесілі – 24,336 млн.тонна CO_2 экв. (57 %). Азот оксидінің (N_2O) эмиссиясы 18,504 млн.тонна CO_2 экв құрайды. (43 %), мочевинаны қолданудан CO_2 эмиссиясының көлемі шамалы (шамамен 0,01%) (8-сурет).



8-сурет – 1990…2021 жж. газ түрлері бойынша «Ауыл шаруашылығы» секторындағы қызметтен парниктік газдар эмиссиясы.

Халықаралық сарапшылар тобының ұсынымдарына сәйкес" ауыл шаруашылығы " секторы бойынша ұлттық түгендеуді жақсарту

2015-2021 жылдардағы есектер мен буйволдардың саны нақтыланды, FAO мәліметтері бойынша, бірақ бұл нақтылау азот оксидінің шығарылу мөлшеріне әсер етпеді.

Шошқалардың азот оксиді шығарындыларын есептеудегі техникалық қателік түзетілді (сұйық көңді басқару жүйелерінің коэффициенті дұрыс қолданылмады), бұл бүкіл уақыт сериясындағы шығарындылардың аздап төмендеуіне әкелді.

Тұрақты мәннің орнына қойлардың тірі салмағының мәндері бар динамикалық қатар қолданылды, нәтижесінде парниктік газдар шығарындылары уақыт қатарында айтарлықтай өзгерген жоқ. Топырақтағы Органикалық заттардың минералдануы нәтижесінде бөлінетін азот мөлшері түзетілді, бұл сектордағы парниктік газдар шығарындыларының жалпы балансының өзгеруіне, сондай-ақ шаймалау нәтижесінде жанама шығарындыларды түзетуге әкелді.

«Жерді пайдалану, жерді пайдалануды өзгерту және орман шаруашылығы» секторының ЕЖФ кестелерінің сипаттамасы

Қазақстан Республикасының міндеттемелеріне сәйкес БҰҰ ҚІНК Конвенциясы бойынша есептілік үшін ҰҚБ - 2023 ЖПЖПӨОШ бөлімінде 1990...2021 жылдардағы орман шаруашылығындағы қызметке және жер пайдаланудың басқа түрлеріне байланысты парниктік газдарды сіңіруді/ эмиссияны бағалау нәтижелері ұсынылған.

Сектор үшін парниктік газдарды сіңіру / эмиссиясын бағалау IPCC БП талаптарына сәйкес орындалды, 2006 ж., 4-Том Ауыл шаруашылығы, орман шаруашылығы және жерді пайдалану және басқару жүйелері бойынша (6 санат), пайдалану практикасындағы қайта құрулар (6 санат) бойынша жерді санаттауға қатысты басқа да жер пайдалану түрлері, олардың жіктелуі мен анықтамаларына сәйкес ұлттық деңгейде. ЕЖФ электрондық кестелерінде (CRF) 1990 за 2021 жылдардағы ЖПЖПӨОШ секторы үшін парниктік газдар түгендеу нәтижелері негізгі кестелерде келтірілген:

4. Land Use, Land –Use Change and Forestry;

4 A Forest Land; 4 B Crop land; 4 C Grassland; 4 D Wetlands;

4 E Settlements; 4 F Other Land; 4 G Harvested Wood Products.

Көміртегі қорларын және олардың жылдық өзгерістерін бағалау табиғи экожүйелер мен агроэкожүйелердің барлық құрамдас бөліктерінде, тірі биомасса, өлі органикалық заттар (өлі ағаш және орман төсеніштері) және минералды топырақты қоса алғанда, көміртектің резервуарларға қайта бөлінуін ескере отырып берілген. Сондай-ақ, кестеде жерді пайдаланудың нақты түрлерімен байланысты қызмет жүзеге асырылатын аудандар көрсетілген.

ЕЖФ (CRF) электрондық кестесінде ұсынылған ЖПЖПӨОШ секторы бойынша раниктіл газдар түгендеу нәтижелері 1990-2021 жж. жоғарыда аталған қызмет санаттары бойынша парниктік газдарды сіңіру / эмиссия ағындарын бағалау нәтижелерімен келісіледі, 6.1 - кестеде жинақталған ҰҚБ-2023. 6.1-кестеден көріп отырғанымыздай, 2021 жылғы есептеулер жерді пайдалану санаттары үшін CO2 сіңуін сақтауды растайды.орман алқаптары (FL), жайылымдар (GL), сондай-ақ елді мекендер (SL). ҚР-дағы өңделетін жерлер (CL) ПГ эмиссияларының көзі болып қала береді, бұл, сайып келгенде, уақытша қатардың барлық жылдарында дерлік ЖПЖПӨОШ секторындағы эмиссиялар ретінде ҰҚБ жалпы ағынының сақталуын анықтайды. 2021 жылға сектор үшін парниктік газдар қорытынды эмиссиялары CO2 баламасында 10821,6 мың тонна деңгейінде есептеулер бойынша алынды, бұл сектор үшін 2020 жылғы

қорытынды эмиссиялардан 2811,7 мың тонна CO2 шамасына асып түседі. Базалық жылға қатысты 2021 жылғы парниктік газдар ағындарының жиынтық шамасы 1990 жылғы абсолюттік шама бойынша 13788,6 мың тоннаға артық

ЖПЖПӨОШ секторы үшін антропогендік эмиссиялар / ПГ сіңіру басқарылатын жерлерге арналған ЕЖФ (CRF) электрондық кестесінде ұсынылған, өйткені ҚР-дағы барлық орман және ауыл шаруашылығы алқаптары, сондай-ақ "сулы-батпақты жерлер" санатындағы елді мекендер, жасанды су айдындары астындағы жерлер басқарылатындарға жатады. Басқарылмайтын жерлерге көлдер, өзендер, батпақтар және басқа жерлер кірді. Жерді пайдалану санаттары үшін орман алқаптары (FL) және өңделетін жерлер (CL) көміртегі динамикасы мен CO2 сіңіру / эмиссия көлемінің 2023 жылғы ҰҚБ есептеулері 1990-2021 жылдары аймақтық деңгейде орындалды. Әкімшілік аймақтар деңгейінде алынған нәтижелер ұлттық деңгейдегі ЕЖФ (CRF) электрондық кестелері үшін жинақталды.

5-кесте ҚР-да орман шаруашылығы және жер пайдаланудың басқа да түрлері үшін есептелген CO2 және парниктік газдардың басқа да түрлерінің таза сіңуінің (-) / эмиссиясының (+) жылдық шамалары 1990 за 2021 жж.

Жыл	Үшін сіңіру / эмиссия жиыны орман өрттерінен АИ эмис-ін ескере отырып, жизлх секторы, экв, CO2-де жылына мың, тонна	Лесные площади и древесно-кустарниковые насаждения, с учетом эмиссии от пожаров, тыс, тонн /год в экв, CO2	Өңделетін жерлер, соның ішінде севобо ротадағы егістік алқапқа, жайылымға және көпжылдық е екпелеріне, CO2 мың, тон / жыл	Дала өртінен эмиссияны ескере отырып, жайылымдар мен шабындықтар жылына экв, CO2	Су айналатын жерлер (біз жасанды су), CO2 мың,тонна /жыл
1990	-2967,0	-5533	5201,9	-2635,9	4,25
1991	5,0	-8299	13575,83	-5271,8	1,47
1992	2976,3	-11065	21949,03	-7907,8	0,00
1993	5947,6	-13831	30322,23	-10543,7	1,10
1994	17673,8	-7842	38695,43	-13179,6	0,00
1995	31348,1	95	47068,63	-15815,5	0,00
1996	45023,4	8033	55441,83	-18451,4	0,00
1997	56749,7	14022	63815,03	-21087,3	0,00
1998	64581,0	16116	72188,23	-23723,3	0,00
1999	64011,2	9809	80561,43	-26359,2	0,00
2000	63443,4	3502	88936,47	-28995,1	0,00
2001	70990,8	-2804	102719,1	-28924,3	0,00
2002	69518,0	-9111	107482,5	-28853,5	0,00
2003	68045,5	-15418	112246,2	-28782,7	0,00
2004	73180,8	-15117	117009,6	-28711,8	0,00
2005	74010,8	-14816	121773,3	-32946,5	0,00
2006	74810,5	-14515	126506,6	-37181,1	0,00
2007	73729,6	-14214	129359,3	-41415,7	0,00
2008	59847,8	-13913	119411,2	-45650,4	0,00

2009	43494,2	-16084	109463,2	-49885,0	0,00
2010	27140,2	-18255	99514,8	-54119,6	342,80
2011	23505,8	-20425	89566,77	-45635,9	107,47
2012	19870,5	-22596	79618,73	-37152,3	29,19
2013	-942,1	-24767	52493,47	-28668,6	0,00
2014	9296,6	-22202	51683,5	-20184,9	0,00
2015	20536,4	-19638	51875,63	-11701,2	106.37
2016	22040,9	-17073	52067,77	-12953,8	0,18
2017	23545,1	-14508	52259,53	-14206,4	14,89
2018	25048,7	-11944	52451,67	-15459,0	0,00
2019	18934,8	-16997	52643,43	-16711,6	0,00
2020	14433,1	-19724	52121,3	-17964,2	0,00
2021	10821,6	-22850	52888,37	-19216,8	0,00

Халықаралық сарапшылар тобының ұсынымдарына сәйкес «ЖПЖПӨОШ» секторы бойынша ұлттық түгендеуді жақсарту

Ревю-2020 шеңберінде 2022 жылғы қыркүйек –қазан айларында БҰҰ ҚІНК Хатшылығының халықаралық тобының сарапшылары ҚР-ға парниктік газдарды түгендеудің ұлттық жүйесін, оның ішінде ЖПЖПӨОШ секторын одан әрі дамытуға, атап айтқанда, антропогендік қызметтің негізгі санаттары үшін өңірлік деңгейде есеп айырысуды қамтамасыз етуге бағытталған қызметті жалғастыруды ұсынды.

БҰҰ ҚІНК Конвенциясы бойынша есептілікке қатысты алынған ұсынымдарға сәйкес, ҰҚБ-2023 шеңберінде, ЖПЖПӨОШ секторы жер пайдалану санаттары үшін облыстық деңгейде есептеулерін біріктіру бойынша әдістемелік жұмыстар жалғастырылды.орман алқаптары мен өңделетін жерлер ұлттық көміртегі эталондарының мұрағатын кеңейтумен, қызмет коэффициенттерін нақтылаумен, ведомстволық мұрағаттардан келісілген ақпарат алумен. 1990-2021жж. облыстық деңгейде есептелген (барлығы 14 облыс) көміртегі қорларының және қызмет санаттары үшін сіңіру /эмиссия көлемдерінің жылдық өзгерістері орман алқаптары және өңделетін

Қалдықтар секторының ЕЖФ (CRF) кестелерінің сипаттамасы

Қазақстанда жыл сайын 5-6 млн. тонна қатты тұрмыстық қалдықтар түзіледі. Алдағы жылдары азық-түлік және азық-түлік емес тауарлар номенклатурасын, олар үшін қаптаманың ассортименті мен түрлерін ұлғайту, халықтың өмір сүру деңгейінің өсуі есебінен ҚТҚ түзілу көлемінің ұлғаюын күту керек.

2021 жылы Қазақстан Республикасында 4,2 млн. тонна ҚТҚ (Қазақстан Республикасыэкология, геология және табиғи ресурстар министрлігінің деректері бойынша) құрылды, оның 3,2 млн. тоннасы қалдықтарды жинау және тасымалдау бойынша мамандандырылған кәсіпорындар мен жеке кәсіпкерлер жинаған коммуналдық қалдықтарды құрады, олардың саны 676 бірлікті құрады. Негізгі үлесі үй шаруашылықтарының қалдықтарына тиесілі (65,6%), 20,2% өндіріс қалдықтары (тұрмыстық қалдықтарға тең), 10,5% - көше қоқыстары, 2,2% - нарық қалдықтары. 2021 жылы ресми жұмыс істейтін полигондарға (полигондарға), коммуналдық қалдықтарды сұрыптау және қайта өңдеу объектілеріне 3,9 млн. тонна қалдық түсті. Оның 65,9% одан әрі депозитке түссе, 30,4% сұрыпталды.

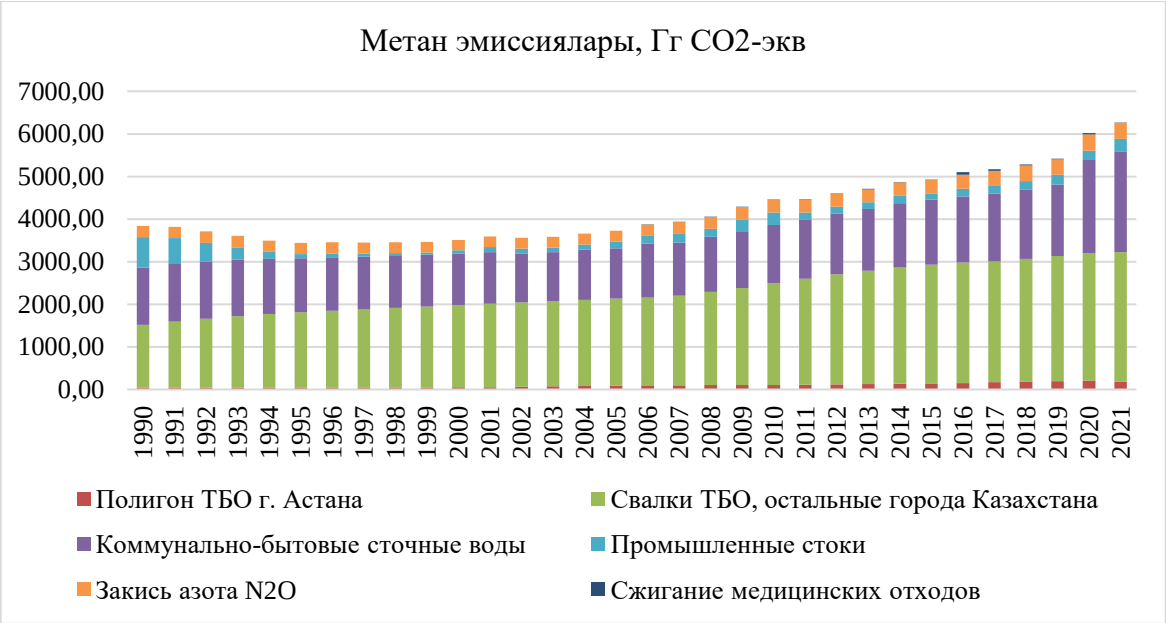
2021 жылдың соңында ресми жұмыс істейтін полигондарда (полигондарда) 47,5 млн. тоннадан астам қалдықтар жиналды.

"Қалдықтар" секторында парниктік газдар эмиссиялары қатты тұрмыстық қалдықтарды (ТҚҚ) қоқыс үйінділерінде көмуден, сарқынды суларды (коммуналдық-тұрмыстық және өнеркәсіптік) өңдеуден, адам өмірінің өнімдерінен, медициналық қалдықтарды жағудан түзіледі. 2021 жылы қайта есептеу нәтижесінде сектордағы парниктік газдардың жалпы эмиссиялары 6260,82Гг CO2-экв құрады. Алдыңғы 2020 жылмен салыстырғанда шығарындылар көлемі 3,9% – ға ұлғайды. Жалпы көлемдегі шығарындылардың негізгі үлесі Қазақстан бойынша қатты қалдықтардың басқарылмайтын полигондарына және коммуналдық-тұрмыстық сарқынды суларды ағызуға тиесілі. 1990 жылы эмиссиялар көлемі 3839,09 Гг CO2-экв құрады. 1990 жылдан 2021 жылға дейінгі барлық кезеңде сектордағы эмиссиялардың өсуі ҚТҚ түзілуінің және халық санының өсуіне байланысты 1,6 есе өсті.

6-кесте – «Қалдықтар» секторындағы парниктік газдардың 1990-2021 жылдарға эмиссиясы, мың тонна CO_2 – баламасы.

Жылдар	Нұр-сұлтан қ. ТБО полигоны	ТБО полигондары, Қазақстанның қалған қалалары	Коммуналдық-тұрмыстық ағынды сулар	Өнеркәсіптік ағынды сулар	N2O Азот оксиді	Медициналық қалдықтарды жағу	«Қалдықтар» секторының жалпы эмиссиялары
1990	45,19	1470,23	1344,17	715,00	264,50	0,00	3839,09
1991	44,46	1547,53	1350,89	611,96	266,01	0,00	3820,85
1992	43,74	1616,17	1346,09	437,79	271,78	0,00	3715,57
1993	43,26	1676,45	1331,01	284,13	270,27	0,00	3605,12
1994	42,93	1728,59	1296,30	165,38	264,01	0,00	3497,22
1995	42,79	1766,94	1273,63	97,26	262,35	0,00	3442,96
1996	42,75	1803,71	1258,57	88,78	261,96	0,00	3455,76
1997	42,78	1838,59	1236,40	73,32	257,01	0,00	3448,10
1998	42,94	1871,75	1220,11	67,80	250,29	0,00	3452,90
1999	45,01	1902,22	1216,52	52,08	246,55	0,00	3462,38
2000	48,98	1930,15	1215,71	70,12	245,96	0,00	3510,91
2001	55,44	1955,33	1215,94	119,75	245,72	0,00	3592,18
2002	63,84	1978,54	1145,20	121,81	248,81	0,00	3558,19
2003	71,68	2001,02	1152,23	102,92	253,00	0,00	3580,84
2004	79,04	2022,86	1178,62	125,26	255,09	0,00	3660,87
2005	86,45	2043,75	1180,06	159,10	260,43	0,00	3729,80
2006	94,12	2063,61	1270,98	175,47	269,26	0,005	3873,45
2007	100,25	2099,19	1251,71	203,17	275,20	0,7272	3930,25
2008	102,67	2187,90	1292,37	185,58	282,47	1,0752	4052,07
2009	104,82	2276,28	1318,88	291,39	292,46	9,6623	4293,48
2010	106,93	2388,73	1365,90	292,96	299,88	10,3689	4464,77
2011	111,14	2485,78	1394,18	167,48	304,14	8,2268	4470,94
2012	116,91	2588,01	1422,08	164,70	308,45	7,5744	4607,72
2013	124,20	2663,70	1450,28	159,79	300,55	9,3527	5556,71
2014	132,51	2732,75	1511,10	167,01	314,89	9,0884	4867,34
2015	142,28	2788,94	1525,73	143,95	324,03	7,8629	4932,80
2016	153,19	2828,95	1551,43	180,43	327,66	60,4491	5102,11
2017	170,40	2838,28	1586,52	202,00	336,71	33,366	5167,29
2018	184,01	2881,87	1632,26	194,34	364,82	25,9617	5283,26
2019	196,40	2938,44	1673,89	230,84	366,62	12,1909	5418,38
2020	210,93	2989,22	2185,37	219,74	381,22	30,9708	6017,44
2021	189,26	3037,72	2365,05	290,93	377,74	0,1224	6260,82

1990-2021 жылдардағы «Қалдықтар» секторынан парниктік газдар эмиссиясының жалпы динамикасы 13-суретте көрсетілген



9-сурет – Қазақстандағы 1990-2021 жылдардағы «Қалдықтар» секторынан парниктік газдар эмиссиясының жалпы динамикасы.

Халықаралық сарапшылар тобының ұсынымдарына сәйкес «Қалдықтар» секторы бойынша ұлттық түгендеуді жақсарту

Барлық сектор бойынша эмиссияларды қайта есептеу жүргізілді, осыған байланысты есеп айырысу нәтижелерінде елеулі өзгерістер болды.

Қатты қалдықтарды жою 5.А-санатында барлық полигондар екі санатқа бөлінді:

- Астана қаласының 5.А1 басқарылатын полигоны
- Еліміздің қалған өңірлерінің 5.А2 басқарылмайтын полигондары

5.D.2 санатында өнеркәсіптік ағынды сулар есептеулер алынып тасталды азот және фосфор тыңайтқыштарын өндіру, өйткені бұл заттар «Органикалық химиялық заттар» санатына кірмейді (тыңайтқыштар минералды). Осы түзетуге байланысты эмиссиялар шығарындылары айтарлықтай төмендеді.

Сонымен қатар, ГЭР ұсынымдарына сәйкес қазіргі уақытта өнеркәсіптік қалдықтарды кәдеге жарату жүйесі, полигондарда жиналатын ҚТҚ құрамы, метанды қалпына келтіру және қалдықтарды компосттау жөніндегі деректер нақтылануда. Жүргізіліп жатқан жұмыстың нәтижелері болашақ түгендеу үшін неғұрлым жоғары әдісті қолдануға бағытталатын болады.

ЕСЕПКЕ ҚОСЫМША

БҰҰ КӨНК Хатшылығының халықаралық сарапшылар тобының ұсынымдарын ескере отырып, RTF және SEF пішіндегі есептік электрондық кестелер

МИНИСТЕРСТВО ЭКОЛОГИИ И ПРИРОДНЫХ РЕСУРСОВ РЕСПУБЛИКИ КАЗАХСТАН

Акционерное общество «Жасыл даму»

Отчет
по подготовке отчетных электронных таблиц в форматах CRF и SEF с учетом рекомендаций международной группы экспертов Секретариата РКИК ООН

г. Астана, 2023 год

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Введение

Одним из основных обязательств РК по РКИК ООН и Киотскому протоколу является ежегодное предоставление в Секретариат РКИК ООН Национального отчета по инвентаризации парниковых газов, состоящих из Национального доклада о кадастре антропогенных выбросов из источников и абсорбции поглотителями парниковых газов, не регулируемых Монреальским протоколом и отчетных таблиц Общего формата отчетности (ОФО).

После ратификации Киотского протокола в 2009 г. Казахстан начал представлять Национальные отчеты по инвентаризации парниковых газов в Секретариат РКИК ООН в форме Национальных докладов о кадастре и электронных Таблиц ОФО (Common Reporting Format – CRF). Это одно из основных обязательств РК по РКИК ООН. Согласно международным требованиям РКИК ООН, инвентаризация парниковых газов проводится со сдвигом на два года назад (статистические данные даются по прошлому году, сбор данных и обработка занимают год). Все НДК и электронные таблицы ОФО размещены на веб-сайте Секретариата РКИК ООН (www.unfccc.int).

Таблицы ОФО разработаны в едином формате для всех стран, представляющих Национальный отчет по инвентаризации парниковых газов, по 5 секторам экономики: Энергетика, Промышленные процессы и использование продуктов, Сельское хозяйство, Лесное хозяйство и другие виды землепользования, Отходы. Таблицы ОФО включают выбросы шести основных газов с прямым парниковым эффектом (диоксид углерода (CO2), метан (CH4), закись азота (N2O), гидрофторуглероды (ГФУ), перфторуглероды (ПФУ) и гексафторид серы (SF6)). Также для некоторых категорий источников проводится оценка эмиссий четырех ПГ с косвенным парниковых эффектом – окиси углерода (CO), окислов азота (NOx) и неметановых летучих органических соединений (НМЛОС) и диоксида серы (SO2).

Расчеты выбросов и поглощений выбросов парниковых газов осуществляются на основе методологии Межправительственной группы экспертов по изменению климата (МГЭИК), принятой и согласованной Конференцией Сторон РКИК ООН (далее – КС) и изложенной в Руководящих принципах (РП МГЭИК) по подготовке Национальных отчетов по инвентаризации парниковых газов для стран Приложения 1 к РКИК ООН.

С 2015 г., согласно решению КС19, все страны Приложения 1, включая Казахстан, осуществляют расчеты по парниковым газам в соответствии с новыми Руководящими принципами инвентаризации парниковых газов (РП МГЭИК 2006 г.). До этого времени использовались РП МГЭИК 1996 г. Так же с 2015 г. отчетные электронные таблицы ОФО (Common Reporting Format) предоставляются в соответствии с новым программным обеспечением (CRF Reporter).

Таблицы ОФО за период 1990-2021 гг. разработаны в соответствии с Решением 24/CP.19 (FCCC/CP/2013/10/Add.3) о пересмотре руководящих принципов РКИКООН для представления докладов о годовых кадастрах для Сторон, включенных в приложение I Киотского протокола. Таблицы общего формата отчетности подготовлены в соответствии с Приложением II, а значения потенциала глобального потепления взяты из Приложения III данного решения.

По результатам последнего обзора НДК за 1990-2017 гг., проведенного ГЭР Секретариатом РКИК ООН в сентябре 2019 г., по Национальному отчету по инвентаризации парниковых газов были представлены рекомендации международных экспертов.

Данный отчет подготовлен в соответствии с Технической спецификацией к Договору о государственных закупках услуг № 13 от 13 марта 2023 года и включает описание к таблицам ОФО в форматах CRF с учетом рекомендаций международной группы экспертов Секретариата РКИК ООН по каждому сектору. В приложении к отчету представлены Таблицы общего формата отчетности (CRF).

Описание таблиц ОФО (CRF) сектора «Энергетика»

Выбросы парниковых газов в секторе «Энергетика» по секторному подходу за 1990…2021 гг.

Общий объем потребления топлива в секторе «Энергетика» по базовому подходу в 2021 г. составил **2814,08 ПДж.** По сравнению с уровнем выбросов парниковых газов за 1990 г. объем потребления топлива снизился на 13,8%, с уровнем 2020 г. на 4,3% (таблица 1).

Выбросы парниковых газов по базовому подходу за 2020 г. в секторе «Энергетика» составили **229,078 млн. тонн CO_2**, что меньше уровня 1990 г. на 14,29% и больше уровня 2020 г. на 0,4%.

Значительное изменения наблюдаются в потреблении жидкого топлива, а именно в снижении фактического потребления сырой нефти, с **396,526 ПДж** до **129,065 ПДж** по причине снижение количества производимой сырой нефти. Выбросы парниковых газов от жидкого топлива в 2021 г. составили **50,337 млн. тонн CO_2 экв**. Данный показатель меньше уровня 1990 г. на 21,86% и больше уровня 2021 г. на 45,64%. Незначительное снижение выбросов наблюдается в потреблении твердого топлива: с **1697,045 ПДж** до **1483,45 ПДж.** Снижение выбросов парниковых газов от потребления твердого топлива в 2021 г. происходит из-за увеличения экспорта энергетического и каменного угля, что в свою очередь повлияло на фактическое потребления твердого топлива.

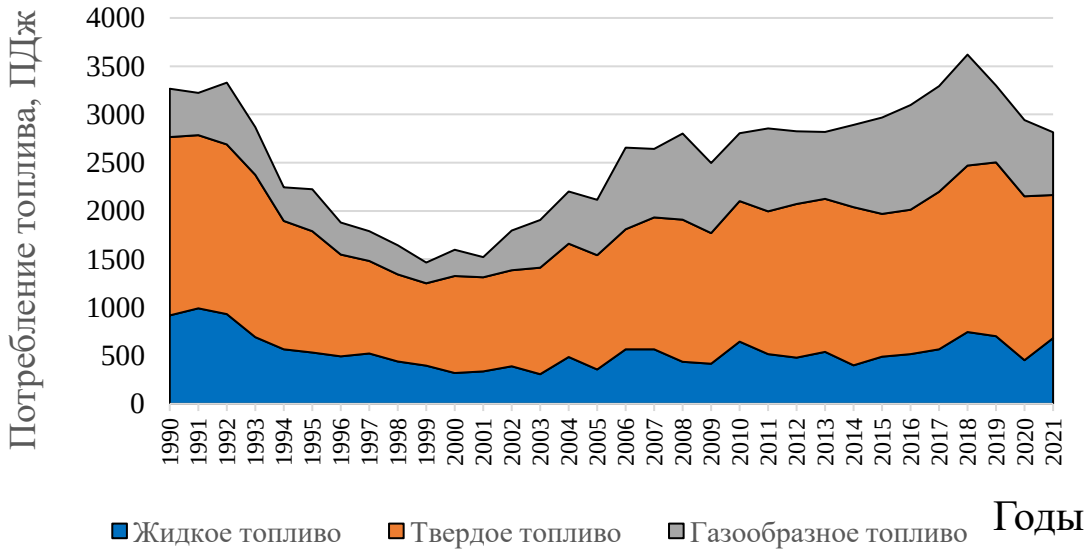


Рисунок 1- Динамика выбросов CO_2 за 1990…2020 гг. в секторе «Энергетика» по базовому подходу за 1990…2021 гг., ПДж

Как и в случае с выбросами парниковых газов за 2021 г., сокращение выбросов от потребления жидкого топлива также связано со снижением потребления автомобильного бензина и дизельного топлива. В случае с

автомобильным бензином значительное изменение связано с возросшим экспортом, что напрямую повлияло на фактическое потребления данного вида топлива исходя из применяемой формулы для расчета выбросов парниковых газов.

Таблица 1 – Динамика потребления топлива и выбросов CO_2 в секторе «Энергетика» по базовому подходу за 1990…2021 гг.

Год	**Всего,**	**По видам топлива, ПДж**			**Всего CO_2,**	**Выбросы CO_2 по видам топлива, млн тонн**		
	ПДж	**Жидкое топливо**	**Твердое топливо**	**Газообразное топливо**	**млн тонн**	**Жидкое топливо**	**Твердое топливо**	**Газообразное топливо**
1990	**3265,13**	917,51	1847,9	499,72	**267,277**	64,423	175,081	27,773
1991	**3221,67**	990,65	1794,12	436,91	**266,025**	68,145	173,369	24,511
1992	**3329,64**	930,01	1758,81	640,81	**270,932**	65,05	169,933	35,95
1993	**2869,02**	693,35	1679,11	496,55	**238,709**	48,36	162,492	27,857
1994	**2245,91**	565,12	1332,22	348,57	**188,39**	40,415	128,42	19,555
1995	**2223,7**	531,6	1258,26	433,84	**184,015**	38,319	121,358	24,339
1996	**1879,2**	492,21	1056,1	330,88	**155,822**	35,385	101,875	18,562
1997	**1788,58**	523,86	956,93	307,78	**147,364**	37,858	92,239	17,267
1998	**1643,65**	439,84	901,44	302,37	**135,527**	31,692	86,872	16,963
1999	**1464,34**	395,2	855,14	214	**121,235**	28,375	81,043	11,816
2000	**1596,97**	321,48	1003,17	272,31	**131,583**	22,767	93,632	15,184
2001	**1521,5**	337,27	973,46	210,77	**127,13**	23,919	91,565	11,646
2002	**1796,33**	388,91	997,72	409,69	**144,41**	27,638	94,063	22,709
2003	**1906,84**	308,43	1103,59	494,82	**152,182**	21,634	103,823	26,725
2004	**2200,9**	486,3	1174,44	540,17	**173,974**	34,623	111,637	27,714
2005	**2113,6**	356,87	1184,81	571,92	**166,473**	24,975	111,465	30,034
2006	**2656**	565,24	1245,09	845,66	**202,264**	40,155	117,02	45,088
2007	**2642,12**	565,34	1366,15	710,63	**205,068**	39,772	127,548	37,747
2008	**2803,11**	434,77	1473,57	894,77	**215,264**	29,368	136,607	49,289
2009	**2496,62**	416,51	1353,73	726,38	**193,253**	27,84	126,897	38,517
2010	**2805,89**	646,01	1455,72	704,16	**220,183**	45,854	136,168	38,161
2011	**2853,72**	514,69	1482,65	856,38	**222,537**	36,239	139,323	46,976
2012	**2824,06**	480,58	1591,87	751,61	**223,81**	34,002	149,534	40,275
2013	**2820,1**	539,99	1584,41	695,7	**223,868**	37,994	148,59	37,284
2014	**2890,15**	398,34	1639,92	851,89	**227,692**	27,746	153,2	46,746
2015	**2968,29**	489,3	1479,41	999,58	**223,257**	30,433	137,789	55,036
2016	**3096,8**	515,07	1495,96	1085,77	**231,316**	32,192	139,664	59,461
2017	**3293,33**	565,52	1633,94	1093,87	**247,506**	35,29	152,267	59,948
2018	**3619,97**	744,21	1727,13	1148,63	**272,339**	48,028	161,174	63,136
2019	**3298,27**	701,1	1803,66	793,51	**257,555**	45,55	168,577	43,427

2020	**2941,5**	454,2	1697,04	790,25	**228,055**	27,363	158,155	42,536
2021	**2814,08**	682,55	1483,45	648,08	**229,078**	50,337	142,842	35,899

Выбросы парниковых газов в секторе «Энергетика» по секторному подходу за 1990…2021 гг.

В соответствии с Руководством МГЭИК 2006 г. оценка выбросов парниковых газов сектора «Энергетика» по секторному подходу (CO_2, CH_4, N_2O, NOx, CO, NMVOC и SO_2) выполнялась по следующим категориям экономической деятельности**: 1.A.1 ОФО Энергетическая промышленность, 1.A.2 ОФО Обрабатывающая промышленность и строительство, 1.A.2 ОФО Транспорт, 1.A.4 ОФО Другие сектора, 1.A.5 ОФО Прочие источники.**

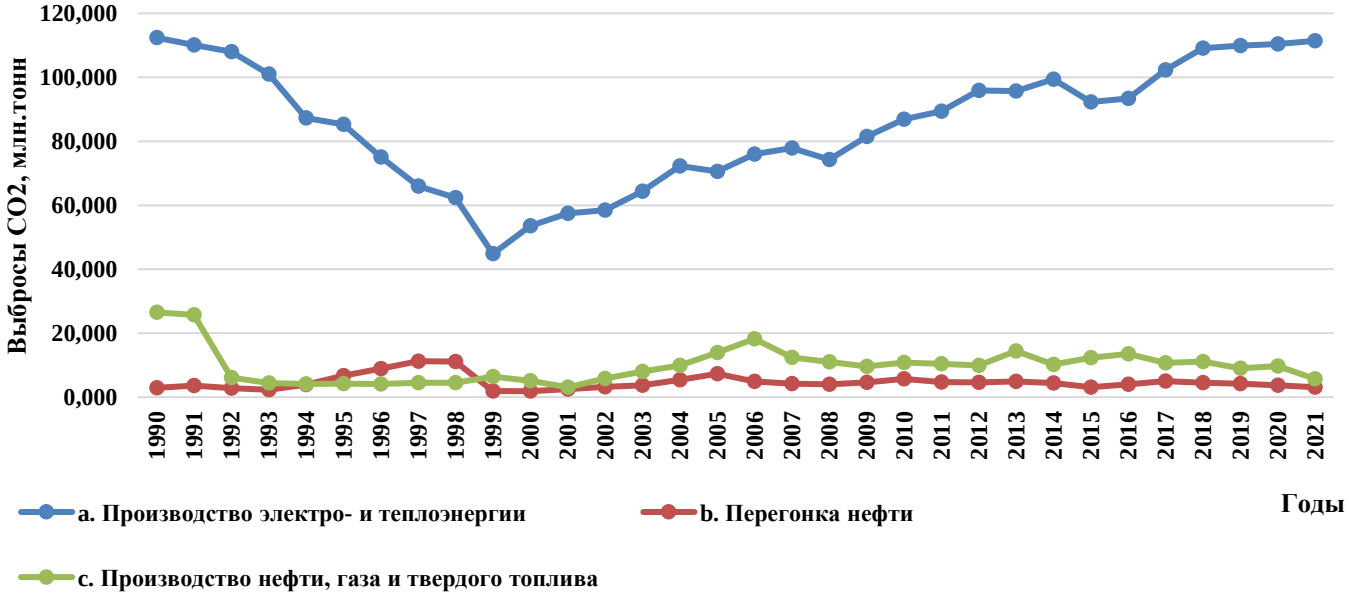


Рисунок 2 – Выбросы CO2 в категории «Энергетическая промышленность» за 1990…2021 гг. по основным источникам (секторный подход, млн. тонн).

Основным источником выбросов парниковых газов в секторе «Энергетика» является категория **«Энергетическая промышленность»**: общее потребление топлива в 2020 г. в данной категории составило **1375,88 ПДж**, что относительно 1990 г. меньше на 17,07%, относительно 2020 г. – больше на 6,11% (таблица 1). Общие выбросы парниковых газов в 2020 г. в категории «Энергетическая промышленность» составили **120,699 млн. тонн CO_2 –экв**. (Рисунок 3), что на 15,22% меньше уровня 1990 г. и на 2,9% меньше уровня 2019 г.

Категория **«1.A.2 ОФО Обрабатывающая промышленность и строительство»** включает в себя выбросы парниковых газов от сжигания топлива в отраслях промышленности, действующих на территории Республики Казахстан. К данной категории относятся: **«1.A.2a Черная металлургия», 1.A.2b «Цветная**

металлургия», «1.A.2c Химическая промышленность», «1.A.2d Целлюлозно-бумажная промышленность», «1.A.2e Пищевая промышленность» и «1.A.2f Производство неметаллических минеральных продуктов», «1.A.2g Все другие отрасли промышленности». Основное потребляемое топливо данной категории – твёрдое топливо, 39,4% от общего количества потреблённого топлива за 2021 г. Общее потребление топлива в данной категории за 2021 г. составило **495,848 ПДж**, что больше уровня за 1990 г. на 52,81% и уровня за 2020 г. на 35,68%. Выбросы парниковых газов в категории «Обрабатывающая промышленность и строительство» в 2021 г. составили **41,133 млн. тонн CO_2** -экв. (Таблица 1). Данный показатель выбросов парниковых газов выше относительно уровня выбросов, рассчитанного за 1990 г. на 54,14% и на 35,99%. относительно уровня 2019 г.

В категорию **«1.A.4 ОФО Другие»** включает подкатегории: **1.A.4a «Коммерческий/институциональный сектор», 1.A.4b «Жилой сектор» и 1.A.4c «Сельское/Лесное/Рыбное хозяйство»**. Суммарные выбросы прямых парниковых газов в категории «Другие сектора» за 2021 г. на 0,9% меньше уровня выбросов рассчитанного для 1990 г., и на 27,2% больше уровня выбросов парниковых газов в 2021 г. Общее количество выбросов парниковых газов в данной категории составили **40,574 млн. тонн** CO_2**-экв**. (Таблица 2). Большую часть выбросов парниковых газов производят два вида топлива – твердое (45,71%) и газообразное топливо (36,33%). Основной источник выбросов в категории «Другие сектора» - 1.A.4b «Жилой сектор». Общее потребление топлива в данной категории за 2021 г. составило **327,104 ПДж**, или 77,87% от общего количество потребленного топлива в данной подкатегории.

Суммарные выбросы прямых парниковых газов в категории **«1.A.5 ОФО Прочие источники»** в 2021 г. составили **18,956 млн. тонн** CO_2**–экв**. (Таблица 2) что почти в 2,1 раз больше уровня выбросов за 1990 г. и на 22,89% меньше уровня 2020 г. Общее потребление топлива в подкатегории «Прочие источники» за 2021 г. составило **258,111 ПДж**, большая часть из которого приходиться на твердое топливо (59,58%).

Таблица 2 – Динамика потребления топлива и выбросов CO_2 в секторе «Энергетика» по секторному подходу за 1990…2020 гг.

Год	**Всего,**		**Энергетическая промышленность**		**Обрабатывающая промышленность и строительство**		**Другие сектора**		**Прочие источники**	
	ПДж	**Млн тонн CO2–экв.**	ПДж	Млн тонн CO2–экв.	ПДж	Млн тонн CO2–экв.	ПДж	Млн тонн CO2–экв.	ПДж	Млн тонн CO2–экв.
1990	**2874,626**	**242,098**	1659,194	142,369	233,967	18,862	562,194	49,386	114,192	8,934
2020	**2715,457**	**224,694**	1465,566	124,318	320,268	26,631	405,220	32,430	255,333	22,279
2021	**3050,232**	**246,528**	1375,876	120,699	495,848	41,133	556,691	40,574	258,111	18,956

Улучшения национальной инвентаризации по сектору «Энергетика» согласно рекомендациям международной группы экспертов

Согласно предоставленным докуметам по проведенным анализам Национального доклада Республики Казахстан о кадастре антропогенных выбросов из источников и абсорбции поглотителями парниковых газов, не регулируемых Монреальским протоколом, за 1990-2019 гг. международной группой экспертов замечания для сектора «Энергетика» можно разделить на три основные категори: замачания касательно правильного использования ключей обозначений («NO», «NE» и «IE») в таблица общего формата CRF, замечания касательно потребления коксующегося угля (замечания по категории «1.A.5 ОФО Прочие источники») и перерасчет выбросов ПГ за 1990-1998 гг.

В текущем Национальном докладе расчета антропогенных выбросов парниковых газов будет произведен анализ и пересмотр всех ключей обозначении, в правильности использования которых были изложены сомнения группой международных экспертов изменения климата.

Данные по использованию коксующегося угля были пересмотрены и пересчитаны на основе данных, предоставленных предприятиям АО «АрселорМиталл Темиртау». Данное предприятия выступает в качестве единственно крупного потребителя коксующегося угля для нужд черной металлургии. Опираясь на данный факт, было принято решение о пересчете ряда данных за 2014-2019 гг. основываясь на данных о потреблении коксующегося угля АО «АрселорМиталл Темиртау» для последующего преобразования в кокс.

Произвести пересчет данных за период 1990–1998 гг. не удалось ввиду отсутствия достоверных статистических данных по потреблению топлива. Бюро национальной статистики МНЭ РК был предоставлен документ: Топливно-энергетический баланс за 1990 год, но в данном документе не предоставлены полные статистические данные по потреблению топлива на территории Республики Казахстан, требуемых для проведения расчетов по национальной инвентаризации парниковых газов в секторе «Энергетика». Принимая во внимание данный факт, проведения пересчета выбросов ПГ за 1990 год не отвечает Руководящим принципам МГЭИК 2006г.

Описание таблиц ОФО (CRF) категории «Транспорт»

Категория «Транспорт»

Доля транспорта в ВВП страны в 2021 гг. составляла около 5,9 %. Каждый вид транспорта имеет свою сферу выгодного применения в зависимости от территориальных, климатических условий и особенностей перевозимых грузов, а также дальности осуществляемой перевозки. По данным Бюро национальной статистики АСПИР РК объемы транспортных перевозок в стране в последние годы устойчиво росли[1], не смотря сохраняющиеся меры ограничений из-за на пандемии COVID19, такая тенденция сохранилась для грузов, однако пассажирские перевозки несколько ограничены. Большие сокращения коснулись авиационного (международных сообщений), железнодорожного (международных и частично внутренних сообщений), морского транспорта (пассажирские перевозки на Каспийском море), частные автомобильные перевозки (международный транзит).

За 30 лет с 1990 г. структура данной подкатегории существенно изменилась. Так доля вклада железнодорожного транспорта уменьшилась с 23 % до 4 %, водного транспорта уменьшилась с 0,9 % до 0,7%, трубопроводного транспорта - увеличилась с 2% до 7 %. Авиация, несмотря на небольшую ежегодную динамику роста, занимает почти стабильно долю в 4%, за исключением последних двух лет.

Общие эмиссии парниковых газов в 2021 г. составил 25166,48 тон CO_2 экв. Наибольшие эмиссии произвел дорожный транспорт 20,81 CO_2.

Более детальные данные по эмиссиям для каждой из категорий отражены на рисунке 3.

1 https://stat.gov.kz/official/dynamic

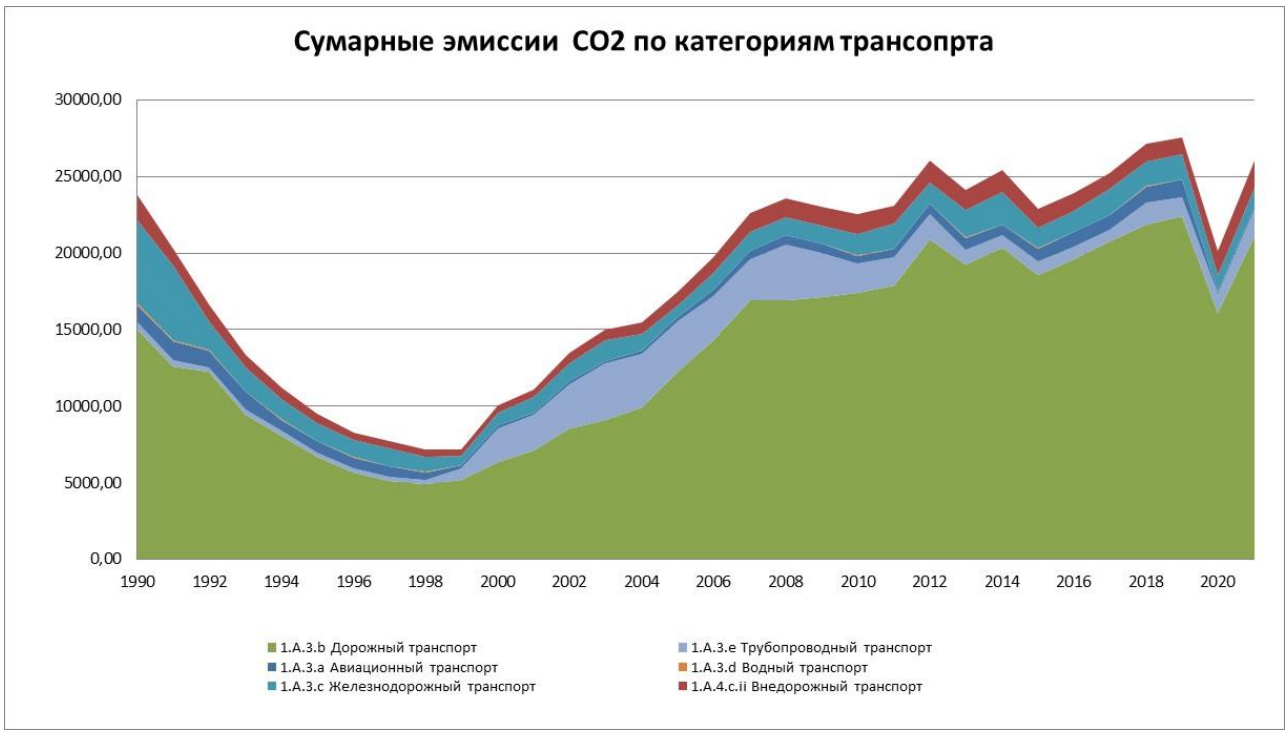


Рисунок 3 - Эмиссии парниковых газов от транспортного сектора в 1990 -2021 гг. (Гг CO_2)

Категория «Летучие эмиссии»

Категория «Летучие эмиссии» разделена на две больших подкатегории: «Твердые топлива», все эмиссии которой представлены в таблицах ОФО под номенклатурным обозначением (1.B.1), и «Жидкие, газообразные топлива», для которых результаты отражаются в таблицах ОФО (1.B.2). Каждая из представленных категорий содержит в себе ряд подкатегорий, которые будут детально представлены ниже.

Объем эмиссии в базовом году 1990 года от летучих эмиссий составил 73047,67 тыс. тонн CO2 экв, в 2021 г. 46628,4 тыс. тонн CO2 экв, таким образом уменьшение эмиссий, в данном секторе составило 36,1%. На долю летучих эмиссий приходилось 16,8% в 1990 году и около 6,5 % в настоящее время в Сектора «Энергетика». На рис 4 представлены общие выбросы парниковых газов от категории «Летучие эмиссии», также представлена сравнительная диаграмма 1990 и 2021 года, где отражены для сравнения доли каждой подкатегории в сумму общих эмиссий. Можно видеть, что несмотря на общее увеличение добычи нефти и газа в настоящее время по сравнению с базовым 1990 годом, эмиссии снизились. Такое положение вызвано несколькими причинами, которые требуют пояснений.

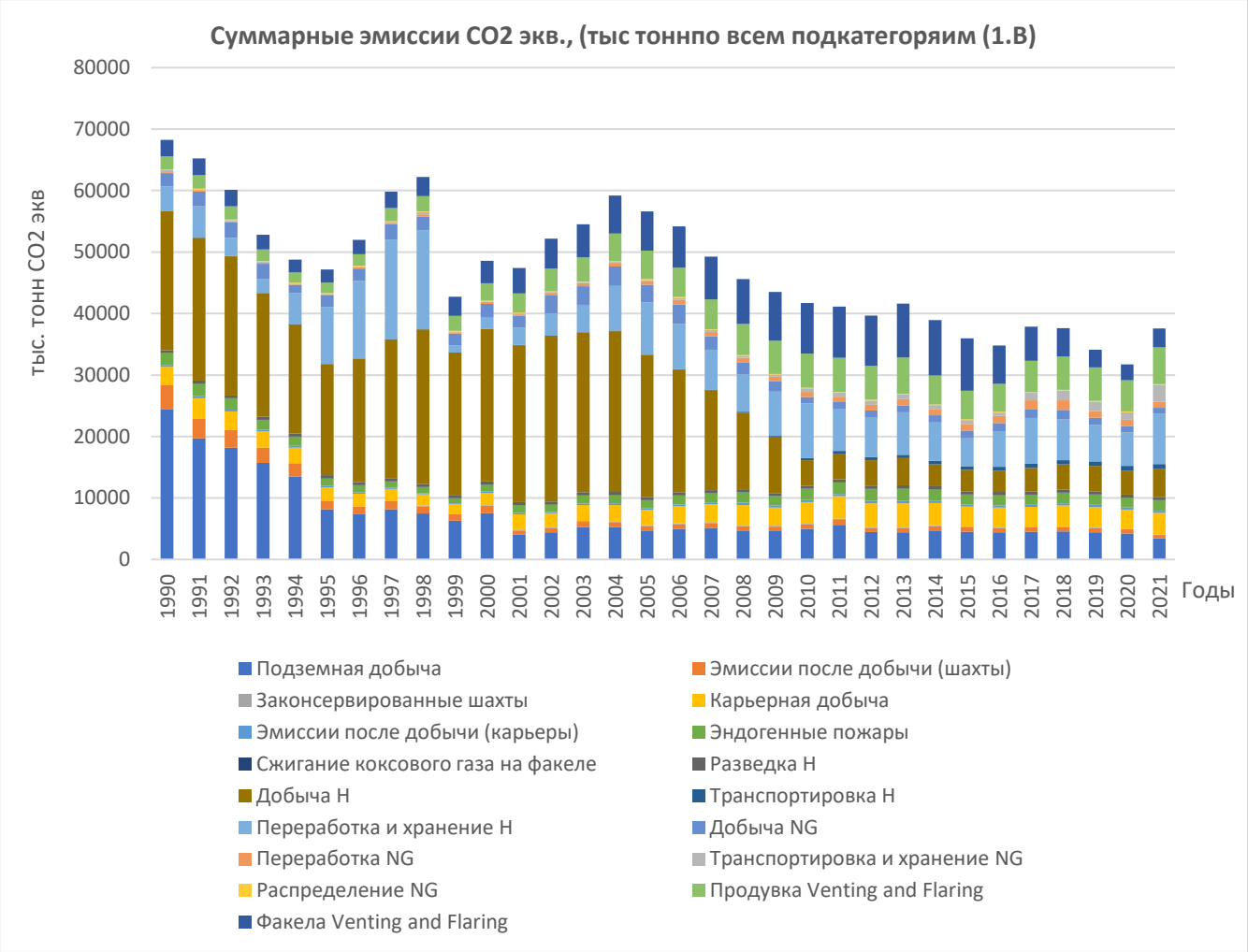


Рисунок 4 - Суммарные эмиссии CO_2 экв., (тыс тонн) по всем подкатегориям (1.B)

В подкатегории добыча угля произошло перераспределение летучих эмиссий от твердого топлива между базовым 1990 г. и сравниваемым 2021 г. Можно видеть, что существенно изменилась доля от подземной добычи с 73% до 35%, и как следствие от процессов после добычи с 11% до 6% (рис 3.5.4). В то же время существенно увеличилась доля эмиссий от карьерной добычи с 9% в 1990 г до 36% 2021 г. Соответственно, увеличилась доля эмиссий от процессов после добычи с 1% в 1990 г до 4 % в 2021 г, и от эндогенных пожаров – с 6% в 1990 г., до 18 % в 2021 г. Также добавим, что начиная с 1997 г, к источникам выбросов добавляются еще эмиссии от закрытых шахт. Не смотря на то, что на сегодняшний день эксперты располагают данными всего о тринадцати закрытых шахтах, доля их эмиссий в общем балансе от твердого топлива составила 1 % (66,6 тыс. тонн CO_2 экв) в 2021 г.

Для подкатегории нефть основные эмиссии происходят от категории добыча нефти, порядка 83 % в базовом году, и 32% в 2021 г (снижение на 51%). Второй по значимости категорий является переработка нефти, на ее долю приходилось 15% в базовом году и 59 % в 2021 г., т.е. эта категория становится ведущей по эмиссиям,

что объясняется увеличением объёмов перерабатываемой продукции (рост переработки возрос почти в два раза).

Добыча газа в Казахстане очень ограничена и чистого газа добывается очень мало, в большинстве случаев присутствует нефтяной попутный газ, с большим содержанием серных соединений. В 1990 году, в Казахстане было добыто 7123 млн $м^3$ природного газа, а в 2021 г., уже 26746,6 млн $м^3$ (рост в 73%), не смотря на то что объемы добычи возросли почти в четыре раза

Общие эмиссии с 27099,28 тыс тон CO_2 экв в 1990 году, уменьшились до 14067,5 тысяч тонн CO_2 эквивалента в 2021 г. уменьшение составило 48,1 %.

Улучшения национальной инвентаризации по категории «Летучие выбросы» согласно рекомендациям международной группы экспертов

Данная категория является довольно сложной, так как некоторые исходные данные для нее не отражаются в национальной статистике по этой причине часть данных запрашивается на предприятиях. Однако, предприятия также могут уточнять свои данные, что приводит к вынужденным пересчётам, как это случилось с категорий использование коксового газа.

С улучшением исходных данных, а также рекомендаций были впервые рассчитаны эмиссии парниковых газов от подкатегорий: Заброшенные подземные шахты Трансформация твердого топлива и Прочие источники.

В целях улучшения качества расчетов и устранения пробелов в данных, по рекомендациям ГЭР в 2019 г. были произведены пересчеты в подкатегориях, Разведка нефти.

Были изменены ключи почти во всех подкатегориях с NO на NA, а в подкатегории Разведка нефти ключ IE заменен расчетными данными.

Для некоторых подкатегорий, были внесены изменения в единицы измерений для категорий производства нефти и газа, Данное замечание касается категорий: Добыча нефти и газа и переработка.

Описание таблиц ОФО (CRF) сектора «Промышленные процессы и использование продуктов (ППИП)»

Инвентаризация выбросов парниковых газов (ПГ) в секторе «Промышленные процессы и использование продуктов» (ППИП) включает оценку выбросов от производства минеральных материалов (2.A), химической промышленности (2.B), металлургической промышленности (2.C), использования растворителей и неэнергетических продуктов из топлива (2.D), электронной промышленности (2.E), использования фторированных заменителей ОРВ (2.F), производства и использования других продуктов (2.G).

Казахстанская инвентаризация ПГ включает шесть категорий из данного перечня — это оценку выбросов от производства минеральных материалов (2.A), химической промышленности (2.B), металлургической промышленности (2.C), использования растворителей и неэнергетических продуктов из топлива (2.D), использования фторированных заменителей ОРВ (2.F), а также использование гесафторида серы (2.G.1). В данной главе представлены все промышленные источники выбросов ПГ (CO2 и CH4), имеющиеся в Казахстане. В Республике Казахстан отсутствуют некоторые производственные процессы, которые, согласно методике РП МГЭИК, 2006г., являются значительными источниками выбросов. Это производство адипиновой кислоты, листового стекла, производство сажи, неметаллургическое производство магнезии, производство капролактама, глиоксаля и глиоксиловой кислоты, производство диоксида титана, а также целлюлозно-бумажная промышленность. В Казахстане также нет производства ГФУ, ПФУ и SF6. Раздел «ППИП» включает оценку эмиссий ПФУ, ГФУ и SF6 от использования этих веществ в холодильном оборудовании, кондиционерах, изготовлении вспеннных материалов и др. Данные вещества, используемые на территории республики, импортируются, в основном от европейских и китайских производителей.

По итогам инвентаризации НДК2021 суммарные эмиссии парниковых газов по сектору ППИП в 2021 году составили **27144,677 тонн CO_2-экв.** Это всего на 0,42% превысили эмиссии 2020года, и на 19,4% превышают выбросы ПГ 1990 года в целом по сектору ППИП (рисунок 6 и таблица 3). Данные рисунка 6 показывают, что в секторе «ППИП» значительное снижение эмиссий парниковых газов происходило в первой половине 90-х годов. В среднем за период с 1994 по 1998 годы уровень парниковых газов был примерно на 60 % ниже эмиссий базового года. При этом в 1996 году эмиссии в этом секторе упали наиболее значительно от уровня 1990 года из-за стагнации промышленного производства в этот период. Рост эмиссий в промышленности начался в 1997 году и достиг максимума в 2017 году, превысив уровень базового года.

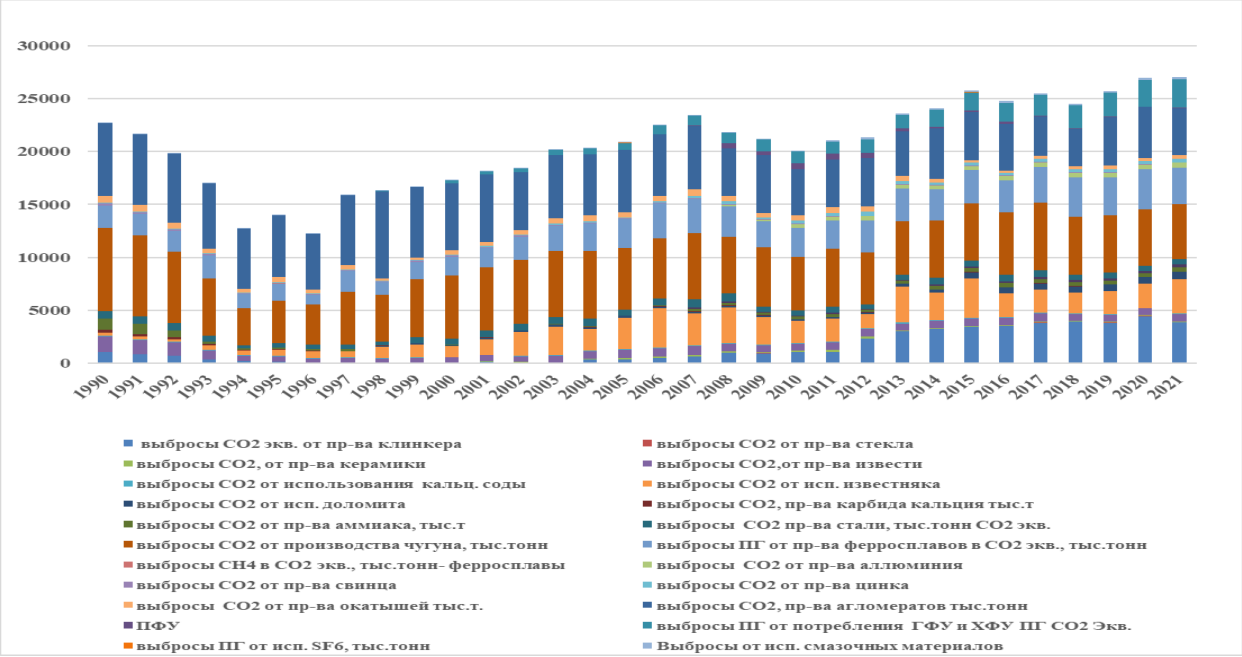


Рисунок 5 – Динамика выбросов парниковых газов сектора «Промышленные процессы и использования продуктов» за 1990-2021 гг.

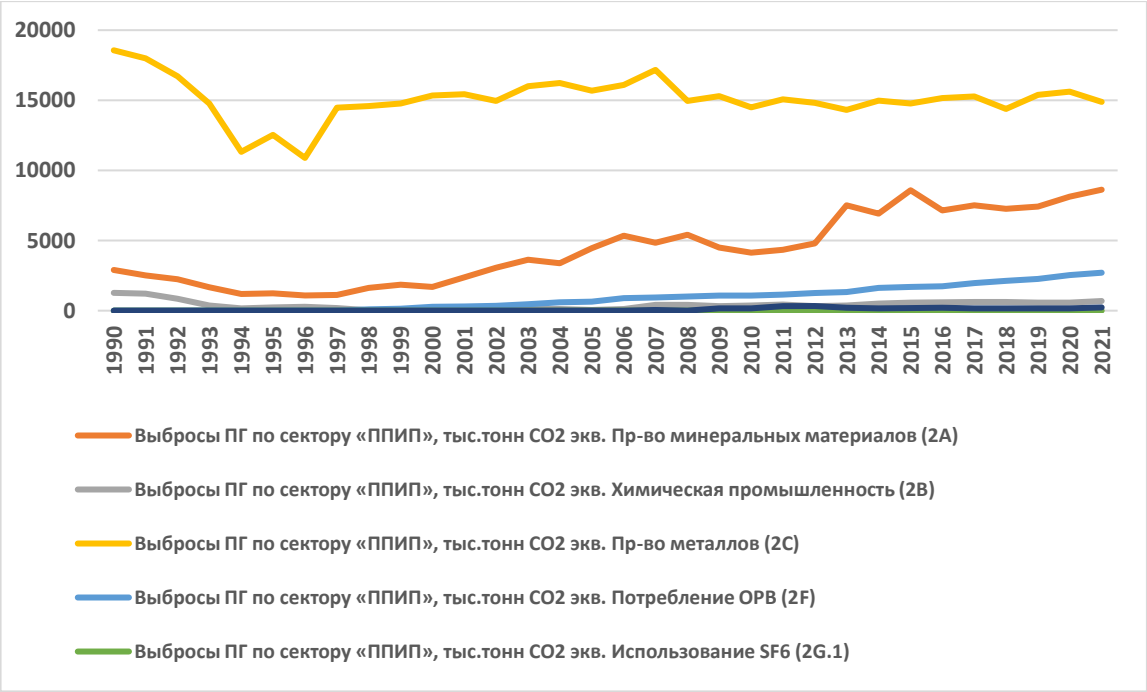


Рисунок 6 – Вклад категорий сектора в общие выбросы парниковых газов по сектору «ППИП» за 1990-2021 гг.

Таблица 3 – Значения выбросов ПГ сектора «ППИП» за период 1990-2021 гг., тыс. тонн CO_2 экв.

Годы	Выбросы ПГ по сектору «ППИП», тыс.тонн CO2 экв.						
	Всего выбросов по сектору «ППИП»	Пр-во минеральных материалов (2A)	Химическая промышленность (2B)	Пр-во металлов (2C)	Потребление ОРВ (2F)	Использование SF6 (2G.1)	Неэнергетические продукты из топлива и использование растворителей (2D)
1990	22737,402	2901,759	1270,418	18562,866	0	0	2,361
1991	21713,797	2525,169	1203,377	17983,009	0	0	2,242
1992	19795,848	2246,26	845,901	16701,561	0	0	2,125
1993	16820,647	1677,112	379,113	14762,042	0,372	0	2,007
1994	12685,166	1194,904	171,004	11316,121	1,248	0	1,888
1995	13990,088	1228,076	228,279	12527,569	4,452	0	1,711
1996	12257,188	1084,965	274,901	10890,041	5,688	0	1,593
1997	15771,28	1117,233	176,902	14466,359	9,312	0	1,475
1998	16338,772	1628,561	28,655	14580,728	99,471	0	1,357
1999	16797,105	1863,478	33,322	14768,429	130,636	0	1,239
2000	17341,32	1689,17	27,558	15350,463	273,008	0	1,121
2001	18159,778	2387,277	51,461	15424,861	295,706	0	0,472
2002	18413,385	3057,763	55,938	14961,359	337,735	0	0,59
2003	20194,539	3622,944	114,651	15993,944	462,588	0	0,413
2004	20326,221	3387,695	117,172	16232,993	587,999	0,007	0,354
2005	20853,668	4458,852	54,948	15694,279	643,64	1,653	0,295
2006	22447,704	5342,589	123,47	16087,191	889,531	1,687	0,236
2007	23434,429	4853,595	416,4101	17168,484	946,838	1,695	47,406
2008	21829,098	5406,298	423,361	14962,642	1019,574	1,715	15,507
2009	21339,742	4506,297	315,286	15289,485	1068,897	1,735	158,041
2010	20224,289	4135,187	358,839	14497,696	1072,993	1,735	157,839
2011	21323,773	4345,026	442,805	15064,649	1144,648	1,749	324,893
2012	21530,106	4789,132	333,482	14814,886	1259,572	1,827	331,207
2013	23716,069	7517,013	361,497	14305,885	1328,219	1,925	201,529
2014	24141,789	6926,702	510,258	14978,253	1619,868	2,009	154,698
2015	25801,093	8579,29	572,565	14771,577	1698,535	2,013	177,112
2016	24870,976	7142,046	602,443	15167,891	1740,315	2,062	216,22
2017	25563,975	7522,897	628,417	15283,214	1968,387	2,097	158,963
2018	24535,745	7254,743	613,843	14383,748	2119,498	2,152	161,759
2019	25535,759	7419,648	569,239	15375,982	2258,361	2,319	167,211
2020	27031,372	8118,531	586,141	15623,479	2529,75	2,304	171,166
2021	27144,677	8626,526	680,221	14889,484	2706,491	2,370	239,585

Улучшения национальной инвентаризации по сектору «Промышленные процессы и использование продуктов» согласно рекомендациям международной группе экспертов

По итогам ежегодного обзора НДК (Обзор НДК 2021г.) по замечаниям и рекомендациям ГЭР в разделе сектора «ППИП» были выполнены улучшения:

1) дополнена информация по целлюлозно-бумажной промышленности в РК;

2) были внесены изменения в структуры секторальных глав, в частности, включено описание категории 2.E «Электронная промышленность»;

3) включено описание использования продуктов категории 2.F в качестве заменителей ОРВ и электрического оборудования 2.G.1, а также 2.G.3 - выбросы N2O от использования продуктов перенесены из раздела по выбросам металлургических процессов в отдельные разделы.

4) Также в целом по НДК были внесены следующие изменения:

- в таблицу 2 (I) ОФД включена информация по данным о деятельности;

- в категориях 2B.2 «Производство азотной кислоты»; 2C.1b «Производство чугуна»; 2C.1e «Производство окатышей»; 2C.1f «Производство агломератов»; 2.C.2 «Производство ферросплавов»; 2.C.3 «Производство алюминия» были проведены пересчеты за весь временной ряд;

- в таблицы ОФО в категории 2.D.3. «Прочее» была включена подкатегория «Использование мочевинных конвертеров» так как согласно РП МГЭИК,2006г. учет эмиссий от данной подкатегории ведется в секторе «ППИП», но при этом описание по данной подкатегории включено в раздел по транспорту категории 1.C. сектора «Энергетика»;

- в соответствующих разделах Национального доклада приведены подробные описания причин и результатов пересчетов, а также представлены сравнительные таблицы полученных изменений инвентаризаций парниковых газов 2020 и 2021 годов.

Описание таблиц ОФО (CRF) сектора «Сельское хозяйство»

В результате проведенной работы по инвентаризации парниковых газов таблицы ОФО (CRF) в секторе «Сельское хозяйство» были заполнены на 100 %. Заполненная информация включает исходную информацию, коэффициенты выбросов парниковых газов, а также результаты расчетов. Кроме того, таблицы включают различные комментарии с объяснениями выбора тех или иных параметров, а также ключи нотации.

Инвентаризация выбросов парниковых газов в секторе «Сельское хозяйство» включает результаты расчетов эмиссии парниковых газов за 1990…2021 гг. по следующим категориям деятельности:

– выбросы метана (CH_4) при внутренней ферментации сельскохозяйственных животных (категория 3A CRF);

– выбросы метана (CH_4) и закиси азота (N_2O), от систем сбора, хранения и использования навоза (категория 3B CRF);

– выбросы метана (CH_4) при выращивании риса (категория 3C CRF);

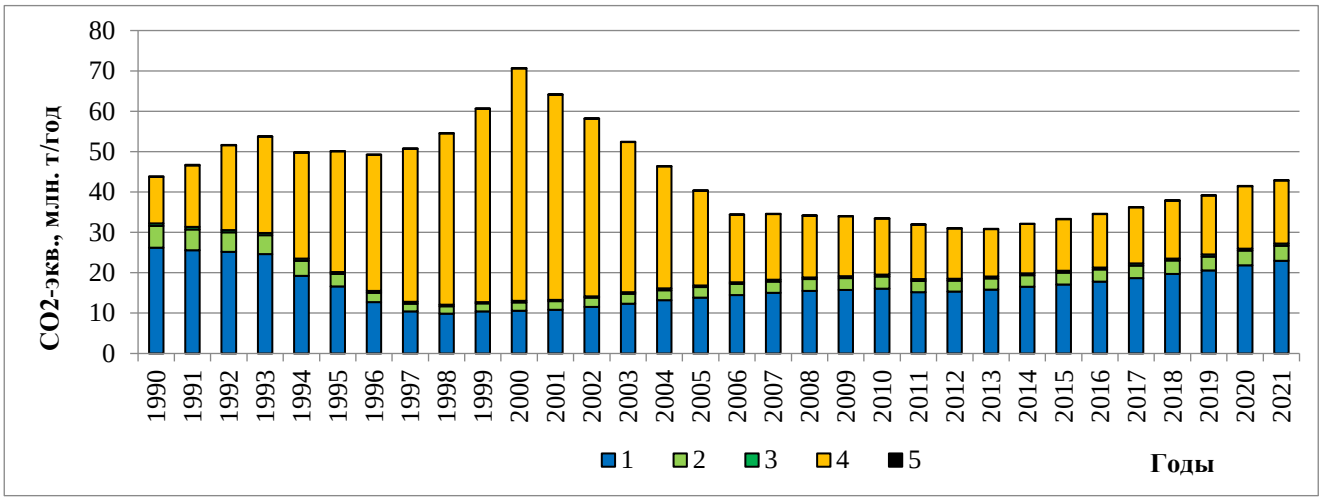
– выбросы закиси азота (N_2O) из обрабатываемых почв (категория 3D CRF);

– выбросы диоксида углерода (CO_2) при удобрении мочевиной (категория 3H CRF).

Сектор «Сельское хозяйство» является вторым по величине источником выбросов парниковых газов после сектора «Энергетика». Доля выбросов парниковых газов в секторе от общенациональных выбросов увеличилась с 11,5 % в 1990 г. до 12 % в 2021 г.

Суммарная эмиссия парниковых газов в секторе 2021 г. составила 42,845 млн. тонн CO2 экв. и по сравнению с 1990 г. уменьшилась на 1,016 млн. тонн (6 %). По сравнению с 2020 г. выбросы в 2021 г. выросли на 1,426 млн. тонн (2 %). Минимальные значения эмиссии наблюдались в 2013 г. (30,774 млн. тонн).

На рисунке 7 и в таблице 4 представлены подробные результаты расчетов эмиссии парниковых газов от сектора «Сельское хозяйство» по категориям деятельности в соответствии с классификацией МГЭИК.



1– внутренняя ферментация; 2 – управление навозом; 3 – выращивание риса; 4 – обрабатываемые почвы; 5 – применение мочевины.

Рисунок 7 – Выбросы парниковых газов от деятельности в секторе «Сельское хозяйство» за 1990…2021 гг.

Общий рост выбросов, наблюдающийся с 1990 по 2000 гг. в первую очередь, связан с динамикой выбросов закиси азота в результате минерализации органического вещества в почве. Резкое сокращение углерода в почве привело к значительным выбросам от возделываемых земель, на этом фоне сокращение выбросов от животноводства, происходившее в 90-е годы, выглядит не таким значительным. В 2000-х в связи с улучшением экономической ситуации в республике, поголовье животных и посевные площади показывают стабильный рост, и уже за счет этого происходит плавный рост общей эмиссии парниковых газов в секторе.

Таблица 4 – Эмиссия парниковых газов от деятельности в секторе «Сельское хозяйство» за 1990…2021 гг., тыс. тонн CO_2 экв.

Годы	Внутренняя ферментация	Управление навозом	Выращивание риса	Обрабаты-ваемые почвы	Применение мочевины	Итого
	3A	3B	3C	3D	3H	3
1990	26245,50	5345,33	651,00	11514,72	104,40	43860,95
1991	25592,75	5138,21	624,75	15263,56	91,36	46710,63
1992	25167,00	4835,23	603,75	20961,32	78,31	51645,61
1993	24613,50	4695,69	567,00	23887,68	65,27	53829,14
1994	19261,00	3689,59	535,50	26262,74	52,23	49801,06
1995	16616,75	3099,92	441,50	29946,02	39,19	50143,38
1996	12717,50	2301,20	472,50	33679,96	26,14	49197,30
1997	10420,50	1922,24	435,75	37932,42	13,10	50724,01
1998	9834,50	1845,20	385,25	42441,16	0,06	54506,17
1999	10416,50	1969,91	372,75	47837,94	0,17	60597,27
2000	10601,25	2043,11	378,50	57597,44	0,08	70620,38

Годы	Внутренняя ферментация	Управление навозом	Выращивание риса	Обрабаты-ваемые почвы	Применение мочевины	Итого
	3A	3B	3C	3D	3H	3
2001	10853,25	2103,60	363,25	50791,12	0,07	64111,29
2002	11564,50	2255,01	357,00	43978,84	0,06	58155,41
2003	12325,75	2436,42	439,00	37148,68	0,06	52349,91
2004	13169,00	2518,31	423,75	30273,82	0,24	46385,12
2005	13811,75	2608,82	445,75	23446,64	0,25	40313,21
2006	14497,50	2715,37	460,00	16705,88	0,13	34378,88
2007	15005,75	2815,58	458,75	16246,96	0,15	34527,19
2008	15533,00	2874,56	396,50	15317,20	0,56	34121,82
2009	15748,25	2917,45	456,25	14852,32	0,23	33974,50
2010	16077,50	2966,10	493,50	13848,06	0,68	33385,84
2011	15146,50	2781,59	489,75	13469,60	2,47	31889,91
2012	15322,00	2736,04	488,25	12426,60	0,72	30973,61
2013	15841,25	2769,53	472,00	11690,54	0,20	30773,52
2014	16514,75	2850,54	500,25	12238,86	0,55	32104,95
2015	17085,00	2931,54	518,75	12769,30	0,27	33304,86
2016	17808,00	3016,52	495,00	13246,10	0,59	34566,21
2017	18652,00	3148,02	548,75	13877,86	1,97	36228,60
2018	19682,50	3316,51	532,75	14321,88	2,54	37856,18
2019	20545,50	3443,94	546,00	14563,26	3,22	39101,92
2020	21853,00	3611,36	537,00	15412,56	5,60	41419,52
2021	22947,50	3771,36	507,25	15615,20	4,12	42845,43

Основная доля эмиссии парниковых газов на 2021 г. в секторе приходится на метан (CH4) – 24,336 млн. тонн CO2 экв. (57 %). Эмиссия закиси азота (N_2O), составляет 18,505 млн. тонн CO_2 экв. (43 %), объем эмиссии CO_2 от применения мочевины является незначительным (около 0,01 %) (рисунок 8).

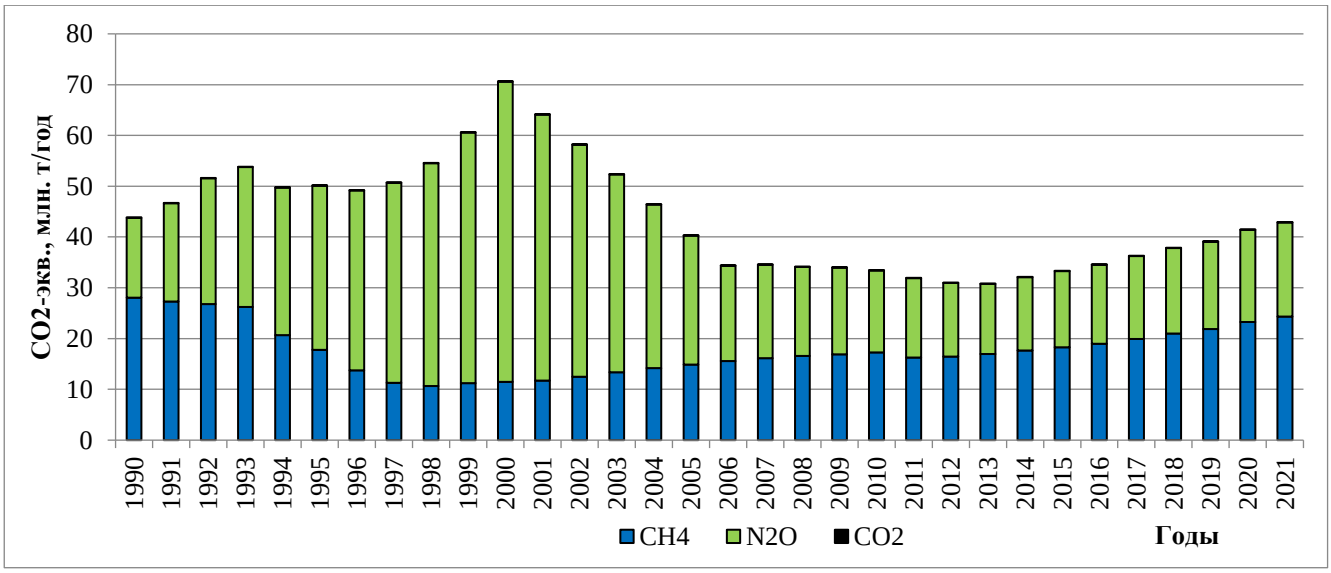


Рисунок 8 – Эмиссия по видам парниковых газов от деятельности в секторе «Сельское хозяйство» по видам газов за 1990…2021 гг.

Улучшения национальной инвентаризации по сектору «Сельское хозяйство» согласно рекомендациям международной группы экспертов

Уточнено поголовье ослов и буйволов за 2015-2021 гг. по данным FAO, однако эти уточнения ввиду малых значений почти не повлияли на величину эмиссии закиси азота.

Исправлена техническая ошибка в расчетах выбросов закиси азота от свиней (коэффициент для жидких систем управления навозом применялся не верно), это привело к небольшому сокращению выбросов по всему временному ряду.

Был использован динамический ряд со значениями живого веса овец, вместо фиксированного значения, в результате выбросы парниковых газов не существенно изменились по всему временному ряду. Скорректировано количество азота, выделяющееся в результате минерализации органического вещества в почве, что привело к изменению общего баланса выбросов парниковых газов в секторе, а также к корректировке косвенных выбросов в результате выщелачивания.

Описание Таблиц ОФО сектора «Землепользование, изменение в землепользовании и лесное хозяйство»

Для отчетности по Конвенции РКИК ООН, в соответствии с обязательствами Республики Казахстан, в разделе ЗИЗЛХ НДК - 2023 представлены результаты оценки поглощения / эмиссии парниковых газов (ПГ) связанные с деятельностью в лесном хозяйстве и другими видами землепользования за 1990…2021 годы.

Оценка поглощения /эмиссии ПГ для сектора выполнена в соответствии с требованиями РП МГЭИК, 2006, Том 4 Сельское хозяйство , лесное хозяйство и другие виды землепользования, касающихся согласованности при категоризации земель по системам пользования и управления (6 категорий), преобразований в практике пользования (6 категорий) в соответствии с их классификацией и определениями на национальном уровне.

В электронных таблицах ОФО (CRF) результаты инвентаризации ПГ для сектора ЗИЗЛХ за 1990…2021 годы представлены в основных таблицах:

4. Land Use, Land –Use Change and Forestry;

4 A Forest Land; 4 B Crop land; 4 C Grassland; 4 D Wetlands;

4 E Settlements; 4 F Other Land; 4 G Harvested Wood Products.

Оценка запасов углерода и их годовых изменений представлена по всем компонентам природных экосистем и агроэкосистем с учетом перераспределения углерода по резервуарам накопления, включая живую биомассу, мертвое органическое вещество (валежная древесина и подстилка для леса) и минеральную почву. Также в таблице показаны площади, на которых осуществляется деятельность, связанная с конкретными видами землепользования.

Представленные в электронной таблице ОФО (CRF) результаты инвентаризации ПГ по сектору ЗИЗЛХ согласуются с результатами оценки потоков поглощения / эмиссии ПГ по вышеупомянутым категориям деятельности за 1990-2021 гг., обобщаемых в таблице 6.1 НДК - 2023. Как видно из таблицы 6.1, расчетами за 2021 год подтверждается сохранение поглощения CO_2 для категорий землепользования Лесные земли (FL), Пастбища (GL), а также Поселения (SL). Возделываемые земли (CL) в РК остаются источником эмиссий ПГ, что в итоге определяет и сохранность общего потока ПК как эмиссии в секторе ЗИЗЛХ почти за все годы временного ряда. На 2021 год итоговые эмиссии ПГ для сектора получены по расчетам на уровне 10821,6 тысяч тонн в эквиваленте CO_2, что превышает итоговые эмиссии для сектора за 2020 год на величину 2811,7 тысяч тонн CO2. По отношению к базовому году итоговая величина потоков парниковые газы за 2021 год превышает по абсолютной величине аналогичную за 1990 год на 13788,6 тысяч тонн CO2, с учетом противоположного знака

направленности итогового потока CO2 за 1990 год, характеризующего его как поглощение.

Антропогенные эмиссии / поглощения ПГ для сектора ЗИЗЛХ представлены в электронной таблице ОФО (CRF) для управляемых земель, поскольку допускалось, что все лесные и сельскохозяйственные угодья в РК, а также земли под поселениями, искусственными водоемами из категории «Водно-болотные угодья», относятся к управляемым. К не управляемым землям относились озера, реки, болота и прочие угодья. Для категорий землепользования Лесные площади (FL) и Возделываемые земли (CL) расчеты динамики углерода и объемов поглощения / эмиссий CO2 в НДК 2023 выполнялись за 1990-2021гг на региональном уровне. Полученные результаты на уровне административных областей обобщались для электронных таблиц ОФО (CRF) на национальном уровне.

Таблица 5 - Годовые величины чистого поглощения (-) / эмиссии (+) CO_2 и других видов парниковых газов, рассчитанные для лесного хозяйства и других видов землепользования в РК за 1990…2021 гг.

Годы	Итого поглоще-ние/эмиссии для сектора ЗИЗЛХ с учетом эмис ии от лесных пожаров, тыс, тонн /год в экв, CO_2	Лесные площа-ди и древесно-кустарниковые насаждения, с учетом эмиссии от пожаров, тыс, тонн /год в экв, CO_2	Возделываемые земли, включая пашню в севообо роте, выводимую в залежь, пастби ща и многолетни е насаждения, CO_2 тыс, тон /год	Пастбища и сенокосы при ро дные, с учетом эмиссии от степных пожа ров, тыс, тонн /год в экв, CO_2	Водноболо тные угодья (искуствен ные водое мы), CO_2 тыс,тонн /год
1990	-2967,0	-5533	5201,9	-2635,9	4,25
1991	5,0	-8299	13575,83	-5271,8	1,47
1992	2976,3	-11065	21949,03	-7907,8	0,00
1993	5947,6	-13831	30322,23	-10543,7	1,10
1994	17673,8	-7842	38695,43	-13179,6	0,00
1995	31348,1	95	47068,63	-15815,5	0,00
1996	45023,4	8033	55441,83	-18451,4	0,00
1997	56749,7	14022	63815,03	-21087,3	0,00
1998	64581,0	16116	72188,23	-23723,3	0,00
1999	64011,2	9809	80561,43	-26359,2	0,00
2000	63443,4	3502	88936,47	-28995,1	0,00
2001	70990,8	-2804	102719,1	-28924,3	0,00
2002	69518,0	-9111	107482,5	-28853,5	0,00
2003	68045,5	-15418	112246,2	-28782,7	0,00
2004	73180,8	-15117	117009,6	-28711,8	0,00
2005	74010,8	-14816	121773,3	-32946,5	0,00
2006	74810,5	-14515	126506,6	-37181,1	0,00
2007	73729,6	-14214	129359,3	-41415,7	0,00
2008	59847,8	-13913	119411,2	-45650,4	0,00
2009	43494,2	-16084	109463,2	-49885,0	0,00
2010	27140,2	-18255	99514,8	-54119,6	342,80

2011	23505,8	-20425	89566,77	-45635,9	107,47
2012	19870,5	-22596	79618,73	-37152,3	29,19
2013	-942,1	-24767	52493,47	-28668,6	0,00
2014	9296,6	-22202	51683,5	-20184,9	0,00
2015	20536,4	-19638	51875,63	-11701,2	106.37
2016	22040,9	-17073	52067,77	-12953,8	0,18
2017	23545,1	-14508	52259,53	-14206,4	14,89
2018	25048,7	-11944	52451,67	-15459,0	0,00
2019	18934,8	-16997	52643,43	-16711,6	0,00
2020	14433,1	-19724	52121,3	-17964,2	0,00
2021	10821,6	-22850	52888,37	-19216,8	0,00

Улучшения национальной инвентаризации по сектору «ЗИЗЛХ» согласно рекомендациям международной группе экспертов

В рамках Ревью-2020 в сентябре –октябре 2022, экспертами международной группы от Секретариата РКИК ООН рекомендовалось РК продолжить деятельность, направленную на дальнейшее развитие национальной системы инвентаризации парниковых газов, включая сектор ЗИЗЛХ, в частности для обеспечения расчетов на региональном уровне для ключевых категорий антропогенной деятельности.

В соответствии с полученными рекомендациями касающихся отчетности по Конвенции РКИК ООН, в рамках НДК -2023, сектор ЗИЗЛХ продолжались методические работы по раз агрегированию расчетов ПГ на областном уровне для категорий землепользования Лесные угодья и Возделываемые земли с расширением архива национальных эталонов углерода, уточнением коэффициентов деятельности, получением согласованной информации из ведомственных архивов. Рассчитанные за 1990-2021гг. на областном уровне (всего 14 областей) годовые изменения запасов углерода и объемов поглощения /эмиссии для категорий деятельности Лесные угодья и Возделываемые земли представлены в НДК -2023, сектор ЗИЗЛХ. С целью представления результатов в электронных таблицах ОФО (CRF) показатели обобщались предварительно на национальном уровне.

Описание таблиц ОФО (CRF) сектора «Отходы»

Ежегодно в Казахстане образуется 5-6 млн. тонн твердых бытовых отходов. В ближайшие годы следует ожидать увеличения объемов образования ТБО за счет увеличения номенклатуры продовольственных и непродовольственных товаров, ассортимента и видов упаковки для них, роста уровня жизни населения.

За 2021 год в Республике Казахстан образовано 4,2 млн. тонн ТБО (по данным Министерства экологии и природных ресурсов Республики Казахстан), из которых 3,2 млн. тонн составили коммунальные отходы, собранные специализированными предприятиями и индивидуальными предпринимателями по сбору и транспортировке отходов, число которых составило 676 единиц. Основная доля приходится на отходы домашних хозяйств (65,6%), 20,2% составили отходы производства (приравненные к бытовым), 10,5% - уличный мусор, 2,2% - рыночные отходы. В 2021г. на официально действующие полигоны (свалки), объекты сортировки и переработки коммунальных отходов поступило 3,9 млн. тонн отходов. Из них 65,9% поступило для их дальнейшего депонирования, 30,4% отсортировано.

На конец 2021 года на официально действующих полигонах (свалках) накоплено более 47,5 млн. тонн отходов.

В секторе «Отходы» эмиссии парниковых газов образуются от захоронения на свалках твердых бытовых отходов (СТО), переработки сточных вод (коммунально-бытовых и промышленных), продуктов жизнедеятельности человека, сжигания медицинских отходов. Общие эмиссии парниковых газов в секторе в 2021 году в результате пересчета составили 6260,82Гг CO2-экв. В сравнении с предыдущим 2020 годом объем выбросов увечился – на 3,9%. Основная доля выбросов в общем объеме приходится на неуправляемые полигоны твердых отходов по Казахстану и сброс коммунально-бытовых сточных вод. В 1990 году объем эмиссий составлял 3839,09Гг CO2-экв. За весь период с 1990 г. по 2021 г. рост эмиссий в секторе увеличился в 1,6 раза, за счет роста образования ТБО и численности населения.

Таблица 6 – Эмиссия парниковых газов в секторе «Отходы» за 1990 - 2021 гг., тысяч тонн CO_2-эквивалента

Годы	Полигон ТБО г.Астана	Свалки ТБО, остальные города Казахстана	Комму-нально-бытовые сточные воды	Промышленные стоки	Закись азота N2O	Сжигание медицинских отходов	Общие эмиссии от сектора «Отходы»
1990	45,19	1470,23	1344,17	715,00	264,50	0,00	3839,09
1991	44,46	1547,53	1350,89	611,96	266,01	0,00	3820,85

1992	43,74	1616,17	1346,09	437,79	271,78	0,00	3715,57
1993	43,26	1676,45	1331,01	284,13	270,27	0,00	3605,12
1994	42,93	1728,59	1296,30	165,38	264,01	0,00	3497,22
1995	42,79	1766,94	1273,63	97,26	262,35	0,00	3442,96
1996	42,75	1803,71	1258,57	88,78	261,96	0,00	3455,76
1997	42,78	1838,59	1236,40	73,32	257,01	0,00	3448,10
1998	42,94	1871,75	1220,11	67,80	250,29	0,00	3452,90
1999	45,01	1902,22	1216,52	52,08	246,55	0,00	3462,38
2000	48,98	1930,15	1215,71	70,12	245,96	0,00	3510,91
2001	55,44	1955,33	1215,94	119,75	245,72	0,00	3592,18
2002	63,84	1978,54	1145,20	121,81	248,81	0,00	3558,19
2003	71,68	2001,02	1152,23	102,92	253,00	0,00	3580,84
2004	79,04	2022,86	1178,62	125,26	255,09	0,00	3660,87
2005	86,45	2043,75	1180,06	159,10	260,43	0,00	3729,80
2006	94,12	2063,61	1270,98	175,47	269,26	0,005	3873,45
2007	100,25	2099,19	1251,71	203,17	275,20	0,7272	3930,25
2008	102,67	2187,90	1292,37	185,58	282,47	1,0752	4052,07
2009	104,82	2276,28	1318,88	291,39	292,46	9,6623	4293,48
2010	106,93	2388,73	1365,90	292,96	299,88	10,3689	4464,77
2011	111,14	2485,78	1394,18	167,48	304,14	8,2268	4470,94
2012	116,91	2588,01	1422,08	164,70	308,45	7,5744	4607,72
2013	124,20	2663,70	1450,28	159,79	300,55	9,3527	5556,71
2014	132,51	2732,75	1511,10	167,01	314,89	9,0884	4867,34
2015	142,28	2788,94	1525,73	143,95	324,03	7,8629	4932,80
2016	153,19	2828,95	1551,43	180,43	327,66	60,4491	5102,11
2017	170,40	2838,28	1586,52	202,00	336,71	33,366	5167,29
2018	184,01	2881,87	1632,26	194,34	364,82	25,9617	5283,26
2019	196,40	2938,44	1673,89	230,84	366,62	12,1909	5418,38
2020	210,93	2989,22	2185,37	219,74	381,22	30,9708	6017,44
2021	189,26	3037,72	2365,05	290,93	377,74	0,1224	6260,82

Общая динамика эмиссии парниковых газов от сектора «Отходы» за 1990 - 2021 гг. представлена на рисунке 13

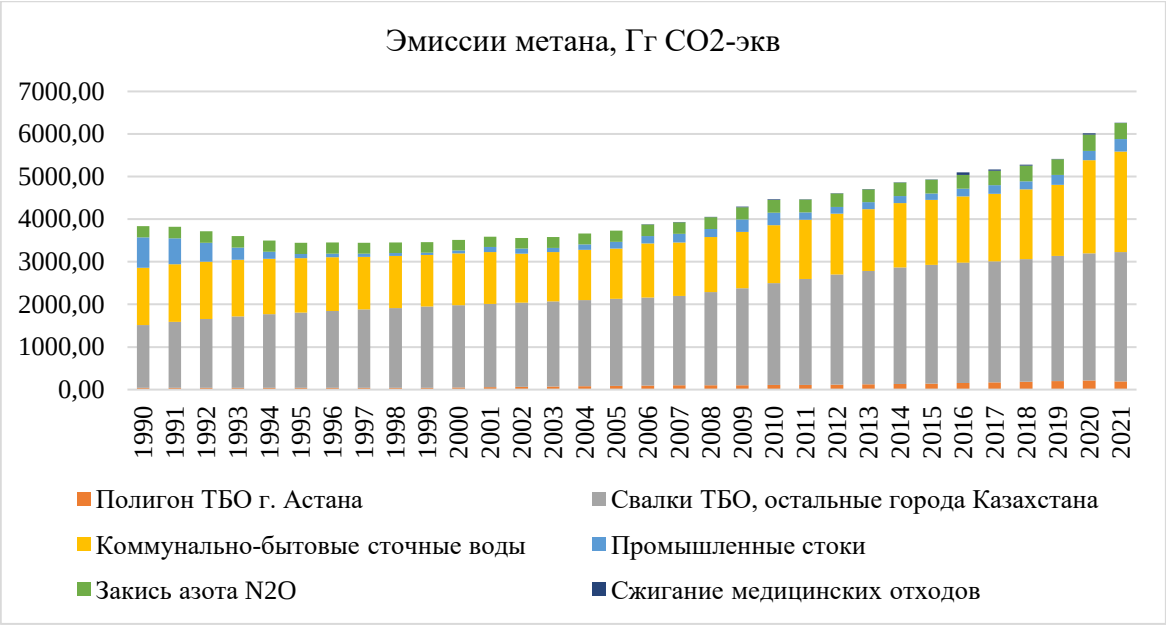


Рисунок 9 – Общая динамика эмиссии парниковых газов от сектора «Отходы» в Казахстане за 1990 - 2021 гг.

Улучшения национальной инвентаризации по сектору «Отходы» согласно рекомендациям международной группы экспертов

Был произведен пересчет эмиссий практически по всему сектору, в связи с чем произошли значительные изменения в результатах расчетов.

В категории 5.A Удаление твердых отходов все полигоны были поделены на две категории:

- Управляемый полигон г. Астаны 5.A1
- Неуправляемые полигоны остальных регионов страны 5.A2.

В категории 5.D.2 Промышленные сточные воды были удалены расчеты от производство азотных и фосфорных удобрений, так как данные вещества не входят в категорию «Органические химические вещества» (удобрения являются минеральными). В связи с данной корректировкой выбросы эмиссий значительно уменьшились.

Вместе с тем, в соответствии с рекомендациями ГЭР, в настоящее время уточняются данные по системе утилизации промышленных отходов, составе ТБО, складируемых на полигонах, рекуперации метана и компостированию отходов. Результаты проводимой работы будут направлены на использование более высокого метода для будущей инвентаризации.

ПРИЛОЖЕНИЕ К ОТЧЕТУ

Отчетные электронные таблицы в форматах CRF и SEF с учетом рекомендаций международной группы экспертов Секретариата РКИК ООН

TABLE 1 SECTORAL REPORT FOR ENERGY
(Sheet 1 of 2)

Inventory 1990

Submission 2023 v1

KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2	CH_4	N_2O	NO_X	CO	NMVOC	SO_2
	(kt)						
Total Energy	245375,03	2531,81	5,63	58241,88	461762,12	55735,08	1083,83
A. Fuel combustion activities (sectoral approach)	238899,46	61,49	5,57	58241,88	461762,12	55735,08	1083,83
1. Energy industries	141770,89	2,28	1,81	423,94	32,68	8,29	711,54
a. Public electricity and heat production	112392,65	1,75	1,47	336,08	25,71	6,45	623,63
b. Petroleum refining	2877,37	0,12	0,02	7,87	0,59	0,19	7,91
c. Manufacture of solid fuels and other energy industries	26500,87	0,41	0,32	79,99	6,38	1,65	80,00
2. Manufacturing industries and construction	18763,85	1,39	0,22	57,69	20,14	2,96	106,11
a. Iron and steel	7752,34	0,65	0,10	25,21	9,55	1,39	45,83
b. Non-ferrous metals	2497,47	0,18	0,03	7,20	2,31	0,36	24,11
c. Chemicals	1904,10	0,06	0,01	5,23	1,11	0,19	3,07
d. Pulp, paper and print	39,02	0,00	0,00	0,11	0,03	0,01	0,17
e. Food processing, beverages and tobacco	772,08	0,05	0,01	2,19	0,87	0,09	4,51
f. Non-metallic minerals	4848,23	0,35	0,06	14,58	5,10	0,75	23,96
g. Other (*please specify*)	950,61	0,08	0,01	3,17	1,17	0,17	4,46
3. Transport	21580,90	6,76	2,67	57587,13	460677,64	55610,23	39,94
a. Domestic aviation	1083,55	0,01	0,03	1,90	8,26	0,11	0,29
b. Road transportation	14628,58	6,02	0,75	57585,15	460669,36	55610,11	39,65
c. Railways	4860,59	0,27	1,84	0,08	0,02	0,01	NE
d. Domestic navigation	122,74	0,03	0,00	NE	NE	NE	NE
e. Other transportation	885,45	0,43	0,04	NO	NO	NE	NO

TABLE 1 SECTORAL REPORT FOR ENERGY
(Sheet 2 of 2)

Inventory 1990
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2	CH_4	N_2O	NO_X	CO	NMVOC	SO_2
	(kt)						
4. Other sectors	47904,69	50,05	0,77	163,66	921,57	102,50	197,07
a. Commercial/institutional	28952,33	4,24	0,41	30,96	513,86	51,71	143,02
b. Residential	16963,36	42,63	0,24	18,57	298,53	30,42	49,72
c. Agriculture/forestry/fishing	1989,00	3,18	0,12	114,13	109,18	20,37	4,33
5. Other *(as specified in table 1.A(a) sheet 4)*	8879,13	1,02	0,10	9,46	110,08	11,10	29,17
a. Stationary	8879,13	1,02	0,10	9,46	110,08	11,10	29,17
b. Mobile	NO,IE	NO,IE	NO,IE	NO	NO	NO	NO
B. Fugitive emissions from fuels	6475,57	2470,31	0,06	NO,NA	NO,NA	NO,NA	NO,NA
1. Solid fuels	2156,14	1255,87	0,03	NO	NO	NO	NO
a. Coal mining and handling	229,05	1255,85	NO	NO	NO	NO	
b. Solid fuel transformation	1911,67	0,02	0,03	NO	NO	NO	NO
c. Other *(as specified in table 1.B.1)*	15,42	0,00	NO	NO	NO	NO	NO
2. Oil and natural gas and other emissions from energy production	4319,43	1214,44	0,03	NO,NA	NO,NA	NO,NA	NO,NA
a. Oil	373,69	1069,00	0,00	NO	NO	NO	NO
b. Natural gas	168,83	104,97				NO	NO
c. Venting and flaring	3776,90	40,48	0,03	NO	NO	NO	NO
d. Other *(as specified in table 1.B.2)*	NA	NA	NA	NA	NA	NA	NA
C. CO_2 Transport and storage	NO,NA						
1. Transport of CO_2	NO						
2. Injection and storage	NA						
3. Other	NO						
Memo items: [(1)]							
International bunkers	666,08	0,01	0,02	NO	NO	NO	NO
Aviation	576,45	0,00	0,02	NO	NO	NO	NO
Navigation	89,63	0,01	0,00	NO	NO	NO	NO
Multilateral operations	NA	NA	NA	NA	NA	NA	NA
CO_2 emissions from biomass	1166,88						
CO_2 captured	NO,IE,NA						
For domestic storage	NO						
For storage in other countries	NO						

[(1)] Countries are asked to report emissions from international aviation and marine bunkers and multilateral operations, as well as carbon dioxide (CO_2) emissions from biomass, under Memo items. These emissions should not be included in the national total emissions from the energy sector. Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO_2 emissions are accounted for as a loss of biomass stocks in the land use, land-use change and forestry sector.

Documentation Box:	
Parties should provide detailed explanations on the energy sector in chapter 3: energy (IPCC sector 1) of the national inventory report. Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.	
Documentation box	hous coal. Separate data for this type of coal were not provided by national statistics. 1./1990: The data for calculations are not available in the national statistics of Kazakhstan.

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES AND PRODUCT USE
(Sheet 1 of 2)

Inventory 1990
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2	CH_4	N_2O	HFCs[1]	PFCs[1]	Unspecified mix of HFCs and PFCs[1]	SF_6	NF_3	NO_x	CO	NMVOC	SO_2
	(kt)			CO_2 equivalent (kt)			(kt)					
Total industrial processes	22705,05	1,29	NO,NE,NA	NO,NA	NA,NO	NO,NA	NA,NO	NO,NA	0,46	0,05	3,26	0,00
A. Mineral industry	2901,76								NO	NO	NO	NO
1. Cement production	1015,08											NO
2. Lime production	1489,31											
3. Glass production	NO											
4. Other process uses of carbonates	397,37								NO	NO	NO	NO
B. Chemical industry	1270,42	NO	NO	NO	NO	NO	NO	NO	0,46	0,05	NO	0,00
1. Ammonia production	995,46	NO	NO						0,46	0,05	NO	0,00
2. Nitric acid production			NO						NO			
3. Adipic acid production	NO		NO						NO	NO	NO	
4. Caprolactam, glyoxal and glyoxylic acid production	NO		NO								NO	NO
5. Carbide production	274,96	NO							NO	NO	NO	NO
6. Titanium dioxide production	NO											
7. Soda ash production	NO											
8. Petrochemical and carbon black production	NO	NO							NO	NO	NO	NO
9. Fluorochemical production				NO	NO	NO	NO	NO				
10. Other *(as specified in table 2(I).A-H)*	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C. Metal industry	18530,51	1,29	NO	NO	NO	NO	NO	NO	NO,NA	NO,NA	3,26	NO,NA
1. Iron and steel production	16117,42	0,68							NA	NA	3,26	NA
2. Ferroalloys production	2145,95	0,61							NO	NO	NO	NO
3. Aluminium production	NO				NO		NO		NO	NO	NO	NO
4. Magnesium production	NO			NO	NO	NO	NO		NO	NO	NO	NO
5. Lead production	150,96								NO	NO	NO	NO
6. Zinc production	116,19								NO	NO	NO	NO
7. Other *(as specified in table 2(I).A-H)*	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

[1] The emissions of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), unspecified mix of HFCs and PFCs, and other fluorinated gases are to be expressed as carbon dioxide equivalent emissions. Data on disaggregated emissions of HFCs and PFCs are to be provided in table 2(II).

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES AND PRODUCT USE
(Sheet 2 of 2)

Inventory 1990
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2	CH_4	N_2O	HFCs[1]	PFCs[1]	Unspecified mix of HFCs and PFCs[1]	SF_6	NF_3	NO_x	CO	NMVOC	SO_2
	(kt)			CO_2 equivalent (kt)			(kt)					
D. Non-energy products from fuels and solvent use	2,36	NO,NA	NO,NA						NO,NA	NO,NA	NO,NA	NO,NA
1. Lubricant use	2,36	NA	NA						NA	NA	NA	NA
2. Paraffin wax use	NA	NA	NA						NA	NA	NA	NA
3. Other	NO	NO	NO						NO	NO	NO	NO
E. Electronics industry				NO	NO	NO	NO	NO				
1. Integrated circuit or semiconductor				NO	NO	NO	NO	NO				
2. TFT flat panel display				NO	NO	NO	NO	NO				
3. Photovoltaics				NO	NO	NO	NO	NO				
4. Heat transfer fluid				NO	NO	NO	NO	NO				
5. Other *(as specified in table 2(II))*				NO	NO	NO	NO	NO				
F. Product uses as substitutes for ODS[2]				NO,NA	NO,NA	NO,NA	NO,NA	NO,NA				
1. Refrigeration and air conditioning				NO								
2. Foam blowing agents				NO	NO	NO	NO	NO				
3. Fire protection				NO	NO	NO	NO	NO				
4. Aerosols				NO,NA	NO,NA	NO,NA	NO,NA	NO,NA				
5. Solvents				NO	NO	NO	NO	NO				
6. Other applications				NO	NO	NO	NO	NO				
G. Other product manufacture and use	NO	NO	NO,NE	NO	NO	NO	NO	NO	NO	NO	NO	NO
1. Electrical equipment				NO	NO	NO	NO	NO				
2. SF_6 and PFCs from other product use					NO		NO					
3. N_2O from product uses			NO,NE									
4. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
H. Other (as specified in tables 2(I).A-H and 2(II))[3]	NA	NA	NA	NO,NA	NO,NA	NA	NA	NA	NA	NA	NA	NA

(1) The emissions of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), unspecified mix of HFCs and PFCs, and other fluorinated gases are to be expressed as carbon dioxide equivalent emissions. Data on disaggregated emissions of HFCs and PFCs are to be provided in table
(2) ODS ozone-depleting substances.
(3) Carbon dioxide (CO_2) from food and drink production (e.g. gasification of water) can be of biogenic or non-biogenic origin. Only information on CO_2 emissions of non-biogenic origin should be reported.

Documentation box:	
Parties should provide detailed explanations on the industrial processes sector in chapter 4: industrial processes (CRF sector 2) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.	
Documentation box	ad of the ecology department. For other years recalculation will be made in case of data availability on the carbon balance in the period 1990-2013.

TABLE 3 SECTORAL REPORT FOR AGRICULTURE
(Sheet 1 of 2)

Inventory 1990

Submission 2023 v1

KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2	CH_4	N_2O	NO_x	CO	NMVOC
	(kt)					
3. Total agriculture	104,40	1121,66	52,74	57,76	NO	149,07
I. Livestock		1095,62	14,10			118,81
A. Enteric fermentation		1049,82				
1. Cattle[(1)]		747,70				
Option A:						
Dairy cattle		330,74				
Non-dairy cattle		416,96				
Option B:						
Mature dairy cattle						
Other mature cattle						
Growing cattle						
Option C (country-specific):						
Other *(as specified in table 3(I).A)*						
2. Sheep		255,25				
3. Swine		4,03				
4. Other livestock		42,84				
Buffalo		0,66				
Camels		6,58				
Goats		5,88				
Horses		29,27				
Mules and Asses		0,45				
Other (please specify)		NO				
B. Manure management		45,80	14,10			118,81
1. Cattle[(1)]		22,90	6,08			92,21
Option A:						
Dairy cattle		14,99	2,25			43,76
Non-dairy cattle		7,91	3,83			48,45
Option B:						
Mature dairy cattle						
Other mature cattle						
Growing cattle						
Option C (country-specific):						
Other *(as specified in table 3(I).B)*						
2. Sheep		3,99	1,68			6,75
3. Swine		16,12	2,55			2,22
4. Other livestock		2,79	1,43			17,63
Buffalo		0,06	0,02			0,05
Camels		0,18	NO			0,04
Goats		0,13	0,08			0,64
Horses		1,77	0,24			6,95
Mules and Asses		0,03	0,02			0,07
Poultry		0,60	1,02			9,88
Other (please specify)		0,02	0,05			NE
Rabbit		0,02	0,05			NE
5. Indirect N_2O emissions			2,36			

Note: All footnotes for this table are given at the end of the table on sheet 2.

TABLE 3 SECTORAL REPORT FOR AGRICULTURE
(Sheet 2 of 2)

Inventory 1990
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2	CH_4	N_2O	NO_x	CO	NMVOC
	(kt)					
C. Rice cultivation		26,04				NO
D. Agricultural soils[(2) (3) (4)]		NO	38,64	57,76	NO	30,26
E. Prescribed burning of savannas		NO	NO	NO	NO	NO
F. Field burning of agricultural residues		NO	NO	NO	NO	NO
G. Liming	NO					
H. Urea application	104,40					
I. Other carbon-containing fertilizers	NO					
J. Other *(please specify)*	NO	NO	NO	NO	NO	NO

(1) The sum for cattle would be calculated on the basis of entries made under either option A (dairy and non-dairy cattle), option B (mature dairy cattle, other mature cattle and growing cattle) or option C (other disaggreagtion of cattle categories).

(2) Categories reported under "Agricultural soils" are those reported under table 3.D.

(3) Direct nitrous oxide (N_2O) emissions generated by manure in the system "Pasture, range and paddock" are to be reported under the category "Direct N_2O emissions from managed soils". See also section 10.5 of Volume 4 of the 2006 IPCC Guidelines.

(4) Indirect N_2O emissions generated by manure in the system "Pasture, range and paddock" are to be reported under the category "Indirect N_2O emissions from managed soils". See also section 10.5 of Volume 4 of the 2006 IPCC Guidelines.

Note: The 2006 IPCC Guidelines do not provide methodologies for the calculation of methane (CH_4) emissions and CH_4 and N_2O removals from agricultural soils, or carbon dioxide (CO_2) emissions from prescribed burning of savannas and field burning of agricultural residues. Parties that have estimated such emissions should provide, in the national inventory report (NIR), additional information (activity data and emission factors) used to derive these estimates and include a reference to the section of the NIR in the documentation box of the corresponding Sectoral background data tables.

Documentation box:	
• Parties should provide detailed explanations on the agriculture sector in chapter 5: Agriculture (CRF sector 3) of the NIR. Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.	
• If estimates are reported under category 3(II).H.Other, use this documentation box to provide information regarding activities covered under this category and to provide reference to the section in the NIR where background information can be found.	
Documentation box	ne: Average annual population of livestock was used, explanation is shown in section 5.5 of the NIR3.A.4 Goats Goats: Average annual population of livestock was used, explanation is shown in section 5.5 of the NIR

TABLE 4 SECTORAL REPORT FOR LAND USE, LAND-USE CHANGE AND FORESTRY
(Sheet 1 of 1)

Inventory 1990
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals[(1), (2)]	CH_4[(2)]	N_2O[(2)]	NO_x	CO	NMVOC
	(kt)					
4. Total LULUCF	-15183,06	0,54	1,19	0,92	16,71	4,62
A. Forest land	-13808,25	0,07	1,15	0,12	3,38	0,31
1. Forest land remaining forest land	-13808,25	0,07	1,15	0,12	3,38	0,31
2. Land converted to forest land	NO,IE	NO,IE	NO,IE	NO	NO	NO
B. Cropland	5201,90	NO,IE	NO,IE	NO	NO	NO
1. Cropland remaining cropland	5201,90	NO,IE	NO,IE	NO	NO	NO
2. Land converted to cropland	NO	NO	NO,IE	NO	NO	NO
C. Grassland	-6580,97	0,47	0,04	0,80	13,33	4,31
1. Grassland remaining grassland	-6580,97	0,47	0,04	0,80	13,33	4,31
2. Land converted to grassland	NO,IE	NO	NO	NO	NO	NO
D. Wetlands[(3)]	4,25	NO,IE,NA	NO,IE,NA	NO	NO	NO
1. Wetlands remaining wetlands	NO,NE,NA	NO,IE	NO,IE	NO	NO	NO
2. Land converted to wetlands	4,25	NO	NO	NO	NO	NO
E. Settlements	NO,NE,IE,NA	NO	NO	NO	NO	NO
1. Settlements remaining settlements	NO	NO	NO	NO	NO	NO
2. Land converted to settlements	NO,NE,IE,NA	NO	NO	NO	NO	NO
F. Other land [(4)]	NO	NO	NO	NO	NO	NO
1. Other land remaining other land						
2. Land converted to other land	NO	NO	NO	NO	NO	NO
G. Harvested wood products [(5)]	NO,IE					
H. Other ***(please specify)***	NO	NO	NO	NO	NO	NO

(1) For the purposes of reporting, the signs for removals are always negative (–) and for emissions positive (+).
(2) For each land-use category and subcategory, this table sums the net carbon dioxide (CO_2) emissions and removals shown in tables 4.A to 4.F, and the CO_2, methane (CH_4) and nitrous oxide (N_2O) emissions shown in
(3) Parties may decide not to prepare estimates for CH4 emissions from flooded land contained in Appendix 3 of volume 4 of the 2006 IPCC Guidelines, although they may do so if they wish.
(4) This category includes bare soil, rock, ice, and all land areas that do not fall into any of the other five categories. It allows the total of identified land areas to match the national area.
(5) Non-CO_2 emissions from HWP are covered in the energy sector or waste sector.

Documentation box:
• Parties should provide detailed explanations on the land use, land-use change and forestry sector in chapter 6: Land Use, Land-Use Change and Forestry (CRF sector 4) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.

• If estimates are reported under the category 4.H. Other, use this documentation box to provide information regarding activities covered under this category and to provide a reference to the section in the NIR where background information can be found.

Documentation box	board: 4.G.A HWP in SWDS: Carbon stock change not include in CRF tables. Comment is shown in ch. 7 of NIR

TABLE 5 SECTORAL REPORT FOR WASTE
(Sheet 1 of 1)

Inventory 1990
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [(1)]	CH_4	N_2O	NO_x	CO	NMVOC	SO_2
	(kt)						
Total waste	NO	142,99	0,89	NO,NE	NO,NE	0,09	NO,NE
A. Solid waste disposal	NO	60,62		NO,NE	NO,NE	NO,NE	
1. Managed waste disposal sites	NO	1,81		NE	NE	NE	
2. Unmanaged waste disposal sites	NO	58,81		NE	NE	NE	
3. Uncategorized waste disposal sites	NO	NO		NO	NO	NO	
B. Biological treatment of solid waste		NO	NO	NE,NO	NE,NO	NE,NO	
1. Composting		NO	NO	NO	NO	NO	
2. Anaerobic digestion at biogas facilities		NO	NO	NE	NE	NE	
C. Incineration and open burning of waste	NO	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE
1. Waste incineration	NO	NO	NO	NO	NO	NO	NO
2. Open burning of waste	NO	NO,NE	NO,NE	NE	NE	NE	NE
D. Wastewater treatment and discharge		82,37	0,89	NO	NO	0,09	
1. Domestic wastewater		53,77	0,89	NO	NO	0,09	
2. Industrial wastewater		28,60	NE	NO	NO	NO	
3. Other *(as specified in table 5.D)*		NO	NO	NO	NO	NO	
E. Other *(please specify)*	NO	NO	NO	NO	NO	NO	NO
Memo item: [(2)]							
Long-term storage of C in waste disposal sites	NO						
Annual change in total long-term C storage	NO						
Annual change in total long-term C storage in HWP waste [(3)]	NO						

(1) CO_2 emissions from the categories solid waste disposal on land and waste incineration should only be included if they derive from non-biological or inorganic waste sources.

(2) Long-term storage of carbon in waste disposal sites, Annual change in total long-term storage of carbon stored and Annual change in long-term storage of carbon in HWP waste should be entered as carbon dioxide (CO_2).

(3) Carbon stored in wood, paper, cardboard, garden and park waste (equals to the annual change in stocks of harvested wood products in solid waste disposal sites from consumption, second activity data in the table for harvested wood products).

Documentation box:
• If estimates are reported under 5.E Other, use this documentation box to provide information regarding activities covered under this category and to provide reference to the section in the NIR where background information can be found.

Documentation box	age system. According to IPCC 2006, Volume 5, p 6.11, CH4 emissions from industrial wastewater and sludge are estimated together.

SUMMARY 1.A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES
(Sheet 1 of 3)

Inventory 1990
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs(1)	PFCs(1)	Unspecified mix of HFCs and PFCs(1)	SF_6	NF_3	NO_x	CO	NMVOC	SO_2
	(kt)			(kt CO_2 equivalent)			(kt)					
Total national emissions and removals	253001,42	3798,29	60,45	NO,NA	NA,NO	NO,NA	NA,NO	NO,NA	58301,01	461778,87	55892,12	1083,83
1. Energy	245375,03	2531,81	5,63						58241,88	461762,12	55735,08	1083,83
A. Fuel combustion Reference approach(2)	267276,52											
Sectoral approach(2)	238899,46	61,49	5,57						58241,88	461762,12	55735,08	1083,83
1. Energy industries	141770,89	2,28	1,81						423,94	32,68	8,29	711,54
2. Manufacturing industries and construction	18763,85	1,39	0,22						57,69	20,14	2,96	106,11
3. Transport	21580,90	6,76	2,67						57587,13	460677,64	55610,23	39,94
4. Other sectors	47904,69	50,05	0,77						163,66	921,57	102,50	197,07
5. Other	8879,13	1,02	0,10						9,46	110,08	11,10	29,17
B. Fugitive emissions from fuels	6475,57	2470,31	0,06						NO,NA	NO,NA	NO,NA	NO,NA
1. Solid fuels	2156,14	1255,87	0,03						NO	NO	NO	NO
2. Oil and natural gas and other emissions from energy production	4319,43	1214,44	0,03						NO,NA	NO,NA	NO,NA	NO,NA
C. CO_2 Transport and storage	NO,NA											
2. Industrial processes and product use	22705,05	1,29	NO,NE,NA	NO,NA	NA,NO	NO,NA	NA,NO	NO,NA	0,46	0,05	3,26	0,00
A. Mineral industry	2901,76								NO	NO	NO	NO
B. Chemical industry	1270,42	NO	NO	NO	NO	NO	NO	NO	0,46	0,05	NO	0,00
C. Metal industry	18530,51	1,29	NO	NO	NO	NO	NO	NO	NO,NA	NO,NA	3,26	NO,NA
D. Non-energy products from fuels and solvent use	2,36	NO,NA	NO,NA						NO,NA	NO,NA	NO,NA	NO,NA
E. Electronic industry				NO	NO	NO	NO	NO				
F. Product uses as substitutes for ODS				NO,NA	NO,NA	NO,NA	NO,NA	NO,NA				
G. Other product manufacture and use	NO	NO	NO,NE	NO	NO	NO	NO	NO	NO	NO	NO	NO
H. Other(3)	NA	NA	NA	NO,NA	NO,NA	NA	NA	NA	NA	NA	NA	NA

Note: All footnotes for this table are given at the end of the table on sheet 3.

SUMMARY 1.A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES
(Sheet 2 of 3)

Inventory 1990
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2	CH_4	N_2O	HFCs [1]	PFCs[1]	Unspecified mix of HFCs	SF_6	NF_3	NO_x	CO	NMVOC	SO_2
	(kt)			(kt CO_2 equivalent)			(kt)					
3. Agriculture	104,40	1121,66	52,74						57,76	NO	149,07	NO
A. Enteric fermentation		1049,82										
B. Manure management		45,80	14,10								118,81	
C. Rice cultivation		26,04									NO	
D. Agricultural soils		NO	38,64						57,76	NO	30,26	
E. Prescribed burning of savannas		NO	NO						NO	NO	NO	
F. Field burning of agricultural residues		NO	NO						NO	NO	NO	
G. Liming	NO											
H. Urea application	104,40											
I. Other carbon-contining fertilizers	NO											
J. Other	NO	NO	NO						NO	NO	NO	NO
4. Land use, land-use change and forestry [4]	-15183,06	0,54	1,19						0,92	16,71	4,62	NO
A. Forest land [4]	-13808,25	0,07	1,15						0,12	3,38	0,31	
B. Cropland [4]	5201,90	NO,IE	NO,IE						NO	NO	NO	
C. Grassland [4]	-6580,97	0,47	0,04						0,80	13,33	4,31	
D. Wetlands [4]	4,25	NO,IE,NA	NO,IE,NA						NO	NO	NO	
E. Settlements [4]	NO,NE,IE,NA	NO	NO						NO	NO	NO	
F. Other land [4]	NO	NO	NO						NO	NO	NO	
G. Harvested wood products	NO,IE											
H. Other [4]	NO	NO	NO						NO	NO	NO	NO
5. Waste	NO	142,99	0,89						NO,NE	NO,NE	0,09	NO,NE
A. Solid waste disposal [5]	NO	60,62							NO,NE	NO,NE	NO,NE	
B. Biological treatment of solid waste [5]		NO	NO						NE,NO	NE,NO	NE,NO	
C. Incineration and open burning of waste [5]	NO	NO,NE	NO,NE						NO,NE	NO,NE	NO,NE	NO,NE
D. Wastewater treatment and discharge		82,37	0,89						NO	NO	0,09	
E. Other [5]	NO	NO	NO						NO	NO	NO	NO
6. Other ***(please specify)*** [6]	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Note: All footnotes for this table are given at the end of the table on sheet 3.

SUMMARY 1.A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 3 of 3)

Inventory 1990
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs[1]	PFCs[1]	Unspecified mix of HFCs and PFCs[1]	SF_6	NF_3	NO_x	CO	NMVOC	SO_2
	(kt)			(kt CO_2 equivalent)					(kt)			
Memo items:[7]												
International bunkers	666,08	0,01	0,02						NO	NO	NO	NO
Aviation	576,45	0,00	0,02						NO	NO	NO	NO
Navigation	89,63	0,01	0,00						NO	NO	NO	NO
Multilateral operations	NA	NA	NA						NA	NA	NA	NA
CO_2 emissions from biomass	1166,88											
CO_2 captured	NO,IE,NA											
Long-term storage of C in waste disposal sites	NO											
Indirect N_2O			NO,NE,NA									
Indirect CO_2	NO,NE,NA											

(1) The emissions of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), unspecified mix of HFCs and PFCs and other fluorinated gases are to be expressed as carbon dioxide (CO_2) equivalent emissions. Data on disaggregated emissions of

(2) For verification purposes, Parties are requested to report the results of their calculations using the Reference approach and to explain any differences with the Sectoral approach in the documentation box to table 1.A(c). For estimating national

(3) 2.H. Other includes pulp and paper and food and beverages industry.

(4) For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(5) CO_2 from categories solid waste disposal on land and waste incineration should only be included if it stems from non-biogenic or inorganic waste streams. Only emissions from waste incineration without energy recovery are to be reported in the waste sector, whereas emissions from incineration with energy recovery are to be reported in the energy sector.

(6) If reporting any country-specific category under sector "6. Other", detailed explanations should be provided in Chapter 8: Other (CRF sector 6) of the national inventory report (NIR).

(7) Parties are asked to report emissions from international aviation and international navigation and multilateral operations, as well as CO_2 emissions from biomass and CO_2 captured, under Memo Items. These emissions should not be included in the national total emissions from the energy sector. Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO_2 emissions are accounted for as a loss of biomass stocks in the Land Use, Land-use Change and Forestry sector.

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 1990
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [(1)]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[(1)]	253001,42	94957,22	18014,30	NO,NA	NA,NO	NA,NO	NO,NA	NO,NA	365972,94
1. Energy	245375,03	63295,21	1678,31						310348,54
A. Fuel combustion (sectoral approach)	238899,46	1537,36	1660,90						242097,73
1. Energy industries	141770,89	56,93	540,80						142368,62
2. Manufacturing industries and construction	18763,85	34,64	64,44						18862,92
3. Transport	21580,90	169,00	796,12						22546,02
4. Other sectors	47904,69	1251,19	230,61						49386,50
5. Other	8879,13	25,61	28,94						8933,67
B. Fugitive emissions from fuels	6475,57	61757,84	17,40						68250,82
1. Solid fuels	2156,14	31396,72	8,80						33561,66
2. Oil and natural gas	4319,43	30361,12	8,60						34689,16
C. CO_2 transport and storage	NO,NA								NO,NA
2. Industrial processes and product use	22705,05	32,35	NO,NE,NA	NO,NA	NA,NO	NA,NO	NO,NA	NO,NA	22737,40
A. Mineral industry	2901,76								2901,76
B. Chemical industry	1270,42	NO	NO	NO	NO	NO	NO	NO	1270,42
C. Metal industry	18530,51	32,35	NO	NO	NO	NO	NO	NO	18562,87
D. Non-energy products from fuels and solvent use	2,36	NO,NA	NO,NA						2,36
E. Electronic Industry				NO	NO	NO	NO	NO	NO
F. Product uses as ODS substitutes				NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
G. Other product manufacture and use	NO	NO	NO,NE	NO	NO	NO	NO	NO	NO,NE
H. Other	NA	NA	NA	NO,NA	NO,NA	NA	NA	NA	NO,NA
3. Agriculture	104,40	28041,41	15715,14						43860,95
A. Enteric fermentation		26245,50							26245,50
B. Manure management		1144,91	4200,42						5345,33
C. Rice cultivation		651,00							651,00
D. Agricultural soils		NO	11514,72						11514,72
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		NO	NO						NO
G. Liming	NO								NO
H. Urea application	104,40								104,40
I. Other carbon-containing fertilizers	NO								NO
J. Other	NO	NO	NO						NO
4. Land use, land-use change and forestry[(1)]	-15183,06	13,50	355,63						-14813,93
A. Forest land	-13808,25	1,75	343,71						-13462,79
B. Cropland	5201,90	NO,IE	NO,IE						5201,90
C. Grassland	-6580,97	11,75	11,92						-6557,30
D. Wetlands	4,25	NO,IE,NA	NO,IE,NA						4,25
E. Settlements	NO,NE,IE,NA	NO	NO						NO,NE,IE,NA
F. Other land	NO	NO	NO						NO
G. Harvested wood products	NO,IE								NO,IE
H. Other	NO	NO	NO						NO
5. Waste	NO	3574,75	265,22						3839,97
A. Solid waste disposal	NO	1515,50							1515,50
B. Biological treatment of solid waste		NO	NO						NO
C. Incineration and open burning of waste	NO	NO,NE	NO,NE						NO,NE
D. Waste water treatment and discharge		2059,25	265,22						2324,47
E. Other	NO	NO	NO						NO
6. Other *(as specified in summary 1.A)*	NO	NO	NO	NO	NO	NO	NO	NO	NO

Memo items:[(2)]									
International bunkers	666,08	0,31	5,53						671,92
Aviation	576,45	0,10	4,81						581,36
Navigation	89,63	0,21	0,72						90,56
Multilateral operations	NA	NA	NA						NA
CO_2 emissions from biomass	1166,88								1166,88
CO_2 captured	NO,IE,NA								NO,IE,NA
Long-term storage of C in waste disposal sites	NO								NO
Indirect N_2O			NO,NE,NA						
Indirect CO_2 [(3)]	NO,NE,NA								
Total CO_2 equivalent emissions without land use, land-use change and forestry									380786,87
Total CO_2 equivalent emissions with land use, land-use change and forestry									365972,94
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									NA
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									NA

(1) For carbon dioxide (CO_2) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive

(2) See footnote 7 to table Summary 1.A.

(3) In accordance with the UNFCCC Annex I inventory reporting guidelines, for Parties that decide to report indirect CO_2, the national totals shall be provided with and without indirect CO_2.

SUMMARY 3 SUMMARY REPORT FOR METHODS AND EMISSION FACTORS USED
(Sheet 1 of 2)

Inventory 1990
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2		CH_4		N_2O		HFCs		PFCs		SF_6		Unspecified mix of HFCs and PFCs		NF_3	
	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor
1. Energy	T1,T2	CS,D	T1,T2	CS,D	T1,T2	D										
A. Fuel combustion	T1,T2	D	T1,T2	D	T1,T2	D										
1. Energy industries	T1	D	T1	D	T1	D										
2. Manufacturing industries and construction	T1	D	T1	D	T1	D										
3. Transport	T1,T2	D	T1,T2	D	T1,T2	D										
4. Other sectors	T1	D	T1	D	T1	D										
5. Other	T1	D	T1	D	T1	D										
B. Fugitive emissions from fuels	T1	CS,D	T1	CS,D	T1	D										
1. Solid fuels	T1	CS,D	T1	D	T1	D										
2. Oil and natural gas	T1	D	T1	CS,D	T1	D										
C. CO_2 transport and storage																
2. Industrial processes	T1,T2	CS,D	D	D												
A. Mineral industry	T1,T2	CS,D														
B. Chemical industry	T2	CS														
C. Metal industry	T1,T2	CS,D	D	D												
D. Non-energy products from fuels and solvent use	T1	D														
E. Electronic industry																
F. Product uses as ODS substitutes																
G. Other product manufacture and use																
H. Other																

Use the following notation keys to specify the method applied:

D (IPCC default) **T1a, T1b, T1c** (IPCC Tier 1a, Tier 1b and Tier 1c, respectively) **CR** (CORINAIR) **M** (model)
RA (Reference Approach) **T2** (IPCC Tier 2) **CS** (Country Specific)
T1 (IPCC Tier 1) **T3** (IPCC Tier 3) **OTH** (Other)

If using more than one method within one source category, list all the relevant methods. Explanations regarding country-specific methods, other methods or any modifications to the default IPCC methods, as well as information regarding the use of different methods per source category where more than one method is indicated, should be provided in the documentation box. Also use the documentation box to explain the use of notation OTH.

Use the following notation keys to specify the emission factor used:

D (IPCC default) **CS** (Country Specific) **OTH** (Other)
CR (CORINAIR) **PS** (Plant Specific) **M** (model)

Where a mix of emission factors has been used, list all the methods in the relevant cells and give further explanations in the documentation box. Also use the documentation box to explain the use of notation OTH.

SUMMARY 3 SUMMARY REPORT FOR METHODS AND EMISSION FACTORS USED
(Sheet 2 of 2)

Inventory 1990
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2		CH_4		N_2O		HFCs		PFCs		SF_6		Unspecified mix of HFCs and PFCs		NF_3	
	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor
3. Agriculture	T1	D	T1,T2	CS,D	T1,T2	CS,D										
A. Enteric fermentation			T1,T2	CS,D												
B. Manure management			T1,T2	CS,D	T1,T2	CS,D										
C. Rice cultivation			T1	D												
D. Agricultural soils[3]					T1,T2	CS,D										
E. Prescribed burning of savannas																
F. Field burning of agricultural residues																
G. Liming																
H. Urea application	T1	D														
I. Other carbon-containing fertilizers																
J. Other																
4. Land use, land-use change and forestry	T1,T2	CS	T1,T2	D	T1,T2	D										
A. Forest land	T2	CS	T2	D	T2	D										
B. Cropland	T2	CS														
C. Grassland	T2	CS	T1	D	T1	D										
D. Wetlands	T1	CS														
E. Settlements																
F. Other land																
G. Harvested wood products																
H. Other																
5. Waste			M,T1	D,M	T1	D										
A. Solid waste disposal			M	M												
B. Biological treatment of solid waste																
C. Incineration and open burning of waste																
D. Waste water treatment and discharge			T1	D	T1	D										
E. Other																
6. Other ***(as specified in summary 1.A)***																

Use the following notation keys to specify the method applied:

D (IPCC default) **T1a, T1b, T1c** (IPCC Tier 1a, Tier 1b and Tier 1c, respectively) **CR** (CORINAIR) **M** (model)
RA (Reference Approach) **T2** (IPCC Tier 2) **CS** (Country Specific)
T1 (IPCC Tier 1) **T3** (IPCC Tier 3) **OTH** (Other)

If using more than one method within one source category, list all the relevant methods. Explanations regarding country-specific methods, other methods or any modifications to the default IPCC methods, as well as information regarding the use of different methods per source category where more than one method is indicated, should be provided in the documentation box. Also use the documentation box to explain the use of notation OTH.

Use the following notation keys to specify the emission factor used:

D (IPCC default) **CS** (Country Specific) **OTH** (Other)
CR (CORINAIR) **PS** (Plant Specific) **M** (model)

Where a mix of emission factors has been used, list all the methods in the relevant cells and give further explanations in the documentation box. Also use the documentation box to explain the use of notation OTH.

Documentation box:

• Parties should provide the full information on methodological issues, such as methods and emission factors used, in the relevant sections of chapters 3 to 8 (see section 2.2 of each of Chapters 3 - 8) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and further details are needed to understand the content of this table.

• Where a mix of methods/emission factors has been used within one source category, use this documentation box to specify those methods/emission factors for the various sub-sources where they have been applied.
• Where the notation OTH (Other) has been entered in this table, use this documentation box to specify those other methods/emission factors.

Documentation box	

TABLE 6 CROSS-SECTORAL REPORT: Indirect emissions of N_2O and CO_2
(Sheet 1 of 1)

Inventory 1990
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	SOURCE EMISSIONS					INDIRECT EMISSIONS	
	CH_4	CO	NMVOC	NOx	NH_3	CO_2 (1)	N_2O (2)
	(kt)					(kt)	
Total	3798,29	461778,87	55892,12	58301,01	NO,NE,NA	NO,NE,NA	NO,NE,NA
1. Energy	2531,81	461762,12	55735,08	58241,88	NE	NE	NE
2. Industrial processes and product use	1,29	0,05	3,26	0,46	NA	NA	NA
3. Agriculture (3)	1121,66	NO	149,07	57,76		NO	NO
4. LULUCF (3)	0,54	16,71	4,62	0,92		NO	NO
5. Waste	142,99	NO,NE	0,09	NO,NE	NO	NA	NA
6. Other *(please specify)*	NO	NO	NO	NO	NO	NO	NO

(1) Parties may report indirect CO_2 from the atmospheric oxidation of CH_4, CO and NMVOCs.

(2) Parties may report indirect emissions of N_2O from sources other than agriculture and LULUCF.

(3) Indirect emissions of N_2O resulting from ammonia emissions are covered in the sectoral tables for agriculture and LULUCF. In this table, only indirect N_2O emissions

TABLE 7 SUMMARY OVERVIEW FOR KEY CATEGORIES [(1)]
(Sheet 1 of 1)

Inventory 1990
Submission 2023 v1
KAZAKHSTAN

KEY CATEGORIES OF EMISSIONS AND REMOVALS	Gas	Criteria used for key source identification		Key category excluding LULUCF	Key category including LULUCF
		L	T		
1.A.1 Fuel combustion - Energy Industries - Liquid Fuels	CO2	X		X	X
1.A.1 Fuel combustion - Energy Industries - Liquid Fuels	CH4				
1.A.1 Fuel combustion - Energy Industries - Liquid Fuels	N2O				
1.A.1 Fuel combustion - Energy Industries - Solid Fuels	CO2	X		X	X
1.A.1 Fuel combustion - Energy Industries - Solid Fuels	CH4				
1.A.1 Fuel combustion - Energy Industries - Solid Fuels	N2O				
1.A.1 Fuel combustion - Energy Industries - Gaseous Fuels	CO2	X		X	X
1.A.1 Fuel combustion - Energy Industries - Gaseous Fuels	CH4				
1.A.1 Fuel combustion - Energy Industries - Gaseous Fuels	N2O				
1.A.1 Fuel combustion - Energy Industries - Other Fossil Fuels	CO2	X		X	X
1.A.1 Fuel combustion - Energy Industries - Other Fossil Fuels	CH4				
1.A.1 Fuel combustion - Energy Industries - Other Fossil Fuels	N2O				
1.A.1 Fuel combustion - Energy Industries - Peat	CO2				
1.A.1 Fuel combustion - Energy Industries - Peat	CH4				
1.A.1 Fuel combustion - Energy Industries - Peat	N2O				
1.A.1 Fuel combustion - Energy Industries - Biomass	CH4				
1.A.1 Fuel combustion - Energy Industries - Biomass	N2O				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Liquid Fuels	CO2	X		X	X
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Liquid Fuels	CH4				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Liquid Fuels	N2O				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Solid Fuels	CO2	X		X	X
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Solid Fuels	CH4				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Solid Fuels	N2O				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Gaseous Fuels	CO2	X		X	X
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Gaseous Fuels	CH4				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Gaseous Fuels	N2O				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Other Fossil Fuels	CO2				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Other Fossil Fuels	CH4				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Other Fossil Fuels	N2O				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Peat	CO2				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Peat	CH4				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Peat	N2O				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Biomass	CH4				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Biomass	N2O				
1.A.3.a Domestic Aviation	CO2				
1.A.3.a Domestic Aviation	CH4				
1.A.3.a Domestic Aviation	N2O				
1.A.3.b Road Transportation	CO2	X		X	X
1.A.3.b Road Transportation	CH4				
1.A.3.b Road Transportation	N2O				
1.A.3.c Railways	CO2	X		X	X
1.A.3.c Railways	CH4				
1.A.3.c Railways	N2O				
1.A.3.d Domestic Navigation - Liquid Fuels	CO2				
1.A.3.d Domestic Navigation - Liquid Fuels	CH4				
1.A.3.d Domestic Navigation - Liquid Fuels	N2O				
1.A.3.d Domestic Navigation - Gaseous Fuels	CO2				
1.A.3.d Domestic Navigation - Gaseous Fuels	CH4				
1.A.3.d Domestic Navigation - Gaseous Fuels	N2O				
1.A.3.d Domestic Navigation - Other Fossil Fuels	CO2				
1.A.3.d Domestic Navigation - Other Fossil Fuels	CH4				
1.A.3.d Domestic Navigation - Other Fossil Fuels	N2O				
1.A.3.d Domestic Navigation - Biomass Fuels	CH4				
1.A.3.d Domestic Navigation - Biomass Fuels	N2O				
1.A.3.e Other Transportation	CO2				
1.A.3.e Other Transportation	CH4				
1.A.3.e Other Transportation	N2O				
1.A.4 Other Sectors - Liquid Fuels	CO2	X		X	X
1.A.4 Other Sectors - Liquid Fuels	CH4				
1.A.4 Other Sectors - Liquid Fuels	N2O				
1.A.4 Other Sectors - Solid Fuels	CO2	X		X	X
1.A.4 Other Sectors - Solid Fuels	CH4				
1.A.4 Other Sectors - Solid Fuels	N2O				
1.A.4 Other Sectors - Gaseous Fuels	CO2	X		X	X
1.A.4 Other Sectors - Gaseous Fuels	CH4				
1.A.4 Other Sectors - Gaseous Fuels	N2O				
1.A.4 Other Sectors - Other Fossil Fuels	CO2				
1.A.4 Other Sectors - Other Fossil Fuels	CH4				
1.A.4 Other Sectors - Other Fossil Fuels	N2O				
1.A.4 Other Sectors - Peat	CO2				
1.A.4 Other Sectors - Peat	CH4				
1.A.4 Other Sectors - Peat	N2O				
1.A.4 Other Sectors - Biomass	CH4				
1.A.4 Other Sectors - Biomass	N2O				
1.A.5 Other (Not specified elsewhere) - Liquid Fuels	CO2				
1.A.5 Other (Not specified elsewhere) - Liquid Fuels	CH4				
1.A.5 Other (Not specified elsewhere) - Liquid Fuels	N2O				
1.A.5 Other (Not specified elsewhere) - Solid Fuels	CO2	X		X	X
1.A.5 Other (Not specified elsewhere) - Solid Fuels	CH4				
1.A.5 Other (Not specified elsewhere) - Solid Fuels	N2O				
1.A.5 Other (Not specified elsewhere) - Gaseous Fuels	CO2	X		X	X
1.A.5 Other (Not specified elsewhere) - Gaseous Fuels	CH4				
1.A.5 Other (Not specified elsewhere) - Gaseous Fuels	N2O				
1.A.5 Other (Not specified elsewhere) - Other Fossil Fuels	CO2				
1.A.5 Other (Not specified elsewhere) - Other Fossil Fuels	CH4				
1.A.5 Other (Not specified elsewhere) - Other Fossil Fuels	N2O				
1.A.5 Other (Not specified elsewhere) - Peat	CO2				
1.A.5 Other (Not specified elsewhere) - Peat	CH4				
1.A.5 Other (Not specified elsewhere) - Peat	N2O				
1.A.5 Other (Not specified elsewhere) - Biomass	CH4				
1.A.5 Other (Not specified elsewhere) - Biomass	N2O				
1.B.1 Fugitive emissions from Solid Fuels	CO2	X		X	X
1.B.1 Fugitive emissions from Solid Fuels	CH4	X		X	X
1.B.2.a Fugitive Emissions from Fuels - Oil and Natural Gas - Oil	CO2				
1.B.2.a Fugitive Emissions from Fuels - Oil and Natural Gas - Oil	CH4	X		X	X
1.B.2.b Fugitive Emissions from Fuels - Oil and Natural Gas - Natural Gas	CO2				
1.B.2.b Fugitive Emissions from Fuels - Oil and Natural Gas - Natural Gas	CH4	X		X	X
1.B.2.c Fugitive Emissions from Fuels - Venting and flaring	CO2	X		X	X
1.B.2.c Fugitive Emissions from Fuels - Venting and flaring	CH4				
1.B.2.c Fugitive Emissions from Fuels - Venting and flaring	N2O				
1.B.2.d Fugitive Emissions from Fuels - Other	CO2				
1.B.2.d Fugitive Emissions from Fuels - Other	CH4				
1.B.2.d Fugitive Emissions from Fuels - Other	N2O				
1.C CO2 Transport and Storage	CO2				
2.A.1 Cement Production	CO2				
2.A.2 Lime Production	CO2				
2.A.3 Glass Production	CO2				
2.A.4 Other Process Uses of Carbonates	CO2				
2.B.1 Ammonia Production	CO2				
2.B.1 Ammonia Production	CH4				
2.B.1 Ammonia Production	N2O				
2.B.2 Nitric Acid Production	N2O				
2.B.3 Adipic Acid Production	CO2				
2.B.3 Adipic Acid Production	N2O				
2.B.4 Caprolactam, Glyoxal and Glyoxylic Acid Production	CO2				
2.B.4 Caprolactam, Glyoxal and Glyoxylic Acid Production	N2O				
2.B.5 Carbide Production	CO2				

2.B.5 Carbide Production	CH4				
2.B.6 Titanium Dioxide Production	CO2				
2.B.7 Soda Ash Production	CO2				
2.B.8 Petrochemical and Carbon Black Production	CO2				
2.B.8 Petrochemical and Carbon Black Production	CH4				
2.B.9 Fluorochemical Production	Aggregate F-gases				
2.B.10 Other	CO2				
2.B.10 Other	CH4				
2.B.10 Other	N2O				
2.B.10 Other	Aggregate F-gases				
2.C.1 Iron and Steel Production	CO2	X		X	X
2.C.1 Iron and Steel Production	CH4				
2.C.2 Ferroalloys Production	CO2	X		X	X
2.C.2 Ferroalloys Production	CH4				
2.C.3 Aluminium Production	CO2				
2.C.3 Aluminium Production	PFCs				
2.C.3 Aluminium Production	SF6				
2.C.4 Magnesium Production	CO2				
2.C.4 Magnesium Production	HFCs				
2.C.4 Magnesium Production	PFCs				
2.C.4 Magnesium Production	SF6				
2.C.4 Magnesium Production	nspecified mix of HFCs and PFCs				
2.C.5 Lead Production	CO2				
2.C.6 Zinc Production	CO2				
2.C.7 Other	CO2				
2.C.7 Other	CH4				
2.C.7 Other	N2O				
2.C.7 Other	Aggregate F-gases				
2.D Non-energy Products from Fuels and Solvent Use	CO2				
2.D Non-energy Products from Fuels and Solvent Use	CH4				
2.D Non-energy Products from Fuels and Solvent Use	N2O				
2.E Electronics Industry	Aggregate F-gases				
2.F.1 Refrigeration and Air conditioning	Aggregate F-gases				
2.F.2 Foam Blowing Agents	Aggregate F-gases				
2.F.3 Fire Protection	Aggregate F-gases				
2.F.4 Aerosols	Aggregate F-gases				
2.F.5 Solvents	Aggregate F-gases				
2.F.6 Other Applications	Aggregate F-gases				
2.G Other Product Manufacture and Use	CO2				
2.G Other Product Manufacture and Use	CH4				
2.G Other Product Manufacture and Use	N2O				
2.G Other Product Manufacture and Use	Aggregate F-gases				
2.H Other	CO2				
2.H Other	CH4				
2.H Other	N2O				
2.H Other	Aggregate F-gases				
3.A Enteric Fermentation	CH4	X		X	X
3.B Manure Management	CH4				
3.B Manure Management	N2O	X		X	X
3.C Rice Cultivation	CH4				
3.D Agricultural Soils	CH4				
3.D.1 Direct N2O Emissions From Managed Soils	N2O	X		X	X
3.D.2 Indirect N2O Emissions From Managed Soils	N2O				
3.E Prescribed burning of savannas	CH4				
3.E Prescribed burning of savannas	N2O				
3.F Field burning of agricultural residues	CH4				
3.F Field burning of agricultural residues	N2O				
3.G Liming	CO2				
3.H Urea Application	CO2				
3.I. Other carbon-containing fertlizers	CO2				
3.J. Other	CO2				
3.J. Other	CH4				
3.J. Other	N2O				
4.A.1 Forest Land Remaining Forest Land	CO2	X			X
4.A.2 Land Converted to Forest Land	CO2				
4.B.1 Cropland Remaining Cropland	CO2	X			X
4.B.2 Land Converted to Cropland	CO2				
4.C.1 Grassland Remaining Grassland	CO2	X			X
4.C.2 Land Converted to Grassland	CO2				
4.D.1.1 Peat Extraction Remaining Peat Extraction	CO2				
4.D.1.2 Flooded Land Remaining Flooded Land	CO2				
4.D.1.3 Other Wetlands Remaining Other Wetlands	CO2				
4.D.2 Land Converted to Wetlands	CO2				
4.E.1 Settlements Remaining Settlements	CO2				
4.E.2 Land Converted to Settlements	CO2				
4.F.1 Other Land Remaining Other Land	CO2				
4.F.2 Land Converted to Other Land	CO2				
4.G Harvested Wood Products	CO2				
4(I). Direct N2O emissions from N inputs to managed soils	N2O				
4(II). Emissions and removals from drainage and rewetting and other management of orga	CO2				
4(II). Emissions and removals from drainage and rewetting and other management of orga	CH4				
4(II). Emissions and removals from drainage and rewetting and other management of orga	N2O				
4(III).Direct N2O emissions from N mineralization/immobilization	N2O				
4(IV) Indirect N2O Emissions from Managed Soils	N2O				
4(V) Biomass Burning	CO2				
4(V) Biomass Burning	CH4				
4(V) Biomass Burning	N2O				
4.H Other	CO2				
4.H Other	CH4				
4.H Other	N2O				
5.A Solid Waste Disposal	CH4				
5.A Solid Waste Disposal	CO2				
5.B Biological Treatment of Solid Waste	CH4				
5.B Biological Treatment of Solid Waste	N2O				
5.C Incineration and Open Burning of Waste	CO2				
5.C Incineration and Open Burning of Waste	CH4				
5.C Incineration and Open Burning of Waste	N2O				
5.D Wastewater Treatment and Discharge	CH4	X		X	X
5.D Wastewater Treatment and Discharge	N2O				
5.E Other	CO2				
5.E Other	CH4				
5.E Other	N2O				
6. Other	CO2				
6. Other	CH4				
6. Other	N2O				
6. Other	Aggregate F-gases				

Note: L = Level assessment; T = Trend assessment.

(1) This table is filled automatically based on the IPCC Tier 1 methodology.

TABLE 8 RECALCULATION - RECALCULATED DATA
(Sheet 1 of 4)

Recalculated year: Inventory 1990
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2						CH_4						N_2O					
	Previous submission	Latest submission	Difference	Difference(1)	Impact of recalculation on total emissions excluding LULUCF(2)	Impact of recalculation on total emissions including LULUCF(3)	Previous submission	Latest submission	Difference	Difference(1)	Impact of recalculation on total emissions excluding LULUCF(2)	Impact of recalculation on total emissions including LULUCF(3)	Previous submission	Latest submission	Difference	Difference(1)	Impact of recalculation on total emissions excluding LULUCF(2)	Impact of recalculation on total emissions including LULUCF(3)
	CO_2 equivalent (kt)			(%)			CO_2 equivalent (kt)			(%)			CO_2 equivalent (kt)			(%)		
Total national emissions and removals	274862,32	253001,42	-21860,90	-7,95	-5,74	-5,97	87739,97	94957,22	7217,25	8,23	1,90	1,97	19092,49	18014,30	-1078,19	-5,65	-0,28	-0,29
1. Energy	259841,82	245375,03	-14466,79	-5,57	-3,80	-3,95	55276,20	63295,21	8019,00	14,51	2,11	2,19	1800,51	1678,31	-122,21	-6,79	-0,03	-0,03
A. Fuel combustion activities	244056,80	238899,46	-5157,34	-2,11	-1,35	-1,41	1541,06	1537,36	-3,70	-0,24	0,00	0,00	1795,07	1660,90	-134,17	-7,47	-0,04	-0,04
1. Energy Industries	141770,89	141770,89	0,00	0,00	0,00	0,00	56,93	56,93	0,00	0,00	0,00	0,00	540,80	540,80	0,00	0,00	0,00	0,00
2. Manufacturing industries and construction	17326,53	18763,85	1437,32	8,30	0,38	0,39	35,42	34,64	-0,78	-2,20	0,00	0,00	65,66	64,44	-1,22	-1,86	0,00	0,00
3. Transport	21245,19	21580,90	335,71	1,58	0,09	0,09	160,17	169,00	8,83	5,51	0,00	0,00	912,38	796,12	-116,26	-12,74	-0,03	-0,03
4. Other sectors	54835,05	47904,69	-6930,36	-12,64	-1,82	-1,89	1262,94	1251,19	-11,75	-0,93	0,00	0,00	247,30	230,61	-16,69	-6,75	0,00	0,00
5. Other	8879,13	8879,13	0,00	0,00	0,00	0,00	25,61	25,61	0,00	0,00	0,00	0,00	28,94	28,94	0,00	0,00	0,00	0,00
B. Fugitive emissions from fuels	15785,02	6475,57	-9309,45	-58,98	-2,44	-2,54	53735,14	61757,84	8022,70	14,93	2,11	2,19	5,44	17,40	11,96	219,86	0,00	0,00
1. Solid fuels	15709,91	2156,14	-13553,77	-86,28	-3,56	-3,70	30149,68	31396,72	1247,04	4,14	0,33	0,34	0,05	8,80	8,75	17696,15	0,00	0,00
2. Oil and natural gas	75,11	4319,43	4244,32	5650,73	1,11	1,16	23585,46	30361,12	6775,66	28,73	1,78	1,85	5,39	8,60	3,21	59,60	0,00	0,00
C. CO_2 Transport and storage	NO,NA	NO,NA																
2. Industrial processes and product use	18835,55	22705,05	3869,50	20,54	1,02	1,06	32,35	32,35	0,00	0,00	0,00	0,00	424,95	NO,NE,NA	-424,95	-100,00	-0,11	-0,12
A. Mineral industry	3876,59	2901,76	-974,83	-25,15	-0,26	-0,27												
B. Chemical industry	1234,17	1270,42	36,24	2,94	0,01	0,01	NO	NO					424,95	NO	-424,95	-100,00	-0,11	-0,12
C. Metal industry	13722,42	18530,51	4808,09	35,04	1,26	1,31	32,35	32,35	0,00	0,00	0,00	0,00	NO	NO				
D. Non-energy products from fuels and solvent use	2,36	2,36	0,00	0,00	0,00	0,00	NO,NA	NO,NA					NO,NA	NO,NA				
G. Other product manufacture and use	NO	NO					NO	NO					NO,NE	NO,NE				
H. Other	NA	NA					NA	NA					NA	NA				

Note: All footnotes for this table are given at the end of the table on sheet 4.

TABLE 8 RECALCULATION - RECALCULATED DATA
(Sheet 2 of 4)

Recalculated year: Inventory 1990
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2						CH_4						N_2O					
	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]
	CO_2 equivalent (kt)			(%)			CO_2 equivalent (kt)			(%)			CO_2 equivalent (kt)			(%)		
3. Agriculture	104,40	104,40	0,00	0,00	0,00	0,00	28041,41	28041,41	0,00	0,00	0,00	0,00	16596,33	15715,14	-881,19	-5,31	-0,23	-0,24
A. Enteric fermentation							26245,50	26245,50	0,00	0,00	0,00	0,00						
B. Manure management							1144,91	1144,91	0,00	0,00	0,00	0,00	4133,97	4200,42	66,45	1,61	0,02	0,02
C. Rice cultivation							651,00	651,00	0,00	0,00	0,00	0,00						
D. Agricultural soils[3]							NO	NO					12462,36	11514,72	-947,64	-7,60	-0,25	-0,26
E. Prescribed burning of savannas							NO	NO					NO	NO				
F. Field burning of agricultural residues							NO	NO					NO	NO				
G. Liming	NO	NO																
H. Urea application	104,40	104,40	0,00	0,00	0,00	0,00												
I. Other carbon-containing fertilizers	NO	NO																
J. Other	NO	NO					NO	NO					NO	NO				
4. Land use, land-use change and forestry (net)[4]	-3919,45	-15183,06	-11263,62	287,38		-3,08	5,75	13,50	7,75	134,78		0,00	5,48	355,63	350,15	6385,87		0,10
A. Forest land	-1445,03	-13808,25	-12363,22	855,57		-3,38	1,50	1,75	0,25	16,67		0,00	1,01	343,71	342,70	33823,53		0,09
B. Cropland	5599,00	5201,90	-397,10	-7,09		-0,11	NO,IE	NO,IE					NO,IE	NO,IE				
C. Grassland	-6911,67	-6580,97	330,70	-4,78		0,09	4,25	11,75	7,50	176,47		0,00	4,47	11,92	7,45	166,67		0,00
D. Wetlands	4,25	4,25	0,00	0,00		0,00	NO,IE,NA	NO,IE,NA					NO,IE,NA	NO,IE,NA				
E. Settlements	-1166,00	NO,NE,IE,NA	1166,00	-100,00		0,32	NO	NO					NO	NO				
F. Other land	NO	NO					NO	NO					NO	NO				
G. Harvested wood products	NO,IE	NO,IE																
H. Other	NO	NO					NO	NO					NO	NO				

Note: All footnotes for this table are given at the end of the table on sheet 4.

TABLE 8 RECALCULATION - RECALCULATED DATA
(Sheet 3 of 4)

Recalculated year: Inventory 1990
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2						CH_4						N_2O					
	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]
	CO_2 equivalent (kt)			(%)			CO_2 equivalent (kt)			(%)			CO_2 equivalent (kt)			(%)		
5. Waste	NO	NO					4384,25	3574,75	-809,50	-18,46	-0,21	-0,22	265,22	265,22	0,00	0,00	0,00	0,00
A. Solid waste disposal	NO	NO					1716,00	1515,50	-200,50	-11,68	-0,05	-0,05						
B. Biological treatment of solid waste							NO	NO					NO	NO				
C. Incineration and open burning of waste	NO	NO					NO,NE	NO,NE					NO,NE	NO,NE				
D. Waste water treatment and discharge							2668,25	2059,25	-609,00	-22,82	-0,16	-0,17	265,22	265,22	0,00	0,00	0,00	0,00
E. Other	NO	NO					NO	NO					NO	NO				
6. Other *(as specified in summary 1.A)*	NO	NO					NO	NO					NO	NO				
Memo items:																		
International bunkers	666,08	666,08	0,00	0,00	0,00	0,00	0,31	0,31	0,00	0,00	0,00	0,00	5,53	5,53	0,00	0,00	0,00	0,00
Aviation	576,45	576,45	0,00	0,00	0,00	0,00	0,10	0,10	0,00	0,00	0,00	0,00	4,81	4,81	0,00	0,00	0,00	0,00
Navigation	89,63	89,63	0,00	0,00	0,00	0,00	0,21	0,21	0,00	0,00	0,00	0,00	0,72	0,72	0,00	0,00	0,00	0,00
Multilateral operations	NA	NA					NA	NA					NA	NA				
CO_2 emissions from biomass	1166,88	1166,88	0,00	0,00	0,00	0,00												
CO_2 captured	NO,IE,NA	NO,IE,NA																
Long-term storage of C in waste disposal sites	NO	NO																
Indirect N_2O													NO,NE,NA	NO,NE,NA				
Indirect CO_2	NO,NE,NA	NO,NE,NA																

Note: All footnotes for this table are given at the end of the table on sheet 4.

TABLE 8 RECALCULATION - RECALCULATED DATA
(Sheet 4 of 4)

Recalculated year: Inventory 1990
Submission 2023 v1

KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	HFCs						PFCs						SF_6						Unspecified mix of HFCs and PFCs						NF_3					
	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]
	CO_2 equivalent (kt)			(%)			CO_2 equivalent (kt)			(%)			CO_2 equivalent (kt)			(%)			CO_2 equivalent (kt)			(%)			CO_2 equivalent (kt)			(%)		
Total Actual Emissions	NO,NA	NO,NA					NA,NO	NA,NO					NA,NO	NA,NO					NO,NA	NO,NA					NO,NA	NO,NA				
2.B.9. Fluorochemical production	NO	NO					NO	NO					NO	NO					NO	NO					NO	NO				
2.B.10. Other	NO	NO					NO	NO					NO	NO					NO	NO					NO	NO				
2.C.3. Aluminium production							NO	NO					NO	NO																
2.C.4. Magnesium production	NO	NO					NO	NO					NO	NO					NO	NO										
2.C.7. Other	NO	NO					NO	NO					NO	NO					NO	NO					NO	NO				
2.E.1. Integrated circuit or semiconductor	NO	NO					NO	NO					NO	NO					NO	NO					NO	NO				
2.E.2. TFT flat panel display	NO	NO					NO	NO					NO	NO					NO	NO					NO	NO				
2.E.3. Photovoltaics	NO	NO					NO	NO					NO	NO					NO	NO					NO	NO				
2.E.4. Heat transfer fluid	NO	NO					NO	NO					NO	NO					NO	NO					NO	NO				
2.E.5. Other *(as specified in table 2(II))*	NO	NO					NO	NO					NO	NO					NO	NO					NO	NO				
2.F.1. Refrigeration and air conditioning	NO	NO																												
2.F.2. Foam blowing agents	NO	NO					NO	NO					NO	NO					NO	NO					NO	NO				
2.F.3. Fire protection	NO	NO					NO	NO					NO	NO					NO	NO					NO	NO				
2.F.4. Aerosols	NO,NA	NO,NA					NO,NA	NO,NA					NO,NA	NO,NA					NO,NA	NO,NA					NO,NA	NO,NA				
2.F.5. Solvents	NO	NO					NO	NO					NO	NO					NO	NO					NO	NO				
2.F.6. Other applications	NO	NO					NO	NO					NO	NO					NO	NO					NO	NO				
2.G.1. Electrical equipment	NO	NO					NO	NO					NO	NO					NO	NO					NO	NO				
2.G.2. SF6 and PFCs from other product use							NO	NO					NO	NO																
2.G.4. Other	NO	NO					NO	NO					NO	NO					NO	NO					NO	NO	NO			
2.H. Other	NO,NA	NO,NA					NO,NA	NO,NA					NA	NA					NA	NA					NA	NA	NA			

	Previous submission	Latest submission	Difference	Difference[1]
	CO_2 equivalent (kt)			(%)
Total CO_2 equivalent emissions with land use, land-use change and forestry	381694,78	365972,94	-15721,85	-4,12
Total CO_2 equivalent emissions without land use, land-use change and forestry	385603,00	380786,87	-4816,13	-1,25

[1] Estimate the percentage change due to recalculation with respect to the previous submission (percentage change = 100 x [(LS-PS)/PS], where LS = latest submission and PS = previous submission. All cases of recalculation of the estimate of the source/sink category should be addressed and explained in the
[2] Total emissions refer to total aggregate GHG emissions expressed in terms of CO_2 equivalent, excluding GHGs from the LULUCF sector. The impact of the recalculation on the total emissions is calculated as follows: impact of recalculation (%) = 100 x [(source (LS) - source (PS))/total emissions (LS)],
[3] Total emissions refer to total aggregate GHG emissions expressed in terms of CO_2 equivalent, including GHGs from the LULUCF sector. The impact of the recalculation on the total emissions is calculated as follows: impact of recalculation (%) = 100 x [(source (LS) - source (PS))/total emissions (LS)],
[4] Net CO_2 emissions/removals to be reported.

Documentation box:
Parties should provide detailed information on recalculations in Chapter 10: Recalculations and Improvements, and in the relevant sections of Chapters 3 to 8 (see section 2.5 of each of Chapters 3 - 8) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and further details are needed to understand the content of this table.
References should point particularly to the sections of the NIR in which justifications of the changes as to improvements in accuracy, completeness and consistency of the inventory are reported.

TABLE 9 COMPLETENESS - INFORMATION ON NOTATION KEYS
(Sheet 1 of 1)

Sources and sinks not estimated ("NE")[1]			
GHG	**Sector[2]**	**Source/sink category[2]**	**Explanation**
CH4	Industrial Processes and Product Use	2.C Metal Industry/2.C.1 Iron and Steel Production/2.C.1.b Pig Iron	CH4 emissions were not estimated due to the lack of methodology in the IPCC Guidelines
CH4	Waste	5.C Incineration and Open Burning of Waste/5.C.2 Open Burning of Waste/5.C.2.1 Biogenic/5.C.2.1.a Municipal Solid Waste	Emissions from the incineration of solid waste were not estimated, since they are not significant in accordance with paragraph 37 b) of annex I to decision 24/CP.19. A detailed explanation is shown in the NIR
CO2	LULUCF	4.B Cropland/4.B.1 Cropland Remaining Cropland/4(V) Biomass Burning/Wildfires	Emissions CH4 accounted in the category 4.C.1. 4(V) Biomass Burning (Wildfires)
CO2	LULUCF	4.D Wetlands/4.D.1 Wetlands Remaining Wetlands/4(V) Biomass Burning/Wildfires	via photosynthetic activity, within weeks to few years after burning (IPCC GLS, 2006)
CO2	Waste	5.C Incineration and Open Burning of Waste/5.C.2 Open Burning of Waste/5.C.2.1 Biogenic/5.C.2.1.a Municipal Solid Waste	Emissions from the incineration of solid waste were not estimated, since they are not significant in accordance with paragraph 37 b) of annex I to decision 24/CP.19. A detailed explanation is shown in the NIR
N2O	Agriculture	3.D Agricultural Soils/3.D.1 Direct N2O Emissions From Managed Soils/3.D.1.2 Organic N Fertilizers/3.D.1.2.b Sewage Sludge Applied to Soils	Emissions from "Sewage Sludge Applied to Soils" are not significant in accordance with paragraph 37(b) of the annex to decision 24/CP.19, therefore, are not included in the CRF. Potential emissions estimates are shown in section 5.5 of the NIR
N2O	Industrial Processes and Product Use	2.G Other Product Manufacture and Use/2.G.3 N2O from Product Uses/2.G.3.a Medical Applications	The party provided preliminary estimates of N2O emissions from the use of anesthesia based on data from countries with similar conditions. This category is not significant in accordance with decision 24/CP.19, Annex 1, paragraph 37(b). Preliminary emission estimates are shown in the
N2O	Waste	5.C Incineration and Open Burning of Waste/5.C.2 Open Burning of Waste/5.C.2.1 Biogenic/5.C.2.1.a Municipal Solid Waste	Emissions from the incineration of solid waste were not estimated, since they are not significant in accordance with paragraph 37 b) of annex I to decision 24/CP.19. A detailed explanation is shown in the NIR
no gas	LULUCF	Converted to Settlements	

Sources and sinks reported elsewhere ("IE")[3]				
GHG	**Source/sink category**	**Allocation as per IPCC Guidelines**	**Allocation used by the Party**	**Explanation**
CH4	and Other Emissions from Energy Production/1.B.2.b Natural		Included in 1B.2.a.1	Included 1.B.2.a.1 Exploration
CH4	1.B Fugitive Emissions from Fuels/1.B.2 Oil and Natural Gas and Other Emissions from Energy Production/1.B.2.c Venting and Flaring/1.B.2.c.2 Flaring/1.B.2.c.2.ii Gas			Included 1.B.2.c.2.i Oil
CH4	2.C Metal Industry/2.C.1 Iron and Steel Production/2.C.1.f Other (please specify)	2.C.1 Iron and steel production/2.C.1.f Other (coke production)	Included in 1.A 1.c	
CH4	4.A Forest Land/4.A.2 Land Converted to Forest Land/4(V) Biomass Burning/Wildfires		Included in 4.A.1. 4(V)	Emissions CH4 accounted in the category 4.A.1. 4(V) Biomass Burning (Wildfires)
CH4	4.B Cropland/4.B.1 Cropland Remaining Cropland/4(V) Biomass Burning/Wildfires		Included in 4.C.1. 4(V)	Emissions CH4 accounted in the category 4.C.1. 4(V) Biomass Burning (Wildfires)
CH4	4.D Wetlands/4.D.1 Wetlands Remaining Wetlands/4(V) Biomass Burning/Wildfires		Included in 4.C.1 4(V)	Emissions CH4 accounted in the category 4.C.1 Grassland Remaining Grassland. 4(V) Biomass Burning (Wildfires)
CO2	1.AA Fuel Combustion - Sectoral approach/1.A.5 Other (Not specified elsewhere)/1.A.5.b Mobile (please specify)		Included in 1.A.3.e	Included in 1.A.3.e
CO2	1.AB Fuel Combustion - Reference Approach/Biomass/Gas Biomass		1 AB	Gas biomass values are included in Solid biomass
CO2	1.AB Fuel Combustion - Reference Approach/Biomass/Liquid Biomass		Included in 1.AB	CO2 emissions and consumption of liquid biomass are included in the total of solid biomass
CO2	1.AB Fuel Combustion - Reference Approach/Liquid Fuels/Other Kerosene		111,00	CO2 emissions and consumption of other kerosene in category 1 AB are aggregated with jet kerosene as there are no separate data; national statistics did not provide
CO2	1.AB Fuel Combustion - Reference Approach/Solid Fuels/Coking Coal	1,00	Included in 1.AB	CO2 emissions and consumption of coking coal in category 1 AB are aggregated with sub-bituminous coal as there are no separate data; national statistics did not provide
CO2	1.AB Fuel Combustion - Reference Approach/Solid Fuels/Other Solid Fossil/Coal concentrate		1 AB	CO2 emissions and consumption of coal concentrate are included in the total of CO2 emissions and consumption of subbituminous coal. Separate data for this type of coal were not provided by national statistics.
CO2	1.AB Fuel Combustion - Reference Approach/Solid Fuels/Other Solid Fossil/Energy coal		Included in 1.AB	CO2 emissions and consumption of coal with a calorific value of more than 23.865 MJ / kg on ash-free but moist basis are included in the total of CO2 emissions and consumption of subbituminous coal. Separate data for this type of coal were not provided by national statistics.
CO2	1.AB Fuel Combustion - Reference Approach/Solid Fuels/Other Solid Fossil/High ash coal		Included in 1.AB	CO2 emissions and consumption of high ash coal are included in the total of CO2 emissions and consumption of subbituminous coal. Separate data for this type of coal were not provided by national statistics.
CO2	1.AB Fuel Combustion - Reference Approach/Solid Fuels/Other Solid Fossil/Other coal		Included in 1.AB	CO2 emissions and consumption of other coal are included in the total of CO2 emissions and consumption of subbituminous coal. Separate data for this type of coal were not provided by national statistics.
CO2	1.AD Feedstocks, reductants and other non-energy use of fuels/Liquid Fuels/Other Kerosene		1AD	
CO2	1.AD Feedstocks, reductants and other non-energy use of fuels/Solid Fuels/Coking Coal		1AD	CO2 emissions and consumption of coking coal in category 1 AD are aggregated with sub-bituminous coal as there are no separate data; national statistics did not provide
CO2	1.B Fugitive Emissions from Fuels/1.B.2 Oil and Natural Gas and Other Emissions from Energy Production/1.B.2.b Natural Gas/1.B.2.b.1 Exploration		Included in 1B.2.a.1	Included 1.B.2.a.1 Exploration
CO2	1.B Fugitive Emissions from Fuels/1.B.2 Oil and Natural Gas and Other Emissions from Energy Production/1.B.2.c Venting and Flaring/1.B.2.c.2 Flaring/1.B.2.c.2.ii Gas			Included 1.B.2.c.2.i Oil
CO2	2.C Metal Industry/2.C.1 Iron and Steel Production/2.C.1.f Other (please specify)	2.C.1 Iron and steel production/2.C.1.f Other (coke production)	Included in 1.A 1.c	According to IPCC GLs, 2006, volume 3, ch. 4.2, CO2 emissions from coke production are presented in the Energy sector

CO2	4.A Forest Land/4.A.2 Land Converted to Forest Land/4(V) Biomass Burning/Wildfires		Included in 4.A.1	Emissions CO2 accounted indirectly in the carbon stock change of biomass in the category 4.A.1.Carbon stock change
CO2	4.G Harvested Wood Products/Approach A/Total HWP Consumed Domestically/Paper and Paperboard		Included in 4.A.1	CO2 emissions indirectly accounted in 4.A.1 Carbon stock change. Explanation provided in the NIR
N2O	1.B Fugitive Emissions from Fuels/1.B.2 Oil and Natural Gas and Other Emissions from Energy Production/1.B.2.c Venting and Flaring/1.B.2.c.2 Flaring/1.B.2.c.2.ii Gas			Included 1.B.2.c.2.i Oil
N2O	4(IV) Indirect N2O Emissions from Managed Soils/Atmospheric Deposition		Included in 3.D.2.1	N2O emissions from Atmospheric Deposition from Managed Soils are presented in 3.D.2.1
N2O	4(IV) Indirect N2O Emissions from Managed Soils/Nitrogen Leaching and Run-off		Included in 3.D.2.2	The N2O emissions from Nitrogen Leaching and Run-off are presented in 3.D.2.2
N2O	4.A Forest Land/4.A.2 Land Converted to Forest Land/4(V) Biomass Burning/Wildfires		Included in 4.A.1. 4(V)	Emissions NO2 accounted in the category 4.A.1 Forest Land Remaining Forest Land (Biomass Burning, Wildfires)
N2O	4.B Cropland/4.B.1 Cropland Remaining Cropland/4(V) Biomass Burning/Wildfires		Included in 4.C.1. 4(V)	Emissions N2O accounted in the category 4.C.1. 4(V) Biomass Burning (Wildfires)
N2O	4.D Wetlands/4.D.1 Wetlands Remaining Wetlands/4(V) Biomass Burning/Wildfires		Included in 4.C.1 4(V)	Emissions N2O accounted in the category 4.C.1 Grassland Remaining Grassland. 4(V) Biomass Burning (Wildfires)

(1) Clearly indicate sources and sinks which are considered in the 2006 IPCC Guidelines but are not considered in the submitted inventory. Explain the reason for not reporting these sources and sinks, in order to avoid arbitrary interpretations. An entry should be made for each source/sink category for which the notation key "NE" (not

(2) Indicate omitted source/sink category

(3) Clearly indicate sources and sinks in the submitted inventory that are allocated to a sector other than that indicated by the 2006 IPCC Guidelines. Show the sector indicated in the 2006 IPCC Guidelines and the sector to which the source or sink is allocated in the submitted inventory. Explain the reason for reporting these sources and

TABLE 10 EMISSION TRENDS
GHG CO_2 eq emissions
(Sheet 1 of 6)

Inventory 1990
Submission 2020 v1.0
SLOVENIA

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year[1]	1990	Change from base to latest reported year
	($kt CO_2$ eq)		
Total net emissions[2]	20597.74	20597.74	0.00
1. Energy	21058.24	21058.24	0.00
A. Fuel combustion (sectoral approach)	21058.24	21058.24	0.00
1. Energy industries	14198.64	14198.64	0.00
2. Manufacturing industries and construction	2006.26	2006.26	0.00
3. Transport	3984.32	3984.32	0.00
4. Other sectors	4886.36	4886.36	0.00
5. Other	2183.21	2183.21	0.00
B. Fugitive emissions from fuels	2659.81	2659.81	0.00
1. Solid fuels	2659.81	2659.81	0.00
2. Oil and natural gas and other emissions from energy production	2689.26	2689.26	0.00
C CO2 captured and stored	NA,NO	NA,NO	0.00
2. Industrial Processes	2537.28	2537.28	0.00
A. Mineral industry	280.78	280.78	0.00
B. Chemical industry	1366.25	1366.25	0.00
C. Metal industry	890.25	890.25	0.00
D. Non-energy fuels from fossil fuel and solvent use	0.0	0.0	0.00
E. Electronic Industry	NA	NA	0.00
F. Production of a) HFCs and b) SF6	NA,NO	NA,NO	0.00
G. Other product manufacture and use	NA	NA	0.00
H. Other	NA,NO	NA,NO	0.00
3. Agriculture	1980.91	1980.91	0.00
A. Enteric fermentation	1020.26	1020.26	0.00
B. Manure management	383.18	383.18	0.00
C. Rice cultivation	NO	NO	0.00
D. Agricultural soils	1194.24	1194.24	0.00
E. Prescribed burning of savannas	NO	NO	0.00
F. Field burning of agricultural residues	NO	NO	0.00
G. Liming	NA	NA	0.00
H. Urea application	404.49	404.49	0.00
I. Other carbon-containing fertilizers	NO	NO	0.00
J. Other	NO	NO	0.00
4. Land use, land use change and forestry[3]	2383.78	2383.78	0.00
A. Forest land	2383.78	2383.78	0.00
B. Cropland	1885.96	1885.96	0.00
C. Grassland	2007.28	2007.28	0.00
D. Wetlands	0.00	0.00	0.00
E. Settlements	NA,NE,NO	NA,NE,NO	0.00
F. Other lands	NO	NO	0.00
G. Harvested wood products	NA,IE	NA,IE	0.00
H. Other	NO	NO	0.00
5. Waste	3899.97	3899.97	0.00
A. Solid waste disposal	3899.97	3899.97	0.00
B. Biological treatment of solid waste	NO	NO	0.00
C. Incineration and open burning of waste	NO,NE	NO,NE	0.00
D. Wastewater treatment and discharge	294.47	294.47	0.00
E. Other	NO	NO	0.00
6. Other (as specified in summary 1.A)	NO	NO	0.00
Shortfall	0.00	0.00	0.00
International bunkers	494.38	494.38	0.00
Aviation	96.36	96.36	0.00
Marine	398.02	398.02	0.00
Multilateral operations	NA	NA	0.00
CO_2 emissions from biomass	748.48	748.48	0.00
CO_2 captured	NO,IE,NA	NO,IE,NA	0.00
Long-term storage of C in waste disposal sites	NA	NA	0.00
Indirect N2O	NO,NE,NA	NO,NE,NA	0.00
Indirect CO2	NA	NA	0.00
Total CO_2 equivalent emissions without land use, land use change and forestry	32496.34	32496.34	0.00
Total CO_2 equivalent emissions with land use, land use change and forestry	30107.56	30107.56	0.00
Total CO_2 equivalent emissions, including indirect CO2, without land use, land use change and forestry	NA	NA	0.00
Total CO_2 equivalent emissions, including indirect CO2, with land use, land use change and forestry	NA	NA	0.00

Note: All footnotes for this table are given at the end of the table on sheet 6.

TABLE 10 EMISSION TRENDS
CO2
(Sheet 2 of 5)

Inventory: 1990
Submission:2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year*	1990	Change from base to latest reported year
A. Energy	240,000.00	240,000.00	0.0%
A. Fuel combustion (sectoral approach)	239,000.00	239,000.00	0.0%
1. Energy industries	123,000.00	123,000.00	0.0%
2. Manufacturing industries and construction	28,000.00	28,000.00	0.0%
3. Transport	27,000.00	27,000.00	0.0%
4. Commercial/institutional	21,000.00	21,000.00	0.0%
5. Other	40,000.00	40,000.00	0.0%
B. Fugitive emissions from fuels	1,000.00	1,000.00	0.0%
1. Solid fuels	0.00	0.00	0.0%
2. Oil and natural gas and other emissions from energy production	1,000.00	1,000.00	0.0%
C. CO2 transport and storage	NO	NO	0.0%
B. Industrial processes	10,000.00	10,000.00	0.0%
A. Mineral products	7,000.00	7,000.00	0.0%
B. Chemical industry	NO	NO	0.0%
C. Metal industry	3,000.00	3,000.00	0.0%
D. Non-energy products from fuels and solvent use	0.00	0.00	0.0%
E. Electronic industry	NE	NE	NE
F. Product uses as ODS substitutes	NO	NO	NO
G. Other product manufacture and use	NO	NO	NO
H. Other	NO	NO	NO
C. Agriculture	NE	NE	NE
A. Enteric fermentation	NE	NE	NE
B. Manure management	NE	NE	NE
C. Rice cultivations	NE	NE	NE
D. Agricultural soils	NE	NE	NE
E. Prescribed burning of savannas	NE	NE	NE
F. Field burning of agricultural residues	NE	NE	NE
G. Liming	NE	NE	NE
H. Urea application	NE	NE	NE
I. Other carbon containing fertilizers	NE	NE	NE
J. Other	NE	NE	NE
D. Land use, land use change and forestry [1]	-2,000.00	-2,000.00	0.0%
A. Forest land	-2,000.00	-2,000.00	0.0%
B. Cropland	0.00	0.00	0.0%
C. Grassland	-2,000.00	-2,000.00	0.0%
D. Wetlands	NE	NE	NE
E. Settlements	0.00	0.00	0.0%
F. Other land	NE	NE	NE
G. Harvested wood products	NE	NE	NE
H. Other	NE	NE	NE
E. Waste	2,000.00	2,000.00	0.0%
A. Solid waste disposal	0.00	0.00	0.0%
B. Biological treatment of solid waste	NO	NO	NO
C. Incineration and open burning of waste	NO	NO	NO
D. Wastewater treatment and discharge	2,000.00	2,000.00	0.0%
E. Other	NO	NO	NO
Total Net Emissions/Removals, excluding LULUCF	252,000.00	252,000.00	0.0%
International bunkers	0.00	0.00	0.0%
Aviation	0.00	0.00	0.0%
Navigation	0.00	0.00	0.0%
Multilateral operations	NO	NO	NO
CO2 emissions from biomass	0.00	0.00	0.0%
CO2 captured	-0.00	-0.00	0.0%
Long-term storage of C in waste disposal sites	NE	NE	NE
Indirect CO2 [2]	NE	NE	NE
Indirect F-Gas [3]	0.00	0.00	0.0%
Total CO2 equivalent emissions without land use, land use change and forestry	250,000.00	250,000.00	0.0%
Total CO2 equivalent emissions with land use, land use change and forestry	252,000.00	252,000.00	0.0%
Total CO2 equivalent emissions, including indirect CO2, without land use, land use change and forestry	NE	NE	NE
Total CO2 equivalent emissions, including indirect CO2, with land use, land use change and forestry	NE	NE	NE

Note: All footnotes for this table are given at the end of the table on sheet 5.

TABLE 10 EMISSION TRENDS
CO_2
(Sheet 2 of 6)

Inventory 1990
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year[(1)]	1990	Change from base to latest reported year
	(kt)		%
1. Energy	245375,03	245375,03	0,00
A. Fuel combustion (sectoral approach)	238899,46	238899,46	0,00
1. Energy industries	141770,89	141770,89	0,00
2. Manufacturing industries and construction	18763,85	18763,85	0,00
3. Transport	21580,90	21580,90	0,00
4. Other sectors	47904,69	47904,69	0,00
5. Other	8879,13	8879,13	0,00
B. Fugitive emissions from fuels	6475,57	6475,57	0,00
1. Solid fuels	2156,14	2156,14	0,00
2. Oil and natural gas and other emissions from energy production	4319,43	4319,43	0,00
C. CO_2 transport and storage	NO,NA	NO,NA	0,00
2. Industrial processes	22705,05	22705,05	0,00
A. Mineral industry	2901,76	2901,76	0,00
B. Chemical industry	1270,42	1270,42	0,00
C. Metal industry	18530,51	18530,51	0,00
D. Non-energy products from fuels and solvent use	2,36	2,36	0,00
E. Electronic industry			
F. Product uses as ODS substitutes			
G. Other product manufacture and use	NO	NO	0,00
H. Other	NA	NA	0,00
3. Agriculture	104,40	104,40	0,00
A. Enteric fermentation			
B. Manure management			
C. Rice cultivation			
D. Agricultural soils			
E. Prescribed burning of savannas			
F. Field burning of agricultural residues			
G. Liming	NO	NO	0,00
H. Urea application	104,40	104,40	0,00
I. Other carbon-containing fertilizers	NO	NO	0,00
J. Other	NO	NO	0,00
4. Land use, land-use change and forestry [(2)]	-15183,06	-15183,06	0,00
A. Forest land	-13808,25	-13808,25	0,00
B. Cropland	5201,90	5201,90	0,00
C. Grassland	-6580,97	-6580,97	0,00
D. Wetlands	4,25	4,25	0,00
E. Settlements	NO,NE,IE,NA	NO,NE,IE,NA	0,00
F. Other land	NO	NO	0,00
G. Harvested wood products	NO,IE	NO,IE	0,00
H. Other	NO	NO	0,00
5. Waste	NO	NO	0,00
A. Solid waste disposal	NO	NO	0,00
B. Biological treatment of solid waste			
C. Incineration and open burning of waste	NO	NO	0,00
D. Waste water treatment and discharge			
E. Other	NO	NO	0,00
6. Other *(as specified in summary 1.A)*	NO	NO	0,00
Memo items:			
International bunkers	666,08	666,08	0,00
Aviation	576,45	576,45	0,00
Navigation	89,63	89,63	0,00
Multilateral operations	NA	NA	0,00
CO_2 emissions from biomass	1166,88	1166,88	0,00
CO_2 captured	NO,IE,NA	NO,IE,NA	0,00
Long-term storage of C in waste disposal sites	NO	NO	0,00
Indirect N_2O			
Indirect CO_2 [(3)]	NO,NE,NA	NO,NE,NA	0,00
Total CO_2 equivalent emissions without land use, land-use change and forestry	268184,48	268184,48	0,00
Total CO_2 equivalent emissions with land use, land-use change and forestry	253001,42	253001,42	0,00
Total CO_2 equivalent emissions, including indirect CO2, without land use, land-use change and forestry	NA	NA	0,00
Total CO_2 equivalent emissions, including indirect CO2, with land use, land-use change and forestry	NA	NA	0,00

Note: All footnotes for this table are given at the end of the table on sheet 6.

TABLE 10 EMISSION TRENDS
CO2
(Sheet 3 of 5)

Inventory 1990
(Kt of carbon equivalent)
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year[1]	1990	Change from base to latest reported year
	(Kt)		
A. Energy	223,618	203,605	-9.0%
A. Fuel combustion (sectoral approach)	223,618	203,605	-9.0%
1. Energy industries	4,48	4,48	0.0%
2. Manufacturing industries and construction	2,75	2,75	0.0%
3. Transport	1,71	1,71	0.0%
4. Other sectors	0,07	0,07	0.0%
5. Other	0,00	0,00	0.0%
B. Fugitive emissions from fuels	214,61	195,61	-8.9%
1. Solid fuels	214,61	195,61	-8.9%
2. Oil and natural gas and other	0,00	0,00	0.0%
C. CO2 transport and storage			
B. Industrial processes	0,00	0,00	0.0%
A. Mineral products	0,00	0,00	0.0%
B. Chemical industry	0,00	0,00	0.0%
C. Metal industry	0,00	0,00	0.0%
D. Non-energy products from fuels and solvent use	0,00	0,00	0.0%
E. Electronic industry			
F. Product uses as ODS substitutes			
G. Other product manufacture and use	0,00	0,00	0.0%
H. Other	0,00	0,00	0.0%
C. Solvent and other product use	0,00	0,00	0.0%
A. Paint application	0,00	0,00	0.0%
B. Degreasing and dry cleaning	0,00	0,00	0.0%
C. Chemical products, manufacture and processing	0,00	0,00	0.0%
D. Other			
D. Agriculture	0,00	0,00	0.0%
A. Enteric fermentation	0,00	0,00	0.0%
B. Manure management	0,00	0,00	0.0%
C. Rice cultivation	0,00	0,00	0.0%
D. Agricultural soils	0,00	0,00	0.0%
E. Prescribed burning of savannas	0,00	0,00	0.0%
F. Field burning of agricultural residues	0,00	0,00	0.0%
G. Other			
E. Land use, land-use change and forestry			
A. Forest and other woody biomass stocks			
B. Forest conversion			
C. Abandonment of managed lands			
D. Other			
F. Waste	0,00	0,00	0.0%
A. Solid waste disposal on land	0,00	0,00	0.0%
B. Wastewater handling	0,00	0,00	0.0%
C. Waste incineration	0,00	0,00	0.0%
D. Other waste	0,00	0,00	0.0%
G. Other (as specified in summary 1.A)	0,00	0,00	0.0%
Total CO2 emissions without CO2 from LULUCF	223,618	203,605	-9.0%
Total CO2 emissions with CO2 from LULUCF	223,618	203,605	-9.0%
Memo items:			
International bunkers	0,00	0,00	0.0%
Aviation	0,00	0,00	0.0%
Navigation	0,00	0,00	0.0%
Multilateral operations	0,00	0,00	0.0%
CO2 emissions from biomass			
CO2 from Other Sectors			
Other delegated art. 2.2 water: Bunker fuels			
Liquid fuels			
Indirect CO2 [2]			

Note: All footnotes for this table are given at the end of the table on sheet 5.

TABLE 10 EMISSION TRENDS
CH_4
(Sheet 3 of 6)

Inventory 1990
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year[(1)]	1990	Change from base to latest reported year
	(kt)		%
1. Energy	2531,81	2531,81	0,00
A. Fuel combustion (sectoral approach)	61,49	61,49	0,00
1. Energy industries	2,28	2,28	0,00
2. Manufacturing industries and construction	1,39	1,39	0,00
3. Transport	6,76	6,76	0,00
4. Other sectors	50,05	50,05	0,00
5. Other	1,02	1,02	0,00
B. Fugitive emissions from fuels	2470,31	2470,31	0,00
1. Solid fuels	1255,87	1255,87	0,00
2. Oil and natural gas and other emissions from energy production	1214,44	1214,44	0,00
C. CO_2 transport and storage			
2. Industrial processes	1,29	1,29	0,00
A. Mineral industry			
B. Chemical industry	NO	NO	0,00
C. Metal industry	1,29	1,29	0,00
D. Non-energy products from fuels and solvent use	NO,NA	NO,NA	0,00
E. Electronic industry			
F. Product uses as ODS substitutes			
G. Other product manufacture and use	NO	NO	0,00
H. Other	NA	NA	0,00
3. Agriculture	1121,66	1121,66	0,00
A. Enteric fermentation	1049,82	1049,82	0,00
B. Manure management	45,80	45,80	0,00
C. Rice cultivation	26,04	26,04	0,00
D. Agricultural soils	NO	NO	0,00
E. Prescribed burning of savannas	NO	NO	0,00
F. Field burning of agricultural residues	NO	NO	0,00
G. Liming			
H. Urea application			
I. Other carbon-containing fertilizers			
J. Other	NO	NO	0,00
4. Land use, land-use change and forestry	0,54	0,54	0,00
A. Forest land	0,07	0,07	0,00
B. Cropland	NO,IE	NO,IE	0,00
C. Grassland	0,47	0,47	0,00
D. Wetlands	NO,IE,NA	NO,IE,NA	0,00
E. Settlements	NO	NO	0,00
F. Other land	NO	NO	0,00
G. Harvested wood products			
H. Other	NO	NO	0,00
5. Waste	142,99	142,99	0,00
A. Solid waste disposal	60,62	60,62	0,00
B. Biological treatment of solid waste	NO	NO	0,00
C. Incineration and open burning of waste	NO,NE	NO,NE	0,00
D. Waste water treatment and discharge	82,37	82,37	0,00
E. Other	NO	NO	0,00
6. Other *(as specified in summary 1.A)*	NO	NO	0,00
Total CH_4 emissions without CH_4 from LULUCF	3797,75	3797,75	0,00
Total CH_4 emissions with CH_4 from LULUCF	3798,29	3798,29	0,00
Memo items:			
International bunkers	0,01	0,01	0,00
Aviation	0,00	0,00	0,00
Navigation	0,01	0,01	0,00
Multilateral operations	NA	NA	0,00
CO_2 emissions from biomass			
CO_2 captured			
Long-term storage of C in waste disposal sites			
Indirect N_2O			
Indirect CO_2 [(3)]			

Note: All footnotes for this table are given at the end of the table on sheet 6.

TABLE 10 EMISSION TRENDS
N_2O
(Sheet 4 of 6)

Inventory 1990
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year[1]	1990	Change from base to latest reported year
	(kt)		
1. Energy	5.63	5.63	0.00
A. Fuel combustion (sectoral approach)	5.63	5.63	0.00
1. Energy industries	1.81	1.81	0.00
2. Manufacturing industries and construction	0.22	0.22	0.00
3. Transport	2.67	2.67	0.00
4. Other sectors	0.77	0.77	0.00
5. Other	0.10	0.10	0.00
B. Fugitive emissions from fuels	0.00	0.00	0.00
1. Solid fuels	0.00	0.00	0.00
2. Oil and natural gas and other emissions fr	0.00	0.00	0.00
C. CO_2 transport and storage			
2. Industrial processes	NO,NE,NA	NO,NE,NA	0.00
A. Mineral industry			
B. Chemical industry	NO	NO	0.00
C. Metal industry	NO	NO	0.00
D. Non-energy products from fuels and solvent use	NO,NA	NO,NA	0.00
E. Electronic industry			
F. Product uses as ODS substitutes			
G. Other product manufacture and use	NO,NE	NO,NE	0.00
H. Other	NA	NA	0.00
3. Agriculture	52.74	52.74	0.00
A. Enteric fermentation			
B. Manure management	14.19	14.19	0.00
C. Rice cultivation			
D. Agricultural soils	38.64	38.64	0.00
E. Prescribed burning of savannas	NO	NO	0.00
F. Field burning of agricultural residues	NO	NO	0.00
G. Liming			
H. Urea application			
I. Other carbon-containing fertilizers			
J. Other	NO	NO	0.00
4. Land use, land use change and forestry	1.15	1.15	0.00
A. Forest land	1.15	1.15	0.00
B. Cropland	NO,IE	NO,IE	0.00
C. Grassland	0.00	0.00	0.00
D. Wetlands	NO,IE,NA	NO,IE,NA	0.00
E. Settlements	NO	NO	0.00
F. Other land	NO	NO	0.00
G. Harvested wood products			
H. Other	NO	NO	0.00
5. Waste	0.00	0.00	0.00
A. Solid waste disposal			
B. Biological treatment of solid waste	NO	NO	0.00
C. Incineration and open burning of waste	NO,NE	NO,NE	0.00
D. Wastewater treatment and discharge	0.00	0.00	0.00
E. Other	NO	NO	0.00
6. Other (as specified in summary 1.A)	NO	NO	0.00
Total direct N_2O emissions without N_2O from LULUCF	59.36	59.36	0.00
Total direct N_2O emissions with N_2O from LULUCF	60.47	60.47	0.00
Memo items:			
International bunkers	0.03	0.03	0.00
Aviation	0.01	0.01	0.00
Navigation	0.03	0.03	0.00
Multilateral operations	NA	NA	0.00
CO_2 emissions from biomass			
CO_2 captured			
Long-term storage of C in waste disposal sites			
Indirect N_2O	NO,NE,NA	NO,NE,NA	0.00
Indirect CO_2[2]			

Note: All footnotes for this table are shown at the end of the table on sheet 6.

TABLE 10 EMISSION TRENDS
N_2O
(Sheet 4 of 6)

Inventory 1990
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year[1]	1990	Change from base to latest reported year
	(kt)		%
1. Energy	5,63	5,63	0,00
A. Fuel combustion (sectoral approach)	5,57	5,57	0,00
1. Energy industries	1,81	1,81	0,00
2. Manufacturing industries and construction	0,22	0,22	0,00
3. Transport	2,67	2,67	0,00
4. Other sectors	0,77	0,77	0,00
5. Other	0,10	0,10	0,00
B. Fugitive emissions from fuels	0,06	0,06	0,00
1. Solid fuels	0,03	0,03	0,00
2. Oil and natural gas and other emissions from energy production	0,03	0,03	0,00
C. CO_2 transport and storage			
2. Industrial processes	NO,NE,NA	NO,NE,NA	0,00
A. Mineral industry			
B. Chemical industry	NO	NO	0,00
C. Metal industry	NO	NO	0,00
D. Non-energy products from fuels and solvent use	NO,NA	NO,NA	0,00
E. Electronic industry			
F. Product uses as ODS substitutes			
G. Other product manufacture and use	NO,NE	NO,NE	0,00
H. Other	NA	NA	0,00
3. Agriculture	52,74	52,74	0,00
A. Enteric fermentation			
B. Manure management	14,10	14,10	0,00
C. Rice cultivation			
D. Agricultural soils	38,64	38,64	0,00
E. Prescribed burning of savannas	NO	NO	0,00
F. Field burning of agricultural residues	NO	NO	0,00
G. Liming			
H. Urea application			
I. Other carbon containing fertlizers			
J. Other	NO	NO	0,00
4. Land use, land-use change and forestry	1,19	1,19	0,00
A. Forest land	1,15	1,15	0,00
B. Cropland	NO,IE	NO,IE	0,00
C. Grassland	0,04	0,04	0,00
D. Wetlands	NO,IE,NA	NO,IE,NA	0,00
E. Settlements	NO	NO	0,00
F. Other land	NO	NO	0,00
G. Harvested wood products			
H. Other	NO	NO	0,00
5. Waste	0,89	0,89	0,00
A. Solid waste disposal			
B. Biological treatment of solid waste	NO	NO	0,00
C. Incineration and open burning of waste	NO,NE	NO,NE	0,00
D. Waste water treatment and discharge	0,89	0,89	0,00
E. Other	NO	NO	0,00
6. Other *(as specified in summary 1.A)*	NO	NO	0,00
Total direct N_2O emissions without N_2O from LULUCF	59,26	59,26	0,00
Total direct N_2O emissions with N_2O from LULUCF	60,45	60,45	0,00
Memo items:			
International bunkers	0,02	0,02	0,00
Aviation	0,02	0,02	0,00
Navigation	0,00	0,00	0,00
Multilateral operations	NA	NA	0,00
CO_2 emissions from biomass			
CO_2 captured			
Long-term storage of C in waste disposal sites			
Indirect N_2O	NO,NE,NA	NO,NE,NA	0,00
Indirect CO_2 [3]			

Note: All footnotes for this table are given at the end of the table on sheet 6.

TABLE 10 EMISSION TRENDS
HFCs, PFCs, SF$_6$ and NF$_3$
(Sheet 5 of 6)

Inventory 1990
Willamette Valley, OR-Lane
WASHINGTON

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year(1)	1990	Change from base to latest reported year
	(kt)		
Emissions of HFCs and PFCs - (kt CO$_2$ equivalent)	NO,NA	NO,NA	-100%
Emissions of HFCs - (kt CO$_2$ equivalent)	NO,NA	NO,NA	-100%
HFC-23	NO	NO	-100%
HFC-32	NO	NO	-100%
HFC-41	NO	NO	-100%
HFC-43-10mee	NO	NO	-100%
HFC-125	NO	NO	-100%
HFC-134	NO	NO	-100%
HFC-134a	NO	NO	-100%
HFC-152a	NO	NO	-100%
HFC-143	NO	NO	-100%
HFC-143a	NO	NO	-100%
HFC-227ea	NO	NO	-100%
HFC-23ea	NO	NO	-100%
HFC-245ca	NO	NO	-100%
HFC-365mfc	NO	NO	-100%
HFC-236fa	NO	NO	-100%
HFC-245fa	NO	NO	-100%
HFC-407c	NO	NO	-100%
HFC-404a	NO	NO	-100%
HFC-507a	NO	NO	-100%
Unspecified mixture HFCs(2) - (kt CO$_2$ equivalent)	NO,NA	NO,NA	-100%
Emissions of PFCs - (kt CO$_2$ equivalent)	NO,NO	NO,NO	-100%
CF$_4$	NO	NO	-100%
C$_2$F$_6$	NO	NO	-100%
C$_3$F$_8$	NO	NO	-100%
c-C$_4$F$_8$	NO	NO	-100%
c-C$_5$F$_8$	NO	NO	-100%
c-C$_6$F$_{12}$	NO	NO	-100%
c-C$_7$F$_{14}$	NO	NO	-100%
c-C$_8$F$_{16}$	NO	NO	-100%
Unspecified mixture PFCs(2) - (kt CO$_2$ equivalent)	NO,NO	NO,NO	-100%
Emissions of HFCs and PFCs - (kt CO$_2$ equivalent)	NO,NA	NO,NA	-100%
Emissions of SF$_6$ - (kt CO$_2$ equivalent)	NO,NO	NO,NO	-100%
Emissions of NF$_3$ - (kt CO$_2$ equivalent)	NO,NO	NO,NO	-100%
Emissions of SF$_6$ + NF$_3$ - (kt CO$_2$ equivalent)	NO,NO	NO,NO	-100%
All	NO,NA	NO,NA	-100%

Notes: 1) If Inventoryear first year, leave blank; 2) Specify in the notes sheet

TABLE 10 EMISSION TRENDS
HFCs, PFCs, SF_6, and NF_3
(Sheet 5 of 6)

Inventory 1990
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year[1]	1990	Change from base to latest reported year
	(kt)		%
Emissions of HFCs and PFCs - (kt CO_2 equivalent)	NO,NA	NO,NA	0,00
Emissions of HFCs - (kt CO_2 equivalent)	NO,NA	NO,NA	0,00
HFC-23	NO	NO	0,00
HFC-32	NO	NO	0,00
HFC-41	NO	NO	0,00
HFC-43-10mee	NO	NO	0,00
HFC-125	NO	NO	0,00
HFC-134	NO	NO	0,00
HFC-134a	NO	NO	0,00
HFC-143	NO	NO	0,00
HFC-143a	NO	NO	0,00
HFC-152	NO	NO	0,00
HFC-152a	NO	NO	0,00
HFC-161	NO	NO	0,00
HFC-227ea	NO	NO	0,00
HFC-236cb	NO	NO	0,00
HFC-236ea	NO	NO	0,00
HFC-236fa	NO	NO	0,00
HFC-245ca	NO	NO	0,00
HFC-245fa	NO	NO	0,00
HFC-365mfc	NO	NO	0,00
Unspecified mix of HFCs[4] - (kt CO_2 equivalent)	NO,NA	NO,NA	0,00
Emissions of PFCs - (kt CO_2 equivalent)	NA,NO	NA,NO	0,00
CF_4	NO	NO	0,00
C_2F_6	NO	NO	0,00
C_3F_8	NO	NO	0,00
C_4F_{10}	NO	NO	0,00
c-C_4F_8	NO	NO	0,00
C_5F_{12}	NO	NO	0,00
C_6F_{14}	NO	NO	0,00
$C_{10}F_{18}$	NO	NO	0,00
c-C_3F_6	NO	NO	0,00
Unspecified mix of PFCs[4] - (kt CO_2 equivalent)	NA,NO	NA,NO	0,00
Unspecified mix of HFCs and PFCs - (kt CO_2 equivalent)	NO,NA	NO,NA	0,00
Emissions of SF_6 - (kt CO_2 equivalent)	NA,NO	NA,NO	0,00
SF_6	NA,NO	NA,NO	0,00
Emissions of NF_3 - (kt CO_2 equivalent)	NO,NA	NO,NA	0,00
NF_3	NO,NA	NO,NA	0,00

Note: All footnotes for this table are given at the end of the table on sheet 6.

TABLE 10 EMISSION TRENDS
SUMMARY
(Sheet 6 of 6)

Inventory: 1990
Submission 2015 v1
BAHAMAS(5) KA

GREENHOUSE GAS EMISSIONS	Base year[1]	1990	Change from base to latest reported year
	CO_2 equivalent (kt)		
CO_2 emissions without net CO_2 from LULUCF	NO	NO	NO
CO_2 emissions with net CO_2 from LULUCF	2000.0 kt	2000.0 kt	0.0%
CH_4 emissions without CH_4 from LULUCF	1000.0 kt	1000.0 kt	0.0%
CH_4 emissions with CH_4 from LULUCF	NO	NO	NO
N_2O emissions without N_2O from LULUCF	1000.0 kt	1000.0 kt	0.0%
N_2O emissions with N_2O from LULUCF	NO	NO	NO
HFCs	70.0 kt	70.0 kt	0.0%
PFCs	70.0 kt	70.0 kt	0.0%
Total emissions HFCs and PFCs	70.0 kt	70.0 kt	0.0%
SF6	70.0 kt	70.0 kt	0.0%
Total (without LULUCF)	3000.0 kt	3000.0 kt	0.0%
Total (with LULUCF)	3000.0 kt	3000.0 kt	0.0%
Total (without LULUCF, with indirect)	70.0	70.0	0.0%
Total (with LULUCF, with indirect)	70.0	70.0	0.0%

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year[1]	1990	Change from base to latest reported year
	CO_2 equivalent (kt)		
Energy	2000.0 kt	2000.0 kt	0.0%
A. Industrial processes and product use	70.0 kt	70.0 kt	0.0%
B. Agriculture	2000.0 kt	2000.0 kt	0.0%
C. Land use, land-use change and forestry(net)	1000.0 kt	1000.0 kt	0.0%
D. Waste	1000.0 kt	1000.0 kt	0.0%
E. Other	NO	NO	NO
Total (Excluding LULUCF)[2]	70.0 kt	70.0 kt	0.0%

(1) The column "Base year" should be filled in only by those Parties with economies in transition that use a base year different from 1990 in accordance with the relevant decisions of the COP. For those Parties, this different base year is used to calculate the percentage change in the final column of this table.
(2) Fill in net emissions/removals as reported in table Summary 1.A. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).
(3) In accordance with the UNFCCC reporting guidelines, for Parties that decide to report indirect CO2 the national totals shall be provided with and without indirect CO_2.
(4) In accordance with the UNFCCC reporting guidelines, HFC and PFC emissions should be reported for each relevant chemical. However, if it is not possible to report values for each chemical (i.e. releases, confidential data, lack of disaggregation), this cell should be used for reporting aggregate figures for HFCs and PFCs, respectively. Note that the unit used for this cell is kt of CO2 equivalent and that appropriate notation keys should be entered in the cells for the individual chemicals.
(5) Includes net CO_2, CH_4, and N_2O from LULUCF.

Recommendation Box

Please check the data for absolute emissions, or emission trends in Sheet 5 - Trends in Greenhouse Gas Emissions and in Sheet 1 - Summary 1.A - Sectoral Report for Energy. Check the information box for details.

Enter the recommendation here (Recommendation for potential emission increase)

Explanatory Box

TABLE 10 EMISSION TRENDS
SUMMARY
(Sheet 6 of 6)

Inventory 1990
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS EMISSIONS	Base year[1]	1990	Change from base to latest reported year
	CO_2 equivalent (kt)		(%)
CO_2 emissions without net CO_2 from LULUCF	268184,48	268184,48	0,00
CO_2 emissions with net CO_2 from LULUCF	253001,42	253001,42	0,00
CH_4 emissions without CH_4 from LULUCF	94943,72	94943,72	0,00
CH_4 emissions with CH_4 from LULUCF	94957,22	94957,22	0,00
N_2O emissions without N_2O from LULUCF	17658,67	17658,67	0,00
N_2O emissions with N_2O from LULUCF	18014,30	18014,30	0,00
HFCs	NO,NA	NO,NA	0,00
PFCs	NA,NO	NA,NO	0,00
Unspecified mix of HFCs and PFCs	NO,NA	NO,NA	0,00
SF_6	NA,NO	NA,NO	0,00
NF_3	NO,NA	NO,NA	0,00
Total (without LULUCF)	380786,87	380786,87	0,00
Total (with LULUCF)	365972,94	365972,94	0,00
Total (without LULUCF, with indirect)	NA	NA	0,00
Total (with LULUCF, with indirect)	NA	NA	0,00

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year[1]	1990	Change from base to latest reported year
	CO_2 equivalent (kt)		(%)
1. Energy	310348,54	310348,54	0,00
2. Industrial processes and product use	22737,40	22737,40	0,00
3. Agriculture	43860,95	43860,95	0,00
4. Land use, land-use change and forestry[5]	-14813,93	-14813,93	0,00
5. Waste	3839,97	3839,97	0,00
6. Other	NO	NO	0,00
Total (including LULUCF)[5]	365972,94	365972,94	0,00

(1) The column "Base year" should be filled in only by those Parties with economies
(2) Fill in net emissions/removals as reported in table Summary 1.A. For the purposes
(3) In accordance with the UNFCCC reporting guidelines, for Parties that decide to
(4) In accordance with the UNFCCC reporting guidelines, HFC and PFC emissions
(5) Includes net CO_2, CH_4 and N_2O from LULUCF.

Documentation box:	
• Parties should provide detailed explanations on emissions trends in chapter 2: Trends in Greenhouse Gas Emissions and, as appropriate, in the corresponding Chapters 3 - 8 of the national inventory report (NIR). Use this documentation box to provide	
• Use the documentation box to provide explanations if potential emissions are reported.	
Documentation box	

TABLE 1 SECTORAL REPORT FOR ENERGY
(Sheet 1 of 2)

Inventory 2021

Submission 2023 v1

KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2	CH_4	N_2O	NO_X	CO	NMVOC	SO_2
	(kt)						
Total Energy	254061,34	1186,37	4,42	93359,27	624953,97	103,51	592,93
A. Fuel combustion activities (sectoral approach)	243409,04	72,84	4,36	93359,27	624953,97	103,51	592,93
1. Energy industries	120170,37	1,70	1,63	356,81	26,03	6,65	414,31
a. Public electricity and heat production	111432,07	1,34	1,56	341,41	24,80	6,25	414,31
b. Petroleum refining	3082,18	0,14	0,03				
c. Manufacture of solid fuels and other energy industries	5656,12	0,22	0,04	15,40	1,23	0,40	NA
2. Manufacturing industries and construction	40959,61	2,27	0,39	42,55	3,95	1,16	40,05
a. Iron and steel	9105,58	0,49	0,08				
b. Non-ferrous metals	8239,08	0,72	0,11				
c. Chemicals	2011,79	0,12	0,02				
d. Pulp, paper and print	477,75	0,02	0,00				
e. Food processing, beverages and tobacco	1256,33	0,05	0,01				
f. Non-metallic minerals	4915,46	0,39	0,06				
g. Other (*please specify*)	14953,62	0,48	0,11	42,55	3,95	1,16	40,05
3. Transport	24448,44	9,58	1,61	92925,76	624649,16	67,61	55,37
a. Domestic aviation	191,46	0,00	0,01	0,67	0,33	0,00	0,05
b. Road transportation	20815,32	8,69	1,10	92925,07	624648,80	67,61	55,33
c. Railways	1068,55	0,06	0,41	0,02	0,03	0,00	NE
d. Domestic navigation	4,67	0,00	0,00	NE	NE	NE	NE
e. Other transportation	2368,45	0,82	0,08				

TABLE 1 SECTORAL REPORT FOR ENERGY
(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2	CH_4	N_2O	NO_X	CO	NMVOC	SO_2
	(kt)						
4. Other sectors	38995,28	56,67	0,54	13,18	98,10	9,99	34,59
a. Commercial/institutional	11483,62	3,96	0,15	13,18	98,10	9,99	34,59
b. Residential	24533,98	50,50	0,32				
c. Agriculture/forestry/fishing	2977,68	2,21	0,08				
5. Other *(as specified in table 1.A(a) sheet 4)*	18835,35	2,62	0,19	20,96	176,73	18,09	48,61
a. Stationary	18835,35	2,62	0,19	20,96	176,73	18,09	48,61
b. Mobile	NO,IE	NO,IE	NO,IE	NO	NO	NO	NO
B. Fugitive emissions from fuels	10652,30	1113,53	0,06	NO,NA	NO,NA	NO,NA	NO,NA
1. Solid fuels	1978,55	308,06	0,03	NO	NO	NO	NO
a. Coal mining and handling	209,63	308,04	NO	NO	NO	NO	
b. Solid fuel transformation	1752,53	0,02	0,03	NO	NO	NO	NO
c. Other *(as specified in table 1.B.1)*	16,39	0,00	NO	NO	NO	NO	NO
2. Oil and natural gas and other emissions from energy production	8673,75	805,47	0,04	NO,NA	NO,NA	NO,NA	NO,NA
a. Oil	957,62	561,52	0,01	NO	NO	NO	NO
b. Natural gas	943,15	153,28				NO	NO
c. Venting and flaring	6772,98	90,67	0,03	NO	NO	NO	NO
d. Other *(as specified in table 1.B.2)*	NA	NA	NA	NA	NA	NA	NA
C. CO_2 Transport and storage	NO,NA						
1. Transport of CO_2	NO						
2. Injection and storage	NA						
3. Other							
Memo items: [(1)]							
International bunkers	669,43	0,01	0,02	NO	NO	NO	NO
Aviation	664,41	0,00	0,02	NO	NO	NO	NO
Navigation	5,02	0,00	0,00	NO	NO	NO	NO
Multilateral operations							
CO_2 emissions from biomass	2146,06						
CO_2 captured	NO,IE,NA						
For domestic storage							
For storage in other countries							

[(1)] Countries are asked to report emissions from international aviation and marine bunkers and multilateral operations, as well as carbon dioxide (CO_2) emissions from biomass, under Memo items. These emissions should not be included in the national total emissions from the energy sector. Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO_2 emissions are accounted for as a loss of biomass stocks in the land use, land-use change and forestry sector.

Documentation Box:	
Parties should provide detailed explanations on the energy sector in chapter 3: energy (IPCC sector 1) of the national inventory report. Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.	
Documentation box	d in Kazakhstan 1./2021: This process is not carried out. Extended comment in chapter 3.5.4.1 1./2021: The fuel used by mobile transport is included in

TABLE 1.A(a) SECTORAL BACKGROUND DATA FOR ENERGY
Fuel combustion activities - sectoral approach
(Sheet 1 of 4)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	AGGREGATE ACTIVITY DATA		IMPLIED EMISSION FACTORS			EMISSIONS			
	Consumption		CO_2 [1]	CH_4	N_2O	CO_2 [2]	CH_4	N_2O	CO_2 Amount captured
	(TJ)	NCV/GCV [3]	(t/TJ)	(kg/TJ)		(kt)			
1.A. Fuel combustion	3050232,13	NCV				243409,04	72,84	4,36	NO,NA
Liquid fuels	861043,06	NCV	71,02	14,64	2,29	61153,03	12,61	1,98	NA
Solid fuels	1463494,10	NCV	98,23	33,68	1,50	143765,70	49,29	2,20	NA
Gaseous fuels	696049,75	NCV	55,21	3,30	0,10	38427,32	2,30	0,07	NA
Other fossil fuels [4]	859,02	NCV	73,33	10,48	0,60	63,00	0,01	0,00	NA
Peat [5]	NO	NCV	NO,NA	NO	NO	NO	NO	NO	NO,NA
Biomass [6]	28786,21	NCV	74,55	299,79	4,00		8,63	0,12	NO,NA
1.A.1. Energy industries	1375875,92	NCV				120170,37	1,70	1,63	NO,NA
Liquid fuels	160284,38	NCV	72,32	2,99	0,60	11591,78	0,48	0,10	NA
Solid fuels	1010439,64	NCV	96,07	1,00	1,50	97069,57	1,01	1,52	NA
Gaseous fuels	205151,89	NCV	56,10	1,00	0,10	11509,02	0,21	0,02	NA
Other fossil fuels [4]	NA	NCV	NA	NA	NA	NA	NA	NA	NA
Peat [5]	NO	NCV	NO,NA	NO	NO	NO	NO	NO	NO,NA
Biomass [6]	NA	NCV	NA	NA	NA	NA	NA	NA	NA
a. Public electricity and heat production [7]	1250842,60	NCV				111432,07	1,34	1,56	NA
Liquid fuels	44382,22	NCV	75,84	3,00	0,61	3365,74	0,13	0,03	NA
Solid fuels	1010439,64	NCV	96,07	1,00	1,50	97069,57	1,01	1,52	NA
Gaseous fuels	196020,74	NCV	56,10	1,00	0,10	10996,76	0,20	0,02	NA
Other fossil fuels [4]	NA	NCV	NA	NA	NA	NA	NA	NA	NA
Peat [5]	NO	NCV	NO,NA	NO	NO	NO	NO	NO	NA
Biomass [6]	NA	NCV	NA	NA	NA	NA	NA	NA	NA
b. Petroleum refining	45756,57	NCV				3082,18	0,14	0,03	NO,NA
Liquid fuels	45756,57	NCV	67,36	2,99	0,59	3082,18	0,14	0,03	NA
Solid fuels	NA	NCV	NA	NA	NA	NA	NA	NA	NA
Gaseous fuels	NA	NCV	NA	NA	NA	NA	NA	NA	NA
Other fossil fuels [4]	NA	NCV	NA	NA	NA	NA	NA	NA	NA
Peat [5]	NO	NCV	NO	NO	NO	NO	NO	NO	NO
Biomass [6]	NA	NCV	NA	NA	NA	NA	NA	NA	NA
c. Manufacture of solid fuels and other energy industries [8]	79276,75	NCV				5656,12	0,22	0,04	NA
Liquid fuels	70145,60	NCV	73,33	2,99	0,60	5143,86	0,21	0,04	NA
Solid fuels	NA	NCV	NA	NA	NA	NA	NA	NA	NA
Gaseous fuels	9131,15	NCV	56,10	0,99	0,10	512,26	0,01	0,00	NA
Other fossil fuels [4]	NA	NCV	NA	NA	NA	NA	NA	NA	NA
Peat [5]	NO	NCV	NO,NA	NO	NO	NO	NO	NO	NA
Biomass [6]	NA	NCV	NA	NA	NA	NA	NA	NA	NA

Note: All footnotes for this table are given at the end of the table on sheet 4.

Note: For the coverage of fuel categories, refer to the 2006 IPCC Guidelines (chapter 1 of energy volume, section 1.4.1.1, page 1.11). If some derived gases (e.g. gas works, gas, coke oven gas, blast furnace gas) are considered, Parties should provide information on the allocation of these derived gases under the above fuel categories (liquid, solid, gaseous, biomass and other fuels) in the NIR (see also documentation box at the end of sheet 4 of this table).

TABLE 1.A(a) SECTORAL BACKGROUND DATA FOR ENERGY
Fuel combustion activities - sectoral approach
(Sheet 2 of 4)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	AGGREGATE ACTIVITY DATA		IMPLIED EMISSION FACTORS			EMISSIONS			
	Consumption		CO_2 [1]	CH_4	N_2O	CO_2 [2]	CH_4	N_2O	CO_2 Amount captured
	(TJ)	NCV/GCV [3]	(t/TJ)	(kg/TJ)		(kt)			
1.A.2 Manufacturing industries and construction	495848,11	NCV				40959,61	2,27	0,39	NO,NA
Liquid fuels	195354,77	NCV	75,62	3,00	0,60	14773,59	0,59	0,12	NA
Solid fuels	173690,85	NCV	113,23	8,97	1,50	19666,62	1,56	0,26	NA
Gaseous fuels	126781,62	NCV	51,42	1,01	0,10	6519,40	0,13	0,01	NA
Other fossil fuels [4]	NA	NCV	NA	NA	NA	NA	NA	NA	NA
Peat [5]	NO	NCV	NO,NA	NO	NO	NO	NO	NO	NO,NA
Biomass [6]	20,86	NCV	73,35	28,76	3,84	1,53	0,00	0,00	NO,NA
a. Iron and steel	74416,04	NCV				9105,58	0,49	0,08	NA
Liquid fuels	24701,85	NCV	74,36	3,00	0,61	1836,92	0,07	0,02	NA
Solid fuels	40523,89	NCV	166,64	10,12	1,51	6753,09	0,41	0,06	NA
Gaseous fuels	9190,30	NCV	56,10	1,00	0,10	515,58	0,01	0,00	NA
Other fossil fuels [4]	NA	NCV	NA	NA	NA	NA	NA	NA	NA
Peat [5]	NO	NCV	NO,NA	NO	NO	NO	NO	NO	NA
Biomass [6]	NA	NCV	NA	NA	NA	NA	NA	NA	NA
b. Non-ferrous metals	90289,57	NCV				8239,08	0,72	0,11	NO,NA
Liquid fuels	22066,10	NCV	81,76	2,99	0,59	1804,20	0,07	0,01	NA
Solid fuels	65242,97	NCV	96,07	10,00	1,50	6267,67	0,65	0,10	NA
Gaseous fuels	2980,51	NCV	56,10	1,00	0,10	167,21	0,00	0,00	NA
Other fossil fuels [4]	NA	NCV	NA	NA	NA	NA	NA	NA	NA
Peat [5]	NO	NCV	NO	NO	NO	NO	NO	NO	NO
Biomass [6]	NA	NCV	NA	NA	NA	NA	NA	NA	NA
c. Chemicals	25727,83	NCV				2011,79	0,12	0,02	NO,NA
Liquid fuels	3007,36	NCV	74,62	3,00	0,60	224,40	0,01	0,00	NA
Solid fuels	10152,16	NCV	106,61	10,00	1,50	1082,31	0,10	0,02	NA
Gaseous fuels	12568,31	NCV	56,10	1,00	0,10	705,08	0,01	0,00	NA
Other fossil fuels [4]	NA	NCV	NA	NA	NA	NA	NA	NA	NA
Peat [5]	NO	NCV	NO	NO	NO	NO	NO	NO	NO
Biomass [6]	NA	NCV	NA	NA	NA	NA	NA	NA	NA
d. Pulp, paper and print	7145,57	NCV				477,75	0,02	0,00	NO,NA
Liquid fuels	5435,99	NCV	70,01	3,00	0,60	380,60	0,02	0,00	NA
Solid fuels	31,17	NCV	96,07	10,01	1,51	2,99	0,00	0,00	NA
Gaseous fuels	1678,41	NCV	56,10	1,00	0,10	94,16	0,00	0,00	NA
Other fossil fuels [4]	NA	NCV	NA	NA	NA	NA	NA	NA	NA
Peat [5]	NO	NCV	NO	NO	NO	NO	NO	NO	NO
Biomass [6]	NA	NCV	NO,NA	NA	NA	NA	NA	NA	NO
e. Food processing, beverages and tobacco	18441,46	NCV				1256,33	0,05	0,01	NO,NA
Liquid fuels	8218,75	NCV	73,74	3,00	0,60	606,02	0,02	0,00	NA
Solid fuels	1894,91	NCV	96,64	9,97	1,50	183,12	0,02	0,00	NA
Gaseous fuels	8327,79	NCV	56,10	1,00	0,10	467,19	0,01	0,00	NA
Other fossil fuels [4]	NA	NCV	NA	NA	NA	NA	NA	NA	NA
Peat [5]	NO	NCV	NO	NO	NO	NO	NO	NO	NO
Biomass [6]	NA	NCV	NA	NA	NA	NA	NA	NA	NA
f. Non-metallic minerals	57382,36	NCV				4915,46	0,39	0,06	NO,NA
Liquid fuels	18149,31	NCV	77,69	3,00	0,60	1410,08	0,05	0,01	NA
Solid fuels	32575,18	NCV	96,14	10,00	1,50	3131,87	0,33	0,05	NA
Gaseous fuels	6657,87	NCV	56,10	1,00	0,10	373,51	0,01	0,00	NA
Other fossil fuels [4]	NA	NCV	NA	NA	NA	NA	NA	NA	NA
Peat [5]	NO	NCV	NO	NO	NO	NO	NO	NO	NO
Biomass [6]	NA	NCV	NA	NA	NA	NA	NA	NA	NA
g. Other (*please specify*) [9]	222445,28	NCV				14953,62	0,48	0,11	NA

Note: All footnotes for this table are given at the end of the table on sheet 4.

TABLE 1.A(a) SECTORAL BACKGROUND DATA FOR ENERGY
Fuel combustion activities - sectoral approach
(Sheet 3 of 4)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	AGGREGATE ACTIVITY DATA		IMPLIED EMISSION FACTORS			EMISSIONS		
	Consumption		CO_2 [1]	CH_4	N_2O	CO_2 [2]	CH_4	N_2O
	(TJ)	NCV/GCV [3]	(t/TJ)	(kg/TJ)		(kt)		
1.A.3 Transport	363705,79	NCV				24448,44	9,58	1,61
Liquid fuels	334312,19	NCV	68,28	27,77	4,80	22827,48	9,28	1,60
Solid fuels	NO,NA	NCV	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
Gaseous fuels	29393,61	NCV	55,15	10,00	0,10	1620,96	0,29	0,00
Other fossil fuels [4]	NO,NA	NCV	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
Biomass [6]	NO,NA	NCV	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
a. Domestic aviation [10]	12545,87	NCV				191,46	0,00	0,01
Aviation gasoline	1637,27	NCV	69,30	0,50	2,00	113,46	0,00	0,00
Jet kerosene	10908,60	NCV	7,15	0,05	0,20	78,00	0,00	0,00
Biomass	NO		NO	NO	NO	NO	NO	NO
b. Road transportation [11]	296786,67	NCV				20815,32	8,69	1,10
Gasoline	194243,67	NCV	69,30	33,00	3,20	13461,09	6,41	0,62
Diesel oil	80341,84	NCV	74,10	3,90	5,24	5953,33	0,31	0,42
Liquefied petroleum gases (LPG)	22201,16	NCV	63,10	88,69	2,73	1400,89	1,97	0,06
Other liquid fuels (*please specify*)	NO,NA	NCV				NO,NA	NO,NA	NO,NA
Gaseous fuels	NO,NA	NCV	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
Biomass [6]	NO,NA	NCV	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
Other fossil fuels *(please specify)* [4]	NO,NA	NCV				NO,NA	NO,NA	NO,NA
i. Cars	210427,54	NCV				14559,05	7,51	0,68
Gasoline	170075,13	NCV	69,30	33,00	3,20	11786,21	5,61	0,54
Diesel oil	20600,48	NCV	74,10	3,90	3,90	1526,50	0,08	0,08
Liquefied petroleum gases (LPG)	19751,93	NCV	63,10	92,00	3,00	1246,35	1,82	0,06
Other liquid fuels (*please specify*)	NA					NA	NA	NA
Gaseous fuels	NA		NA	NA	NA	NA	NA	NA
Biomass [6]	NA		NA	NA	NA	NA	NA	NA
Other fossil fuels *(please specify)* [4]	NA					NA	NA	NA
ii. Light duty trucks	33179,19	NCV				2356,29	0,73	0,14
Gasoline	16783,70	NCV	69,30	33,00	3,20	1163,11	0,55	0,05
Diesel oil	14420,30	NCV	74,10	3,90	5,70	1068,55	0,06	0,08
Liquefied petroleum gases (LPG)	1975,19	NCV	63,10	62,00	0,20	124,64	0,12	0,00
Other liquid fuels (*please specify*)	NA					NA	NA	NA
Gaseous fuels	NA		NA	NA	NA	NA	NA	NA
Biomass [6]	NA		NA	NA	NA	NA	NA	NA
Other fossil fuels *(please specify)* [4]	NA					NA	NA	NA
iii. Heavy duty trucks and buses	52732,38	NCV				3868,96	0,44	0,28
Gasoline	6937,28	NCV	69,30	33,00	3,20	480,75	0,23	0,02
Diesel oil	45321,06	NCV	74,10	3,90	5,70	3358,29	0,18	0,26
Liquefied petroleum gases (LPG)	474,05	NCV	63,10	62,00	2,00	29,91	0,03	0,00
Other liquid fFuels (*please specify*)	NA					NA	NA	NA
Gaseous fuels	NA		NA	NA	NA	NA	NA	NA
Biomass [6]	NA		NA	NA	NA	NA	NA	NA
Other fossil fuels *(please specify)* [4]	NA					NA	NA	NA
iv. Motorcycles	447,57	NCV				31,02	0,01	0,00
Gasoline	447,57	NCV	69,30	33,00	3,30	31,02	0,01	0,00
Diesel oil	NA		NA	NA	NA	NA	NA	NA
Liquefied petroleum gases (LPG)	NA		NA	NA	NA	NA	NA	NA
Other liquid fuels (*please specify*)	NA					NA	NA	NA
Gaseous fuels	NA		NA	NA	NA	NA	NA	NA
Biomass [6]	NA		NA	NA	NA	NA	NA	NA
Other fossil fuels *(please specify)* [4]	NA					NA	NA	NA
v. Other (please specify)	NO	NCV				NO	NO	NO
c. Railways	14420,34	NCV				1068,55	0,06	0,41
Liquid fuels	14420,34	NCV	74,10	4,15	28,60	1068,55	0,06	0,41
Solid fuels	NO		NO	NO	NO	NO	NO	NO
Gaseous fuels	NO		NO	NO	NO	NO	NO	NO
Biomass [6]	NO		NO	NO	NO	NO	NO	NO
Other fossil fuels (*please specify)*	NO					NO	NO	NO
d. Domestic Navigation [10]	63,26	NCV				4,67	0,00	0,00
Residual fuel oil	NO		NO	NO	NO	NO	NO	NO
Gas/diesel oil	59,81	NCV	74,10	7,00	2,00	4,43	0,00	0,00
Gasoline	3,45	NCV	69,30	33,00	32,00	0,24	0,00	0,00
Other liquid fuels *(please specify)*	NO					NO	NO	NO
Gaseous fuels	NO		NO	NO	NO	NO	NO	NO
Biomass [6]	NO		NO	NO	NO	NO	NO	NO
Other fossil fuels (*please specify)* [4]	NO					NO	NO	NO
e. Other transportation *(please specify)*	39889,65	NCV				2368,45	0,82	0,08
Liquid fuels	10496,04	NCV	71,22	50,44	7,81	747,49	0,53	0,08
Solid fuels	NO,NA	NCV	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
Gaseous fuels	29393,61	NCV	55,15	10,00	0,10	1620,96	0,29	0,00
Other fossil fuels [4]	NO,NA	NCV	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
Biomass [6]	NO,NA	NCV	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
i. Pipeline transport	31082,65	NCV				1746,54	0,30	0,00
Liquid fuels	1689,04	NCV	74,35	4,68	0,12	125,58	0,01	0,00
Solid fuels	NO		NO	NO	NO	NO	NO	NO
Gaseous fuels	29393,61	NCV	55,15	10,00	0,10	1620,96	0,29	0,00
Other fossil fuels [4]	NO		NO	NO	NO	NO	NO	NO
Biomass [6]	NO		NO	NO	NO	NO	NO	NO
ii. Other *(please specify)*	8807,00	NCV				621,91	0,52	0,08

Note: All footnotes for this table are given at the end of the table on sheet 4.

TABLE 1.A(a) SECTORAL BACKGROUND DATA FOR ENERGY
Fuel combustion activities - sectoral approach
(Sheet 4 of 4)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	AGGREGATE ACTIVITY DATA		IMPLIED EMISSION FACTORS			EMISSIONS			
	Consumption		CO_2 [1]	CH_4	N_2O	CO_2 [2]	CH_4	N_2O	CO_2 Amount captured
	(TJ)	NCV/GCV [3]	(t/TJ)	(kg/TJ)		(kt)			
1.A.4 Other sectors	556691,44	NCV				38995,28	56,67	0,54	NO,NA
Liquid fuels	92440,35	NCV	69,10	15,92	1,21	6387,40	1,47	0,11	NA
Solid fuels	198752,63	NCV	96,65	231,04	1,50	19210,40	45,92	0,30	NA
Gaseous fuels	237691,22	NCV	56,10	5,00	0,10	13334,48	1,19	0,02	NA
Other fossil fuels [4]	859,02	NCV	73,33	10,48	0,60	63,00	0,01	0,00	NA
Peat [5]	NO	NCV	NO,NA	NO	NO	NO	NO	NO	NO,NA
Biomass [6]	26948,22	NCV	74,72	299,98	4,00	2013,68	8,08	0,11	NA
a. Commercial/institutional [12]	164227,00	NCV				11483,62	3,96	0,15	NA
Liquid fuels	60140,27	NCV	69,78	9,99	0,60	4196,44	0,60	0,04	NA
Solid fuels	47261,92	NCV	96,89	10,01	1,50	4579,06	0,47	0,07	NA
Gaseous fuels	47150,20	NCV	56,10	5,01	0,10	2645,13	0,24	0,00	NA
Other fossil fuels [4]	859,02	NCV	73,33	10,48	0,60	63,00	0,01	0,00	NA
Peat [5]	NO	NCV	NO,NA	NO	NO	NO	NO	NO	NA
Biomass [6]	8815,59	NCV	77,58	300,04	4,00	683,95	2,65	0,04	NA
b. Residential [13]	347146,79	NCV				24533,98	50,50	0,32	NA
Liquid fuels	16055,62	NCV	63,99	10,03	0,62	1027,35	0,16	0,01	NA
Solid fuels	146907,74	NCV	96,59	300,00	1,50	14190,17	44,07	0,22	NA
Gaseous fuels	166068,77	NCV	56,10	5,00	0,10	9316,46	0,83	0,02	NA
Other fossil fuels [4]	NA	NCV	NA	NA	NA	NA	NA	NA	NA
Peat [5]	NO	NCV	NO,NA	NO	NO	NO	NO	NO	NA
Biomass [6]	18114,67	NCV	73,33	299,98	4,00	1328,41	5,43	0,07	NA
1.A.4.b.iii Other (please specify)	347146,79	NCV				24533,98	45,06	0,25	NA
c. Agriculture/forestry/fishing	45317,65	NCV				2977,68	2,21	0,08	NO,NA
Liquid fuels	16244,47	NCV	71,63	43,71	4,07	1163,62	0,71	0,07	NA
Solid fuels	4582,97	NCV	96,26	300,02	1,51	441,17	1,38	0,01	NA
Gaseous fuels	24472,25	NCV	56,10	5,00	0,10	1372,89	0,12	0,00	NA
Other fossil fuels [4]	NO,NA	NCV	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NA
Peat [5]	NO	NCV	NO	NO	NO	NO	NO	NO	NO
Biomass [6]	17,96	NCV	73,34	278,43	5,57	1,32	0,01	0,00	NA
i. Stationary	30961,55	NCV				1953,85	1,52	0,01	NO,NA
Liquid fuels	1888,38	NCV	74,02	10,01	0,60	139,78	0,02	0,00	NA
Solid fuels	4582,97	NCV	96,26	300,02	1,51	441,17	1,38	0,01	NA
Gaseous fuels	24472,25	NCV	56,10	5,00	0,10	1372,89	0,12	0,00	NA
Other fossil fuels [4]	NA	NCV	NA	NA	NA	NA	NA	NA	NA
Peat [5]	NO	NCV	NO	NO	NO	NO	NO	NO	NO
Biomass [6]	17,96	NCV	73,34	278,43	5,57	1,32	0,01	0,00	NA
ii. Off-road vehicles and other machinery	9952,60	NCV				712,88	0,43	0,02	
Gasoline	5126,20	NCV	69,30	80,00	2,00	355,25	0,41	0,01	
Diesel oil	4826,40	NCV	74,10	4,21	2,86	357,64	0,02	0,01	
Liquefied petroleum gases (LPG)	NO		NO	NO	NO	NO	NO	NO	
Other liquid fuels (*please specify*)	NO					NO	NO	NO	
Gaseous fuels	NA		NA	NA	NA	NA	NA	NA	
Biomass [6]	NA		NA	NA	NA	NA	NA	NA	
Other fossil fuels *(please specify)* [4]	NA					NA	NA	NA	
iii. Fishing	4403,50	NCV				310,95	0,26	0,04	
Residual fuel oil	NO		NO	NO	NO	NO	NO	NO	
Gas/diesel oil	1206,60	NCV	74,10	4,15	28,60	89,41	0,01	0,03	
Gasoline	3196,90	NCV	69,30	80,00	2,00	221,55	0,26	0,01	
Other liquid fuels *(please specify)*	NO					NO	NO	NO	
Gaseous fuels	NO		NO	NO	NO	NO	NO	NO	
Biomass [6]	NO		NO	NO	NO	NO	NO	NO	
Other fossil fuels (*please specify)* [4]	NO					NO	NO	NO	
1.A.5 Other *(Not specified elsewhere)* [14]	258110,87	NCV				18835,35	2,62	0,19	NA
a. Stationary *(please specify)*	258110,87	NCV				18835,35	2,62	0,19	NA
b. Mobile *(please specify)*	NO,IE	NCV				NO,IE	NO,IE	NO,IE	
Information item: [15]									
Waste incineration with energy recovery included as:									
Biomass [6]									
Fossil fuels [4]									

(1) The implied emission factors (IEFs) for carbon dioxide (CO2) are estimated on the basis of gross emissions, i.e. CO2 emissions + amount captured.

(2) Final CO2 emissions after subtracting the amounts of CO2 captured.

(3) If activity data are calculated using net calorific values (NCVs) specified by the IPCC Guidelines, write NCV in this column. If gross calorific values (GCVs) are used, write GCV in this column.

(4) Include information in the documentation box on which fuels are included and provide a reference to the section in the national inventory report (NIR) where further information is provided.

(5) Although peat is not strictly speaking a fossil fuel, the CO2 emissions from combustion of peat are included in the national emissions as for fossil fuels. See the 2006 IPCC Guidelines, chapter 1 of energy volume, page 1.15.

(6) Although CO2 emissions from biomass are reported in this table, they will not be included in the total CO2 emissions from fuel combustion. The value for total CO2 from biomass is recorded in table1 sheet 2 under the Memo Items.

(7) If data are available, Parties are encouraged to report at the disaggregated level available from the pre-defined drop-down menu. Furthermore, Parties are encouraged to the extent possible to use the pre-defined category definitions rather than to create similar categories. This

(8) If data are available, Parties are encouraged to report at the disaggregated level available from the pre-defined drop-down menu. Furthermore, Parties are encouraged to the extent possible to use the pre-defined category definitions rather than to create similar categories. This

(9) If data are available, Parties are encouraged to report at the disaggregated level available from the pre-defined drop-down menu. Furthermore, Parties are encouraged to the extent possible to use the pre-defined category definitions rather than to create similar categories. This

(10) Domestic aviation and navigation should not include emissions from military aviation and navigation. The emissions from military mobile sources should be reported under category 1.A.5.b.

(11) Emissions from the use of urea as a catalyst are to be reported under category 2.D.3.

(12) If data are available, Parties are encouraged to report at the disaggregated level available from the pre-defined drop-down menu. Furthermore, Parties are encouraged to the extent possible to use the pre-defined category definitions rather than to create similar categories. This

(13) If data are available, Parties are encouraged to report at the disaggregated level available from the pre-defined drop-down menu. Furthermore, Parties are encouraged to the extent possible to use the pre-defined category definitions rather than to create similar categories. This ensures the highest possible degree of comparability of the reporting.

(14) Include military fuel use under this category.

(15) "Information item" data are included to allow cross-sectoral and cross-fuel checks for activity data and emissions. Details on the actual amounts reported for the subcategories and fuels should be included in the NIR.

Documentation Box
• Parties should provide detailed explanations on the fuel combustion subsector in the corresponding part of chapter 3: energy (CRF subsector 1.A) of the NIR. Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table. • If estimates are based on GCVs, use this documentation box to provide reference to the relevant section of the NIR where the information necessary for the calculation of the activity data based on NCVs can be found. • If some derived gases (e.g. gas works gas, coke oven gas, blast furnace gas) are considered, use this documentation box to provide a reference to the relevant section of the NIR containing the information on the allocation of these derived gases under the above fuel categories (liquid, solid, gaseous, biomass and other fuels).
Documentation box: in Kazakhstan Peat is not used in Kazakhstan Peat is not used in Kazakhstan Peat is not used in Kazakhstan Peat is not used in Kazakhstan Peat is not used in Kazakhstan P

TABLE 1.A(b) SECTORAL BACKGROUND DATA FOR ENERGY
CO_2 from fuel combustion activities - reference approach (IPCC worksheet fuel combustion activities)
(Sheet 1 of 1)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

FUEL TYPES			Unit	Production	Imports	Exports	International bunkers	Stock change	Apparent consumption	Conversion factor (TJ/Unit)[1]	NCV/ GCV[2]	Apparent consumption (TJ)	Carbon emission factor (t C/TJ)	Carbon content (kt)	Carbon stored[C excluded] (kt C)	Net carbon emissions ((kt) C)	Fraction of carbon oxidized	Actual CO_2 emissions ((kt) CO_2)
Liquid fossil		Crude oil	kt	86228,71	0,49	68943,71		40,36	17245,13	42,30	NCV	729469,00	20,00	14589,38	NE	14589,38	1,00	53494,39
	Primary fuels	Orimulsion	kt	NO	NO	NO		NO	NO	NA	NCV	NO,NA	NA	NO,NA	NO	NO,NA	NA	NO,NA
		Natural gas liquids	kt	1195,88	NA	223,43		NA	972,45	44,20	NCV	42982,29	17,50	752,19	NA	752,19	1,00	2758,03
	Secondary fuels	Gasoline	kt		361,92	4,47	NO	159,49	197,96	44,30	NCV	8769,81	19,10	167,50	NA	167,50	1,00	614,18
		Jet kerosene	kt		48,50	14,30	210,71	2,04	-178,55	44,10	NCV	-7874,06	19,50	-153,54	NA	-153,54	1,00	-562,99
		Other kerosene	kt		0,85	14,00	NO	8,08	-21,23	43,80	NCV	-930,05	19,60	-18,23	NA	-18,23	1,00	-66,84
		Shale oil	kt		NO	NO		NO	NO	NA	NCV	NO,NA	NA	NO,NA	NO	NO,NA	NA	NO,NA
		Gas/diesel oil	kt		834,51	1761,75	0,79	40,46	-968,49	43,00	NCV	-41645,07	20,20	-841,23	NA	-841,23	1,00	-3084,51
		Residual fuel oil	kt		791,91	278,55	NO	133,79	379,57	40,40	NCV	15334,51	21,10	323,56	NA	323,56	1,00	1186,38
		Liquefied petroleum gases (LPG)	kt		26,24	1422,17		1,16	-1397,09	47,30	NCV	-66082,36	17,20	-1136,62	NA	-1136,62	1,00	-4167,59
		Ethane	kt		NO	NO		NO	NO	NA	NCV	NO,NA	NA	NO,NA	NO	NO,NA	NA	NO,NA
		Naphtha	kt		NO	NO		NO	NO	NA	NCV	NO,NA	NA	NO,NA	NO	NO,NA	NA	NO,NA
		Bitumen	kt		6,10	65,60		1,40	-60,90	40,20	NCV	-2448,18	22,00	-53,86	NA	-53,86	1,00	-197,49
		Lubricants	kt		144,09	16,34	NO	3,38	124,37	40,20	NCV	4999,67	20,00	99,99	NA	99,99	1,00	366,64
		Petroleum coke	kt		NA	NA		0,88	-0,88	32,50	NCV	-28,70	26,60	-0,76	NA	-0,76	1,00	-2,80
		Refinery feedstocks	6 m^3		NA	NA		NA	NA	35,64	NCV	NA	15,70	NA	NA	NA	1,00	NA
		Other oil	kt		NA	NA		NA	NA	40,20	NCV	NA	20,00	NA	NA	NA	1,00	NA
Other liquid fossil												NO,NA		NO,NA	NA	NO,NA		NO,NA
		Tar	kt	NO	NO	NO	NO	NO	NO	NA	NCV	NO,NA	NA	NO,NA	NA	NO,NA	NA	NO,NA
		Oil tar	kt	NO	NO	NO	NO	NO	NO	NA	NCV	NO,NA	NA	NO,NA	NA	NO,NA	NA	NO,NA
Liquid fossil totals												682546,87		13728,38	NO,NE,NA	13728,38		50337,40
Solid fossil	Primary fuels	Anthracite[3]	kt	NO	NO	NO		NO	NO	NA	NCV	NO,NA	NA	NO,NA	NA	NO,NA	NA	NO,NA
		Coking coal	kt	IE	IE	IE		IE	IE	IE	NCV	IE	25,80	IE	IE	IE	1,00	IE
		Other bituminous coal	kt	NO	NO	NO	NO	NO	NO	NA	NCV	NO,NA	NA	NO,NA	NA	NO,NA	NA	NO,NA
		Sub-bituminous coal	kt	NO	NO	NO	NO	NO	NO	NO	NCV	NO	NA	NO,NA	NA	NO,NA	NA	NO,NA
		Lignite	kt	4861,28	0,10	3203,06		91,71	1566,61	11,90	NCV	18642,66	27,60	514,54	NA	514,54	1,00	1886,64
		Oil shale and tar sand	kt	NA	NA	NA		NA	NA	8,90	NCV	NA	29,10	NA	NA	NA	1,00	NA
	Secondary fuels	BKB[4] and patent fuel	kt		NA	NA		NA	NA	20,70	NCV	NA	20,60	NA	NA	NA	1,00	NA
		Coke oven/gas coke	kt		1065,58	9,07		38,97	1017,54	28,20	NCV	28694,63	29,20	837,88	NA	837,88	1,00	3072,24
		Coal tar	kt		0,00	30,82		7,18	-38,00	28,00	NCV	-1063,97	22,00	-23,41	NA	-23,41	1,00	-85,83
Other solid fossil												1437177,25		37627,80	IE,NA	37627,80		137968,60
		Energy coal	kt	98464,90	15,73	25804,11	NO	106,98	72569,54	18,90	NCV	1371564,31	26,20	35934,98	NA	35934,98	1,00	131761,61
		High ash coal	kt	IE	IE	IE	NO	IE	NO,IE	18,90	NCV	NO,IE	26,20	NO,IE	IE	NO,IE	1,00	NO,IE
		Other coal	kt	IE	IE	IE	NO	IE	NO,IE	18,90	NCV	NO,IE	26,20	NO,IE	IE	NO,IE	1,00	NO,IE
		Coal concentrate	kt	3324,79	410,35	1407,18	NO	1,26	2326,70	28,20	NCV	65612,94	25,80	1692,81	NA	1692,81	1,00	6206,98
Solid fossil totals												1483450,56		38956,81	IE,NA	38956,81		142841,64
Gaseous fossil		Natural gas (dry)	6 m^3	26746,57	2287,76	9855,57		545,01	18633,75	34,78	NCV	648081,83	15,30	9915,65	125,11	9790,54	1,00	35898,65
Other gaseous fossil												NO		NO	NO	NO		NO
Gaseous fossil totals												648081,83		9915,65	125,11	9790,54		35898,65
Waste (non-biomass fraction)			kt	NO	NO	NO	NO	NO	NO	NA	NCV	NO,NA	NA	NO,NA	NO	NO,NA	NA	NO,NA
Other fossil fuels												NO		NO	NO	NO		NO
Peat[5,6]			kt	NO	NO	NO	NO	NO	NO	NA	NCV	NO,NA	NA	NO,NA	NO	NO,NA	NA	NO,NA
Total												2814079,25		62600,85	125,11	62475,74		229077,70
Biomass total												-7977,91		-243,33	NO,IE,NA	-243,33		-892,20
		Solid biomass	TJ	68,91	198,76	18,58		8227,00	-7977,91	1,00	NCV	-7977,91	30,50	-243,33	NA	-243,33	1,00	-892,20
		Liquid biomass	TJ	IE	IE	IE		IE	IE	NA	NCV	IE,NA	NA	IE,NA	IE	IE,NA	NA	IE,NA
		Gas biomass	TJ	IE	IE	IE		IE	IE	NA	NCV	IE,NA	NA	IE,NA	IE	IE,NA	NA	IE,NA
		Other non-fossil fuels (biogenic waste)	TJ	NO	NO	NO		NO	NO	NA	NCV	NO,NA	NA	NO,NA	NO	NO,NA	NA	NO,NA

(1) If consumption data are not reported in physical units, please report net calorific values in a similar level of disaggregation as fuel types in the national inventory report (NIR) and indicate in the documentation box where this information is reported.
(2) To convert quantities in previous columns to energy units, use net calorific values (NCVs) and write NCV in this column. If gross calorific values (GCVs) are used, write GCV in this column.
(3) If data for anthracite are not available separately, include with Other Bituminous Coal.
(4) BKB: Brown coal briquettes.
(5) Although peat is not strictly speaking a fossil fuel, the carbon dioxide (CO_2) emissions from combustion of peat are included in the national emissions as for fossil fuels. See the 2006 IPCC Guidelines, chapter 1 of energy volume, page 1.15.
(6) include peat briquettes here.

Documentation Box:

Parties should provide detailed explanations on the fuel combustion sub-sector, including information relating to CO_2 from the Reference approach, in the corresponding part of Chapter 3: Energy (CRF sub-sector 1.A) of the NIR. Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.

Documentation box	: Other bituminous coal is not used in Kazakhstan 1.AB/2021: Orimulsion is not used in Kazakhstan 1.AB/2021: National statistics do not provide data on the total consumption of sub-bituminous coal since 2015. Provides only as "Energy coal" 1.AB/2021: CO2 emissions and consum

TABLE 1.A(c) COMPARISON OF CO_2 EMISSIONS FROM FUEL COMBUSTION

Inventory 2021

Comparison of CO_2 emissions from fuel combustion

Submission 2023 v1

(Sheet 1 of 1)

KAZAKHSTAN

FUEL TYPES	REFERENCE APPROACH			SECTORAL APPROACH[1]		DIFFERENCE[2]	
	Apparent energy consumption[3] (PJ)	Apparent energy consumption (excluding non-energy use, reductants and feedstocks) [4] (PJ)	CO_2 emissions (kt)	Energy consumption (PJ)	CO_2 emissions[5] (kt)	Energy consumption (%)	CO_2 emissions[6] (%)
Liquid fuels (excluding international bunkers)	682,55	692,18	50337,40	861,04	61153,03	-67,34	-17,69
Solid fuels (excluding international bunkers)	1483,45	1389,69	142841,64	1463,49	143765,70	-27,73	-0,64
Gaseous fuels	648,08	648,08	35898,65	696,05	38427,32	-17,94	-6,58
Other fossil fuels	NO,NA	NO	NO,NA	0,86	63,00	-100,00	-100,00
Peat	NO,NA	NO	NO,NA	NO	NO	NO	NO,NA
Total [5]	2814,08	2729,96	229077,70	3021,45	243409,04	-9,65	-5,89

(1) "Sectoral approach" is used to indicate the approach (if different from the reference approach) used by the Party to estimate carbon dioxide (CO_2) emissions from fuel combustion as reported in table 1.A(a), sheets 1-4.

(2) Difference in CO_2 emissions estimated by the reference approach (RA) and the sectoral approach (SA) (difference = 100% x ((RA-SA)/SA)). For calculating the difference in energy consumption between the two approaches, data as reported in the column "Apparent energy consumption (excluding non-energy use, reductants and feedstocks)" are used for the reference approach.

(3) Apparent energy consumption data shown in this column are as in table 1.A(b).

(4) For the purposes of comparing apparent energy consumption in the reference approach with energy consumption in the sectoral approach, data in this column come from table 1.A(d).

(5) For the sectoral approach gross emissions (without accounting for CO_2 captured) are included in the comparison.

(6) In the case of discrepancies between the approaches (of more than 2 per cent), investigate and document the reasons for such discrepancies.

Documentation Box:

• Parties should provide detailed explanations on the fuel combustion subsector, including information related to the comparison of CO_2 emissions calculated using the sectoral approach with those calculated using the reference approach, in the corresponding part of chapter 3: energy (CRF subsector 1.A) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.

Documentation box	

TABLE 1.A(d) SECTORAL BACKGROUND DATA FOR ENERGY
Feedstocks, reductants and other non-energy use of fuels
(Sheet 1 of 1)

FUEL TYPE			ACTIVITY DATA AND RELATED INFORMATION	IMPLIED EMISSION FACTOR	CARBON EXCLUDED FROM REFERENCE APPROACH		IMPLIED CARBON EXCLUDED FRACTION	REPORTED CO_2 EMISSIONS[1]	
			Fuel quantity for NEU	Carbon emission factor	Carbon excluded	CO_2 excluded	Carbon fraction excluded from reference approach[2]	CO_2 emissions from the NEU reported in the inventory	Reported under: Select category(ies) from the category tree[3]
			(TJ)	(t C/TJ)	((kt) C)	((kt) CO_2)	(%)	((kt) CO_2)	
Liquid fossil fossil	Primary fuels	Crude oil	NO	NO	NO	NO	NO	NO	
		Orimulsion	NO	NO	NO	NO	NO,NA	NO	
		Natural gas liquids	NA	NA	NO	NO	NO	NA	Petrochemical Production - Other
	Secondary fuels	Gasoline	NA	NA	NA	NA	NA	NA	roducts from Fuels and Solvent Use
		Jet kerosene	NA	NA	NA	NA	NA	NA	roducts from Fuels and Solvent Use
		Other kerosene[4]	NA	NA	NA	NA	NA	NA	roducts from Fuels and Solvent Use
		Shale oil	NO	NO	NO	NO	NO,NA	NO	
		Gas/diesel oil[4]	NA	NA	NA	NA	NA	NA	roducts from Fuels and Solvent Use
		Residual fuel oil	NA	NA	NA	NA	NA	NA	roducts from Fuels and Solvent Use
		Liquefied petroleum gases (LPG)[4]	NA	NA	NA	NA	NA	NA	roducts from Fuels and Solvent Use
		Ethane[4]	NO	NO	NO	NO	NO,NA	NO	
		Naphtha[4]	NO	NO	NO	NO	NO,NA	NO	
		Bitumen	NA	NA	NA	NA	NA	NA	roducts from Fuels and Solvent Use
		Lubricants[5]	5247,91	20,00	104,96	384,85	104,97	384,85	roducts from Fuels and Solvent Use
		Petroleum coke[5]	NA	NA	NA	NA	NA	NA	cal Industry - Other (please specify)
		Refinery feedstocks	NA	NA	NA	NA	NA	NA	Petrochemical Production - Other
		Other oil[6]	NA	NA	NA	NA	NA	NA	
Other liquid fossil			NO	NO	NO	NO	NO,NA	NO	
		Tar	NO	NO	NO	NO	NO,NA	NO	
Liquid fossil totals			5247,91	20,00	104,96	384,85	0,76	384,85	
Solid fossil	Primary fuels	Anthracite	NO	NO	NO	NO	NO,NA	NO	
		Coking coal	NA	NA	NA	NA	IE,NA	NA	Ferroalloys Production
		Other bituminous coal	NO	NO	NO	NO	NO,NA	NO	
		Sub-bituminous Coal	NO	NO	NO	NO	NO,NA	NO	
		Lignite	NA	NA	NA	NA	NA	NA	etal Industry - Other (please specify)
		Oil shale and tar sand	NA	NA	NA	NA	NA	NA	
	Secondary fuels	BKB and patent fuel	NA		NA	NA	NA		
		Coke oven/gas coke	NA	NA	NA	NA	NA	NA	Ferroalloys Production
		Coal tar[7]	NA	NA	NA	NA	NA	NA	gy Products - Other (please specify)
Other solid fossil			NA	NA	NA	NA	NA	NA	
		Energy coal	NA	NA	NA	NA	NA	NA	gy Products - Other (please specify)
		High ash coal	NA	NA	NA	NA	NO,IE,NA	NA	roducts from Fuels and Solvent Use
		Other coal	NA	NA	NA	NA	NO,IE,NA	NA	roducts from Fuels and Solvent Use
		Coal concentrate	NA	NA	NA	NA	NA	NA	
Solid fossil totals			NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	
Gaseous fossil		Natural gas (dry)[4,8]	8176,92	15,30	125,11	458,74	1,26	458,74	Chemical Industry
Other gaseous fossil			NO	NO	NO	NO	NO	NO	
Gaseous fossil totals			8176,92	15,30	125,11	458,74	1,26	458,74	
Waste (non-biomass fraction)			NO	NO	NO	NO	NO,NA	NO	
Other fossil fuels			NO	NO	NO	NO	NO	NO	
Other fossil fuels totals			NO	NO	NO	NO	NO	NO	

(1) Carbon excluded from fuel combustion is either emitted in another sector of the inventory (for example as industrial process emissions) or is stored for long periods of time in a product manufactured from the fuel and therefore no emissions occur (for example, bitumen/asphalt used for road paving). Column I includes carbon dioxide (CO_2) emissions from non-energy use and column J documents where in the inventory these emissions are reported.
(2) The fraction of carbon excluded from reference approach relates CO_2 from carbon excluded to CO_2 reported in the reference approach.
(3) If the emissions from the fuel are reported in more than one category, list them in the table and provide further details in the documentation box and in the national inventory report (NIR). For the different NEU of fuels see also table 1.6, page 1.26, chapter 1, volume 3 of the 2006 IPCC Guidelines
(4) Enter data for those fuels that are used as feedstocks (fuel used as raw materials for manufacture of products such as plastics or fertilizers), reductant or for other non-energy use (fuels not used as fuel or transformed into another fuel (e.g. bitumen for road construction, lubricants)). For other fuels, use notation key "NO" (not occurring).
(5) Total deliveries.
(6) Refinery gas, paraffin waxes and white spirit are included under "other oil" in table 1A(b).
(7) Deliveries to petrochemical feedstock and blast furnaces.
(8) Deliveries to chemical industry and construction.

Documentation box:

Parties should provide detailed explanations on the fuel consumption for non-energy uses, in the corresponding part of chapter 3.2.3. Feedstocks and non-energy use of fuels of the NIR. Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.

Documentation box	ume 2, p.6.9). 1.AD/2021: National statistics do not provide data on the total consumption of sub-bituminous coal since 2015. Provides segregated by type of sub bituminous coal 1.AD/2021: Anthracite is not used in Kazakhstan

TABLE 1.B.1 SECTORAL BACKGROUND DATA FOR ENERGY
Solid fuels
(Sheet 1 of 1)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA	IMPLIED EMISSION FACTORS		EMISSIONS		
				CH_4		CO_2
	Amount of fuel produced	CH_4[1]	CO_2	Recovery/Flaring[2]	Emissions[3]	Emissions
	(Mt)	(kg/t)		(kt)		
1. B. 1. a. Coal mining and handling	106,65			NO,NE	308,04	209,63
i. Underground mines[4]	8,19	19,90	1,03	NO,NE	162,91	8,43
Mining activities		16,75	0,89	NE	137,12	7,29
Post-mining activities		2,68	0,14	NO	21,94	1,13
Abandoned underground mines		0,47	NO	NO	3,85	NO
ii. Surface mines[4]	98,46	1,47	2,04	NO	145,14	201,20
Mining activities		1,34	1,76	NO	131,94	173,51
Post-mining activities		0,13	0,28	NO	13,19	27,68
1. B. 1. b. Solid fuel transformation[5]	106,65	0,00	16,43	NO	0,02	1752,53
1. B. 1. c. Other (*please specify*)[6]				NO	0,00	16,39
Flaring of coke oven gas	2,48	0,00	6,61	NO	0,00	16,39

(1) The implied emission factors (IEFs) for methane (CH_4) are estimated on the basis of gross emissions as follows: (CH_4 emissions + amounts of CH_4 flared/recovered) / activity data.

(2) Amounts of CH_4 drained (recovered), utilized or flared. If CH_4 is recovered and flared the associated emissions should be included under 1.B.1.c.

(3) Final CH_4 emissions after subtracting the amounts of CH_4 utilized or recovered.

(4) In accordance with the IPCC Guidelines, emissions from Mining activities and Post-mining activities are calculated using the raw coal production for Underground mines and Surface mines.

(5) Include fugitive emissions from coke and charcoal production under this category, recognizing that there are no methods for estimating fugitive emissions from coke and charcoal production in the 2006 IPCC Guidelines.

(6) This category is to be used for reporting any other solid fuel related activities resulting in fugitive emissions, such as emissions from waste piles.

Note: There are no clear references to the coverage of subcategories 1.B.1.b. and 1.B.1.c. in the IPCC Guidelines. Make sure that the emissions entered here are not reported elsewhere. If they are reported under another category, indicate this by using the

Documentation box:

• Parties should provide detailed explanations on the fugitive emissions from source category 1.B.1 Solid Fuels in the corresponding part of chapter 3: energy (CRF category 1.B.1) of the NIR. Use this documentation box to provide references to relevant sections of the national inventory report (NIR) if any additional information and/or further details are needed to understand the content of this table.

• Regarding data on the amount of fuel produced entered in the above table, specify in this documentation box whether the fuel amount is based on the run-of-mine production or on the saleable production.

• If entries are made for Recovery/flaring, indicate in this documentation box whether CH_4 is flared or recovered and provide a reference to the section in the NIR where further details on recovery/flaring can be found.

• If estimates are reported under 1.B.1.b. and 1.B.1.c., use this documentation box to provide information regarding activities covered under these categories and to provide a reference to the section in the NIR where the background information can be found.

Documentation box	

TABLE 1.B.2 SECTORAL BACKGROUND DATA FOR ENERGY
Oil, natural gas and other emissions from energy production
(Sheet 1 of 1)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA[1]			IMPLIED EMISSION FACTORS			EMISSIONS			
	Description[1]	Unit[1]	Value	CO_2[2]	CH_4	N_2O	CO_2 Emissions[3]	CO_2 Amount captured	CH_4[4]	N_2O
				(kg/unit) [5]			(kt)			
1. B. 2. a. Oil[6]							957,62	NO	561,52	0,01
1. Exploration	Oil produced	Kt	86228,71	10595,93	225,84	0,08	913,67	NO	19,47	0,01
2. Production[7]	Oil produced	Kt	86228,71	151,40	2096,33		13,06	NO	180,76	
3. Transport	Oil produced	kt	132600,00	232,98	240,40		30,89	NO	31,88	
4. Refining/storage	(Oil produced)	Kt	17590,46	NO	18726,20	NO	NO	NO	329,40	NO
5. Distribution of oil products	(Oil produced)		NA	NO	NO		NO	NO	NO	
6. Other	(Oil produced)	NO	NO	NO	NO		NO	NO	NO	
1. B. 2. b. Natural gas							943,15	NO	153,28	
1. Exploration	(Gas produced)		IE	NO,IE	IE		IE	NO	IE	
2. Production[7]	(Gas produce	10^6 m^4	26746,57	1248,00	1340,76		33,38	NO	35,86	
3. Processing	(Gas produced)	10^6 m^3	26746,57	33970,03	50,69		908,58	NO	1,36	
4. Transmission and storage	(Gas produced)	10^6 m^34	230849,67	4,09	480,00		0,94	NO	110,81	
5. Distribution	(Gas produced)	10^6 m34	4774,84	51,00	1100,00		0,24	NO	5,25	
6. Other	(Gas produced)		NO	NO,NA	NA		NA	NO	NA	
1. B. 2. c. Venting and flaring							6772,98	NO,IE	90,67	0,03
Venting							4125,23	NO	74,79	
i. Oil	(Gas produced)	1000m^3	100382,66	41095,00	745,00		4125,23	NO	74,79	
ii. Gas	(Gas produced)	NO	NO	NO	NO		NO	NO	NO	
iii. Combined		NO	NO	NO	NO		NO	NO	NO	
Flaring[8]							2647,75	NO,IE	15,89	0,03
i. Oil		kt	86228,71	30706,16	184,24	0,35	2647,75	NO	15,89	0,03
ii. Gas	(Gas produced)	IE	IE	IE	IE	IE	IE	IE	IE	IE
iii. Combined	(Gas produced)		NO	NO	NO	NO	NO	NO	NO	NO
1.B.2.d. Other *(please specify)*[9]							NA	NA	NA	NA

(1) Specify the activity data (AD) used in the description column (see examples). Specify the unit of the AD in the unit column in either energy units or volume units (e.g. PJ, 10^6 m^3 and 10^6 bbl/yr).
(2) The implied emission factors (IEFs) for carbon dioxide (CO_2) are estimated on the basis of gross emissions, i.e. CO_2 emissions + amount captured.
(3) Net CO_2 emissions after subtracting the amounts of CO_2 captured.
(4) In this table, fugitive CH_4 emissions should also be reported for the transmission/distribution of biogas. Emissions associated with the biogas production without energy production should be included in the waste sector under biological treatment of waste (CRF Table 5.B).
(5) The unit of the IEF will depend on the unit of the AD used, and is therefore not specified in this column.
(6) Use the category also to cover emissions from combined oil and gas production fields. Natural gas processing and distribution from these fields should be included under subcategories 1.B.2.b.iii and 1.B.2.b.v, respectively.
(7) If using default emission factors, these categories will include emissions from production other than venting and flaring.
(8) For emissions from flaring, this table should only be used for reporting of flaring emissions associated with oil/gas extraction and refining.
(9) For example, fugitive CO_2 emissions from production of geothermal power could be reported here

Documentation box:

• Parties should provide detailed explanations on the fugitive emissions from category 1.B.2 Oil and Natural gas in the corresponding part of chapter 3: energy (CRF category 1.B.2) of the NIR. Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.

• Regarding data on the amount of fuel produced entered in this table, specify in this documentation box whether the fuel amount is based on the raw material production or on the saleable production. Note cases where more than one type of AD is used to estimate emissions.

• Venting and Flaring: Parties using the IPCC software could report venting and flaring emissions together, indicating this in this documentation box.

• If estimates are reported under 1.B.2.d. Other, use this documentation box to provide information regarding activities covered under this category and to provide a reference to the section in the NIR where background information can be found.

Documentation box	ions are presented jointly for pipeline, rail and road transport. Comments on equity distribution are given in the chapter Best Emissions 1.B.2/2021: Emissions are accounted for in category 1B2C2 III to avoid double counting. See the explanations in the report

TABLE 1.C SECTORAL BACKGROUND DATA FOR ENERGY

Inventory 2021

CO_2 Transport and storage

Submission 2023 v1

(Sheet 1 of 1)

KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA	IMPLIED EMISSION FACTORS	EMISSIONS
	CO_2 transported or injected[1]	CO_2	CO_2[2]
	(kt)	(kg/kt)	(kt)
1. Transport of CO_2	NO	NO	NO
a. Pipelines	NO	NO	NO
b. Ships	NO	NO	NO
c. Other	NO	NO	NO
2. Injection and storage[3]	NA	NA	NA
a. Injection	NA	NA	NA
b. Storage	NA	NA	NA
3. Other			
Information item[4, 5]			
Total amount captured for storage			
Total amount of imports for storage			
Total A			
Total amount of exports for storage			
Total amount of CO_2 injected at storage sites			
Total leakage from transport, injection and storage			
Total B			
Difference (A-B) [6]			

[1] Excluding recycled carbon dioxide (CO_2) for enhanced recovery.

[2] Corrected for baseline background fluxes.

[3] Fugitive emissions during above-ground operations such as processing and CO_2 recycling during enhanced oil and gas recovery operations should be reported as fugitive emissions from oil and

[4] Once captured, there is no differentiated treatment between biogenic carbon and fossil carbon. Emissions and storage of both biogenic and fossil carbon will be estimated and reported.

[5] It should be checked that the mass of CO_2 captured does no exceed the mass of CO_2 stored plus the fugitive emissions (leakage) reported for the inventory year.

[6] Ideally the value should be zero (see page 5.19, volume 2 of the 2006 IPCC guidelines).

Documentation box:	
Parties should provide detailed explanations on CO2 transport and storage in the corresponding part of chapter 3: energy (CRF subsector 1.C) of the NIR. Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.	
Documentation box	1.C/2021: This process is not carried out. Extended comment in chapter 3.5.4.1

TABLE 1.D SECTORAL BACKGROUND DATA FOR ENERGY

Inventory 2021

International aviation and international navigation (international bunkers) and multilateral operations

Submission 2023 v1

(Sheet 1 of 1)

KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA	IMPLIED EMISSION FACTORS			EMISSIONS		
	Consumption	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O
	(TJ)	(t/TJ)	(kg/TJ)		(kt)		
International aviation (aviation bunkers)	9292,47				664,41	0,00	0,02
Jet kerosene	9292,47	71,50	0,50	2,00	664,41	0,00	0,02
Aviation gasoline	NO	NO	NO	NO	NO	NO	NO
Biomass	NO	NO	NO	NO	NO	NO	NO
International navigation (marine bunkers)	66,79				5,02	0,00	0,00
Residual fuel oil	32,92	76,24	7,00	7,00	2,51	0,00	0,00
Gas/diesel oil	33,87	74,10	7,00	2,00	2,51	0,00	0,00
Gasoline	NO	NO	NO	NO	NO	NO	NO
Other liquid fuels *(please specify)*	NO				NO	NO	NO
Gaseous fuels	NO	NO	NO	NO	NO	NO	NO
Biomass	NO	NO	NO	NO	NO	NO	NO
Other fossil fuels (*please specify)* [1]	NO				NO	NO	NO
Multilateral operations[2]							

[1] Include information in the documentation box on which fuels are included and provide a reference to the section in the national inventory report (NIR) where further information is provided.

[2] Parties may choose to report or not report the activity data and implied emission factors for multilateral operations, consistent with the principle of confidentiality stated in the UNFCCC reporting

Note: In accordance with the IPCC Guidelines, international aviation and international navigation emissions from fuel sold to ships or aircraft engaged in international transport should be excluded from

Additional information

Fuel consumption	Distribution [a] (per cent)	
	Domestic	International
Aviation	57,45	42,55
Marine	48,64	51,36

[a] For calculating the allocation of fuel consumption, the sums of fuel consumption for domestic navigation and aviation (table 1.A(a)) and for international bunkers (table 1.D) are used.

Documentation Box:

• Parties should provide detailed explanations on the fuel combustion subsector, including international aviation and international navigation, in the corresponding part of chapter 3: energy (CRF subsector

• Provide in this documentation box a brief explanation of how the consumption of international aviation and international navigation fuels was estimated and separated from domestic consumption, and

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TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES AND PRODUCT USE
(Sheet 1 of 2)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2	CH_4	N_2O	HFCs[1]	PFCs[1]	Unspecified mix of HFCs and PFCs[1]	SF_6	NF_3	NO_x	CO	NMVOC	SO_2
	(kt)			CO_2 equivalent (kt)			(kt)					
Total industrial processes	24186,61	0,41	0,77	2706,49	9,65	NO,NA	0,00	NO,NA	0,52	31,51	266,94	0,00
A. Mineral industry	8626,53								NO	NO	NO	NO
1. Cement production	3840,90											NO
2. Lime production	715,62											
3. Glass production	20,64											
4. Other process uses of carbonates	4049,37								NO	NO	NO	NO
B. Chemical industry	451,00	NO	0,77	NO	NO	NO	NO	NO	0,26	0,03	NO	0,00
1. Ammonia production	426,72	NO	NO						0,26	0,03	NO	0,00
2. Nitric acid production			0,77						NO			
3. Adipic acid production	NO		NO						NO	NO	NO	
4. Caprolactam, glyoxal and glyoxylic acid production	NO		NO								NO	NO
5. Carbide production	24,28	NO										
6. Titanium dioxide production	NO											
7. Soda ash production	NO											
8. Petrochemical and carbon black production	NO	NO							NO	NO	NO	NO
9. Fluorochemical production				NO	NO	NO	NO	NO				
10. Other *(as specified in table 2(I).A-H)*	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C. Metal industry	14869,50	0,41	NO	NO	9,65	NO	NO	NO	0,26	31,48	1,16	NO,NA
1. Iron and steel production	10558,97	0,38							NA	NA	1,16	NA
2. Ferroalloys production	3522,45	0,04							NO	NO	NO	NO
3. Aluminium production	430,57				9,65		NO		0,26	31,48	NO	NO
4. Magnesium production	NO			NO	NO	NO	NO		NO	NO	NO	NO
5. Lead production	57,91								NO	NO	NO	NO
6. Zinc production	299,61								NO	NO	NO	NO
7. Other *(as specified in table 2(I).A-H)*	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

[1] The emissions of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), unspecified mix of HFCs and PFCs, and other fluorinated gases are to be expressed as carbon dioxide equivalent emissions. Data on disaggregated emissions of HFCs and PFCs are to be provided in table 2(II).

TABLE 2(I) SECTORAL REPORT FOR INDUSTRIAL PROCESSES AND PRODUCT USE
(Sheet 2 of 2)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2	CH_4	N_2O	HFCs[1]	PFCs[1]	Unspecified mix of HFCs and PFCs[1]	SF_6	NF_3	NO_x	CO	NMVOC	SO_2
	(kt)			CO_2 equivalent (kt)			(kt)					
D. Non-energy products from fuels and solvent use	239,59	NO,NA	NO,NA						NO,NA	NO,NA	265,78	NO,NA
1. Lubricant use	96,91	NA	NA						NA	NA	NA	NA
2. Paraffin wax use	0,08	NA	NA						NA	NA	NA	NA
3. Other	142,60	NO	NO						NO	NO	265,78	NO
E. Electronics industry				NO	NO	NO	NO	NO				
1. Integrated circuit or semiconductor				NO	NO	NO	NO	NO				
2. TFT flat panel display				NO	NO	NO	NO	NO				
3. Photovoltaics				NO	NO	NO	NO	NO				
4. Heat transfer fluid				NO	NO	NO	NO	NO				
5. Other *(as specified in table 2(II))*				NO	NO	NO	NO	NO				
F. Product uses as substitutes for ODS[2]				2706,49	NO,NA	NO,NA	NO,NA	NO,NA				
1. Refrigeration and air conditioning				2701,47								
2. Foam blowing agents				NO	NO	NO	NO	NO				
3. Fire protection				NO	NO	NO	NO	NO				
4. Aerosols				5,02	NO,NA	NO,NA	NO,NA	NO,NA				
5. Solvents				NO	NO	NO	NO	NO				
6. Other applications				NO	NO	NO	NO	NO				
G. Other product manufacture and use	NO	NO	NO,NE	NO	NO	NO	0,00	NO	NO	NO	NO	NO
1. Electrical equipment				NO	NO	NO	0,00	NO				
2. SF_6 and PFCs from other product use					NO		NO					
3. N_2O from product uses			NO,NE									
4. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
H. Other (as specified in tables 2(I).A-H and 2(II))[3]	NA	NA	NA	NO,NA	NO,NA	NA	NA	NA	NA	NA	NA	NA

(1) The emissions of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), unspecified mix of HFCs and PFCs, and other fluorinated gases are to be expressed as carbon dioxide equivalent emissions. Data on disaggregated emissions of HFCs and PFCs are to be provided in table
(2) ODS ozone-depleting substances.
(3) Carbon dioxide (CO_2) from food and drink production (e.g. gasification of water) can be of biogenic or non-biogenic origin. Only information on CO_2 emissions of non-biogenic origin should be reported.

Documentation box:	
Parties should provide detailed explanations on the industrial processes sector in chapter 4: industrial processes (CRF sector 2) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.	
Documentation box	u" provided by Head of the ecology department. For other years recalculation will be made in case of data availability on the carbon balance in the period 1990-2013.

TABLE 2(I).A-H SECTORAL BACKGROUND DATA FOR INDUSTRIAL PROCESSES AND PRODUCT USE
Emissions of CO_2, CH_4 and N_2O
(Sheet 1 of 2)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA		IMPLIED EMISSION FACTORS[2]			EMISSIONS					
	Production/Consumption quantity		CO_2	CH_4	N_2O	CO_2		CH_4		N_2O	
						Emissions[3]	Recovery[4]	Emissions[3]	Recovery[4]	Emissions[3]	Recovery[4]
	Description[1]	(kt)	(t/t)			(kt)					
A. Mineral industry						8626,53	NO				
1. Cement production	clinker production	7295,70	0,53			3840,90	NO				
2. Lime production	(lime production)	933,62	0,77			715,62	NO				
3. Glass production	glass production	206,41	0,10			20,64	NO				
4. Other process uses of carbonates						4049,37	NO				
a. Ceramics	production of ceramics and ceramic products	579,62	0,11			63,76	NO				
b. Other uses of soda ash	using soda ash	155,19	0,42			64,41	NO				
c. Non-metallurgical magnesium production	Non-metallurgical Magnesium production	NO	NO			NO	NO				
d. Other	use of limestone and dolomite	8792,57	0,45			3921,20	NO				
B. Chemical industry						451,00	NO	NO	NO	0,77	NO
1. Ammonia production[5]	ammonia production	260,10	1,64	NO	NO	426,72	NO	NO	NO	NO	NO
2. Nitric acid production	nitric acid production	334,43			0,00					0,77	NO
3. Adipic acid production	Adipic Acid production	NO	NO		NO	NO	NO			NO	NO
4. Caprolactam, glyoxal and glyoxylic acid production						NO	NO			NO	NO
a. Caprolactam	Caprolactam	NO	NO		NO	NO	NO			NO	NO
b. Glyoxal	Glyoxal	NO	NO		NO	NO	NO			NO	NO
c. Glyoxylic acid	Glyoxylic Acid production	NO	NO		NO	NO	NO			NO	NO
5. Carbide production		29,83	0,81	NO		24,28	NO	NO	NO		
a. Silicon carbide	Silicon carbide production	NO	NO	NO		NO	NO	NO	NO		
b. Calcium carbide	production of calcium carbide	29,83	0,81	NO		24,28	NO	NO	NO		
6. Titanium dioxide production	Titanium Dioxide production	NO	NO			NO	NO				
7. Soda ash production	Soda Ash production	NO	NO			NO	NO				
8. Petrochemical and carbon black production						NO	NO	NO	NO		
a. Methanol	methanol production	NO	NO	NO		NO	NO	NO	NO		
b. Ethylene	ethylene production	NO	NO	NO		NO	NO	NO	NO		
c. Ethylene dichloride and vinyl chloride monomer	Ethylene dichloride and vinyl chloride monomer	NO	NO	NO		NO	NO	NO	NO		
d. Ethylene oxide	Ethylene oxide	NO	NO	NO		NO	NO	NO	NO		
e. Acrylonitrile	Acrylonitrile	NO	NO	NO		NO	NO	NO	NO		
f. Carbon black	Carbon Black	NO	NO	NO		NO	NO	NO	NO		
g. Other[6]						NO	NO	NO	NO		
10. Other *(please specify)*						NO	NO	NO	NO	NO	NO

(1) Where the IPCC Guidelines provide options for activity data (AD), e.g. cement production or clinker production for estimating the emissions from cement production, specify the activity data used (as shown in the example in parentheses) in order to make the choice of emission factor more transparent and to

(2) The IEFs are estimated on the basis of gross emissions as follows: IEF = (emissions plus amounts recovered, oxidized, destroyed or transformed) / AD.

(3) Final emissions are to be reported (after subtracting the amounts of emission recovery, oxidation, destruction or transformation).

(4) Amounts of emission recovery, oxidation, destruction or transformation.

(5) To ensure that double counting does not occur, fuel consumption (e.g. natural gas) in ammonia production should not be included in the energy sector. Should CO2 from ammonia production be recovered for downstream use and be excluded from the reporting in category 2.B.1, the products and the purposes for which the CO2 is used should be clearly explained in the NIR for the most recent inventory year. The related CO2 emissions from these products and significant uses shall be reported in the relevant source categories in the inventory if these emissions occur within the borders of the Party concerned. Parties shall provide an overview in the NIR in which other source categories of the GHG inventory CO2 emissions from significant uses of urea are reported.

(6) If data are available, Parties are encouraged to report at the disaggregated level available from the pre-defined drop-down menu. Furthermore, Parties are encouraged to the extent possible to use the pre-defined category definitions rather than to create similar categories. This ensures the highest possible degree of comparability of the reporting. If detailed data are not available, Parties should include all emissions from petrochemical and carbon black production not included in subcategories 2.B.8.a-2.B.8.f here.

TABLE 2(I).A-H SECTORAL BACKGROUND DATA FOR INDUSTRIAL PROCESSES AND PRODUCT USE

Emissions of CO_2, CH_4 and N_2O

(Sheet 2 of 2)

Inventory 2021

Submission 2023 v1

KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA		IMPLIED EMISSION FACTORS [2]			EMISSIONS					
	Production/Consumption quantity		CO_2	CH_4	N_2O	CO_2		CH_4		N_2O	
						Emissions[3]	Recovery[4]	Emissions[3]	Recovery[4]	Emissions[3]	Recovery[4]
	Description [1]	(kt)	(t/t)			(kt)					
C. Metal industry						14869,50	NO	0,41	NO	NO	NO
1. Iron and steel production						10558,97	NO	0,38	NO		
a. Steel	steel production	4521,91	0,11	NO		492,90	NO	NO	NO		
b. Pig iron	pig iron production	3195,31	1,64	NO,NE		5240,27	NO	NE	NO		
c. Direct reduced iron	Direct Reduced Iron	NO	NO	NO		NO	NO	NO	NO		
d. Sinter	production of agglomerates	5396,41	0,82	0,00		4451,19	NO	0,38	NO		
e. Pellet	pellet production	5788,51	0,06	NO		374,62	NO	NO	NO		
f. Other *(please specify)*						IE	NO	IE	NO		
2. Ferroalloys production	production of ferroalloys	2070,04	1,70	0,00		3522,45	NO	0,04	NO		
3. Aluminium production	aluminum production	262,36	1,64			430,57	NO				
4. Magnesium production	Magnesium Production	NO	NO			NO	NO				
5. Lead production	lead production	111,36	0,52			57,91	NO				
6. Zinc production	uction of zinc from weltz cakes	81,86	3,66			299,61	NO				
7. Other *(please specify)*						NO	NO	NO	NO	NO	NO
D. Non-energy products from fuels and solvent use						239,59	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
1. Lubricant use	lubricating oil	164,36	0,59	NA	NA	96,91	NA	NA	NA	NA	NA
2. Paraffin wax use	paraffin	0,14	0,57	NA	NA	0,08	NA	NA	NA	NA	NA
3. Other *(please specify)* [5][6]						142,60	NO	NO	NO	NO	NO
G. Other product manufacture and use						NO	NO	NO	NO	NO,NE	NO,NE
3. N_2O from product uses										NO,NE	NO,NE
a. Medical applications	Medical use of nitrous oxide	NA			NE					NE	NE
b. Other[7]										NO	NO
4. Other						NO	NO	NO	NO	NO	NO
H. Other *(please specify)* [8]						NA	NA	NA	NA	NA	NA
2.H.2 Food and beverages industry		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

[1] Where the IPCC Guidelines provide options for activity data (AD), e.g. cement production or clinker production for estimating the emissions from cement production, specify the activity data used (as shown in the example in parentheses) in order to make the choice of emission factor more transparent

[2] The IEFs are estimated on the basis of gross emissions as follows: IEF = (emissions + amounts recovered, oxidized, destroyed or transformed) / AD.

[3] Final emissions are to be reported (after subtracting the amounts of emission recovery, oxidation, destruction or transformation).

[4] Amounts of emission recovery, oxidation, destruction or transformation.

[5] If data are available, Parties are encouraged to report at the disaggregated level available from the pre-defined drop-down menu. Furthermore, Parties are encouraged to the extent possible to use the pre-defined category definitions rather than to create similar categories. This ensures the highest possible degree of comparability of the reporting. If detailed data are not available, Parties should include all emissions from non-energy products from fuels and solvent use not included in subcategories 2.D.1-2.D.2 here.

[6] Emissions from urea used as a catalyst should be reported here.

[7] If data are available, Parties are encouraged to report at the disaggregated level available from the pre-defined drop-down menu. Furthermore, Parties are encouraged to the extent possible to use the pre-defined category definitions rather than to create similar categories. This ensures the highest possible degree of comparability of the reporting. If detailed data are not available, Parties should include all emissions from N2O from product uses not included in subcategory G.3.a here.

[8] If data are available, Parties are encouraged to report at the disaggregated level available from the pre-defined drop-down menu. Furthermore, Parties are encouraged to the extent possible to use the pre-defined category definitions rather than to create similar categories. This ensures the highest possible degree of comparability of the reporting. If detailed data are not available Parties should include all emissions from industrial processes not included in subcategories 2.A-2.G here.

Documentation Box:

• Parties should provide detailed explanations on the industrial processes sector in chapter 4: industrial processes (CRF sector 2) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.

• In relation to metal production, more specific information (e.g. data on virgin and recycled steel production) could be provided in this documentation box, or in the NIR, together with a reference to the relevant section of the NIR.

• Confidentiality: Where only aggregate figures for activity data are provided, e.g. due to reasons of confidentiality, a note indicating this should be provided in this documentation box.

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Documentation box	ompany of JSC "ArselorMittal Steel Temirtau" provided by Head of the ecology department. For other years recalculation will be made in case of data availability on the carbon balance in the period 1990-2013.
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Documentation box	2.D.3/2021: Emissions for CO2 are calculated from the use of converters in the exhaust gas treatment system in cars
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TABLE 2(II) SECTORAL REPORT FOR INDUSTRIAL PROCESSES AND PRODUCT USE - EMISSIONS OF HFCs, PFCs, SF_6 AND NF3
(Sheet 1 of 1)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	HFC-23	HFC-32	HFC-41	HFC-43-10mee	HFC-125	HFC-134	HFC-134a	HFC-143	HFC-143a	HFC-152	HFC-152a	HFC-161	HFC-227ea	HFC-236cb	HFC-236ea	HFC-236fa	HFC-245ca	HFC-245fa	HFC-365mfc	Unspecified mix of HFCs (1)	Total HFCs	CF_4	C_2F_6	C_3F_8	C_4F_{10}	c-C_4F_8	C_5F_{12}	C_6F_{14}	C_9F_{18}	c-C_5F_8	Unspecified mix of PFCs (1)	Total PFCs	Unspecified mix of HFCs and PFCs (1)	SF_6	NF_3
	(t)																			CO_2 equivalent (kt)		(t)									CO_2 equivalent (kt)		CO_2 equivalent (kt)	(t)	(t)
Total actual emissions of halocarbons (by chemical) and SF_6	NO	201,98	NO	NO	405,49	NO	377,79	NO	136,62	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO,NA		1,09	0,13	NO	NO	NO	NO	NO	NO	NO	NO,NA		NO,NA	0,10	NO,NA
B. Chemical industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO
9. Flurochemical production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO
By-product emissions	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO
Fugitive emissions	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO
10. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO
C. Metal industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		1,09	0,13	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO
3. Aluminium production																						1,09	0,13	NO	NO	NO	NO	NO	NO	NO	NO			NO	
4. Magnesium production																				NO											NO		NO	NO	
7. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO
E. Electronics industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO
1. Integrated circuit or semiconductor																				NO											NO		NO	NO	NO
2. TFT flat panel display																				NO											NO		NO	NO	NO
3. Photovoltaics																				NO											NO		NO	NO	NO
4. Heat transfer fluid																				NO											NO		NO	NO	NO
5. Other *(as specified in table 2(II))*	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO
F. Product uses as substitutes for ODS (2)	NO	201,98	NO	NO	405,49	NO	377,79	NO	136,62	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO,NA		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO,NA		NO,NA	NO,NA	NO,NA
1. Refrigeration and air conditioning		201,98			405,49		374,28		136,62																										
2. Foam blowing agents																				NO											NO		NO	NO	NO
3. Fire protection																				NO											NO		NO	NO	NO
4. Aerosols	NO	NO	NO	NO	NO	NO	3,51	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO,NA		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO,NA		NO,NA	NO,NA	NO,NA
5. Solvents																				NO											NO		NO	NO	NO
6. Other applications																				NO											NO		NO	NO	NO
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	0,10	NO
1. Electrical equipment																				NO											NO		NO	0,10	NO
2. SF_6 and PFCs from other product use																						NO	NO	NO	NO	NO	NO	NO	NO	NO	NO			NO	
4. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO
H. Other *(please specify)*	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NA		NO	NO	NO	NO	NO	NO	NO	NO	NO	NA		NA	NA	NA
2.H.2 Food and beverages industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NA		NO	NO	NO	NO	NO	NO	NO	NO	NO	NA		NA	NA	NA
.	CO_2 equivalent (kt)																																		
Total emissions (3)	NO	136,33	NO	NO	1419,22	NO	540,25	NO	610,69	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO,NA		8,04	1,61	NO	NO	NO	NO	NO	NO	NO	NO,NA		NO,NA	2,37	NO,NA
B. Chemical industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO
C. Metal production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		8,04	1,61	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO
E. Electronics industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO
F. Product uses as substitutes for ODS	NO	136,33	NO	NO	1419,22	NO	540,25	NO	610,69	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO,NA		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO,NA		NO,NA	NO,NA	NO,NA
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	2,37	NO
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NA		NO	NO	NO	NO	NO	NO	NO	NO	NO	NA		NA	NA	NA

(1) In accordance with the UNFCCC reporting guidelines, emissions of hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs), unspecified mix of HFCs and PFCs and other fluorinated gases should be reported for each relevant chemical. However, if it is not possible to report values for each chemical (i.e. owing to mixtures, confidential data, lack of disaggregation), these columns could be used for reporting aggregate figures for HFCs and PFCs, unspecified mix of HFCs and PFCs and fluorinated gases, respectively. Parties should provide information on global warming potential values used in the national inventory review report. Note that the unit used in these columns is kt of carbon dioxide equivalent (CO_2 eq).

(2) ODS ozone-depleting substances

(3) Total actual emissions equal the sum of the actual emissions of each halocarbon, sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3) from the categories 2.C, 2.E, 2.F, 2.G and 2.H in this table multiplied by the corresponding global warming potential values.

Note: As stated in the UNFCCC reporting guidelines, Parties should report actual emissions of HFCs, PFCs and SF_6, where data are available, providing disaggregated data by chemical and source category in units of mass and in CO_2 eq. Parties reporting actual emissions should also report potential emissions for the sources where the concept of potential emissions applies, for reasons of transparency and comparability.

Documentation box:
• Parties should provide detailed explanations on the industrial processes sector in chapter 4: industrial processes (CRF sector 2) of the NIR. Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.
• If estimates are reported under 2.H Other, use this documentation box to provide information regarding activities covered under this category and to provide a reference to the section of the NIR where background information can be found.

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TABLE 2(II).B-H SECTORAL BACKGROUND DATA FOR INDUSTRIAL PROCESSES AND PRODUCT USE
Sources of fluorinated substances
(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Gas *(please specify)* *One row per substance*	ACTIVITY DATA		IMPLIED EMISSION FACTORS[1]	EMISSIONS	
					Emissions[2]	Recovery[3]
		Description	(t)	(kg/t)	(t)	(t)
B. Chemical industry						
9. Fluorochemical production						
By-product emissions						
Production of HCFC-22		Production of HCFC-22				
HFC-23	HFC-23	Production of HCFC-22	NO	NO	NO	NO
HFC-32	HFC-32	Production of HCFC-22	NO	NO	NO	NO
HFC-41	HFC-41	Production of HCFC-22	NO	NO	NO	NO
HFC-43-10mee	HFC-43-10mee	Production of HCFC-22	NO	NO	NO	NO
HFC-125	HFC-125	Production of HCFC-22	NO	NO	NO	NO
HFC-134	HFC-134	Production of HCFC-22	NO	NO	NO	NO
HFC-134a	HFC-134a	Production of HCFC-22	NO	NO	NO	NO
HFC-143	HFC-143	Production of HCFC-22	NO	NO	NO	NO
HFC-143a	HFC-143a	Production of HCFC-22	NO	NO	NO	NO
HFC-152	HFC-152	Production of HCFC-22	NO	NO	NO	NO
HFC-152a	HFC-152a	Production of HCFC-22	NO	NO	NO	NO
HFC-161	HFC-161	Production of HCFC-22	NO	NO	NO	NO
HFC-227ea	HFC-227ea	Production of HCFC-22	NO	NO	NO	NO
HFC-236cb	HFC-236cb	Production of HCFC-22	NO	NO	NO	NO
HFC-236ea	HFC-236ea	Production of HCFC-22	NO	NO	NO	NO
HFC-236fa	HFC-236fa	Production of HCFC-22	NO	NO	NO	NO
HFC-245ca	HFC-245ca	Production of HCFC-22	NO	NO	NO	NO
HFC-245fa	HFC-245fa	Production of HCFC-22	NO	NO	NO	NO
HFC-365mfc	HFC-365mfc	Production of HCFC-22	NO	NO	NO	NO
Unspecified mix of HFCs	Unspecified mix of HFCs	Production of HCFC-22	NO	NO	NO	NO
CF4	CF4	Production of HCFC-22	NO	NO	NO	NO
C2F6	C2F6	Production of HCFC-22	NO	NO	NO	NO
C3F8	C3F8	Production of HCFC-22	NO	NO	NO	NO
C4F10	C4F10	Production of HCFC-22	NO	NO	NO	NO
c-C4F8	c-C4F8	Production of HCFC-22	NO	NO	NO	NO
C5F12	C5F12	Production of HCFC-22	NO	NO	NO	NO
C6F14	C6F14	Production of HCFC-22	NO	NO	NO	NO
C10F18	C10F18	Production of HCFC-22	NO	NO	NO	NO
c-C3F6	c-C3F6	Production of HCFC-22	NO	NO	NO	NO
Unspecified mix of PFCs	Unspecified mix of PFCs	Production of HCFC-22	NO	NO	NO	NO
Unspecified mix of HFCs and PFCs	fied mix of HFCs and PFCs	Production of HCFC-22	NO	NO	NO	NO
SF6	SF6	Production of HCFC-22	NO	NO	NO	NO
NF3	NF3	Production of HCFC-22	NO	NO	NO	NO
Other *(please specify - one row per substance)*		Production				
Fugitive emissions [4]						
Production of HFC-134a		Production of HFC-134a				
Unspecified mix of HFCs	Unspecified mix of HFCs	Production of HFC-134a	NO	NO	NO	NO
Unspecified mix of PFCs	Unspecified mix of PFCs	Production of HFC-134a	NO	NO	NO	NO
Unspecified mix of HFCs and PFCs	fied mix of HFCs and PFCs	Production of HFC-134a	NO	NO	NO	NO
SF6	SF6	Production of HFC-134a	NO	NO	NO	NO
NF3	NF3	Production of HFC-134a	NO	NO	NO	NO
Production of SF_6		Production of SF6				
Unspecified mix of HFCs	Unspecified mix of HFCs	Production of SF6	NO	NO	NO	NO
Unspecified mix of PFCs	Unspecified mix of PFCs	Production of SF6	NO	NO	NO	NO
Unspecified mix of HFCs and PFCs	fied mix of HFCs and PFCs	Production of SF6	NO	NO	NO	NO
SF6	SF6	Production of SF6	NO	NO	NO	NO
NF3	NF3	Production of SF6	NO	NO	NO	NO
Other *(please specify - one row per substance)*		Production				
C. Metal production						
3. Production of aluminium						
By-product emissions		Production of primary aluminium				
CF4	CF4	Production of primary aluminium	262361,38	0,00	1,09	NO
C2F6	C2F6	Production of primary aluminium	262361,38	0,00	0,13	NO
C3F8	C3F8	Production of primary aluminium	NO	NO	NO	NO
C4F10	C4F10	Production of primary aluminium	NO	NO	NO	NO
c-C4F8	c-C4F8	Production of primary aluminium	NO	NO	NO	NO
C5F12	C5F12	Production of primary aluminium	NO	NO	NO	NO
C6F14	C6F14	Production of primary aluminium	NO	NO	NO	NO
C10F18	C10F18	Production of primary aluminium	NO	NO	NO	NO
c-C3F6	c-C3F6	Production of primary aluminium	NO	NO	NO	NO
Unspecified mix of PFCs	Unspecified mix of PFCs	Production of primary aluminium	NO	NO	NO	NO
Unspecified mix of HFCs and PFCs	fied mix of HFCs and PFCs	Production of primary aluminium	NO	NO	NO	NO
SF6	SF6	Production of primary aluminium	NO	NO	NO	NO
F-gases used in foundries[5]		Amount of aluminium casted				
Unspecified mix of PFCs	Unspecified mix of PFCs	Amount of aluminium casted	NO	NO	NO	NO
Unspecified mix of HFCs and PFCs	fied mix of HFCs and PFCs	Amount of aluminium casted	NO	NO	NO	NO
SF6	SF6	Amount of aluminium casted	NO	NO	NO	NO
4. Magnesium production[6]		Amount of magnesium casted				
Unspecified mix of HFCs	Unspecified mix of HFCs	Amount of magnesium casted	NO	NO	NO	NO
Unspecified mix of PFCs	Unspecified mix of PFCs	Amount of magnesium casted	NO	NO	NO	NO
Unspecified mix of HFCs and PFCs	fied mix of HFCs and PFCs	Amount of magnesium casted	NO	NO	NO	NO
SF6	SF6	Amount of magnesium casted	NO	NO	NO	NO
7. Other *(please specify - one row per substance)*						
E. Electronics industry[7]						
1. Integrated circuit or semiconductor		Consumption				
Unspecified mix of HFCs	Unspecified mix of HFCs	Consumption	NO	NO	NO	NO
Unspecified mix of PFCs	Unspecified mix of PFCs	Consumption	NO	NO	NO	NO
Unspecified mix of HFCs and PFCs	fied mix of HFCs and PFCs	Consumption	NO	NO	NO	NO
SF6	SF6	Consumption	NO	NO	NO	NO
NF3	NF3	Consumption	NO	NO	NO	NO
2. TFT flat panel display		Consumption				
Unspecified mix of HFCs	Unspecified mix of HFCs	Consumption	NO	NO	NO	NO
Unspecified mix of PFCs	Unspecified mix of PFCs	Consumption	NO	NO	NO	NO
Unspecified mix of HFCs and PFCs	fied mix of HFCs and PFCs	Consumption	NO	NO	NO	NO
SF6	SF6	Consumption	NO	NO	NO	NO
NF3	NF3	Consumption	NO	NO	NO	NO
3. Photovoltaics		Consumption				
Unspecified mix of HFCs	Unspecified mix of HFCs	Consumption	NO	NO	NO	NO
Unspecified mix of PFCs	Unspecified mix of PFCs	Consumption	NO	NO	NO	NO
Unspecified mix of HFCs and PFCs	fied mix of HFCs and PFCs	Consumption	NO	NO	NO	NO
SF6	SF6	Consumption	NO	NO	NO	NO
NF3	NF3	Consumption	NO	NO	NO	NO
4. Heat transfer fluid		Consumption				
Unspecified mix of HFCs	Unspecified mix of HFCs	Consumption	NO	NO	NO	NO
Unspecified mix of PFCs	Unspecified mix of PFCs	Consumption	NO	NO	NO	NO
Unspecified mix of HFCs and PFCs	fied mix of HFCs and PFCs	Consumption	NO	NO	NO	NO
SF6	SF6	Consumption	NO	NO	NO	NO
NF3	NF3	Consumption	NO	NO	NO	NO
5. Other *(please specify - one row per substance)* [8]		Consumption				

Note: All footnotes for this table are given at the end of the table on sheet 2.

TABLE 2(I).B-H SECTORAL BACKGROUND DATA FOR INDUSTRIAL PROCESSES AND PRODUCT USE
Sources of fluorinated substances
(Sheet 2 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Gas *(please specify)*	ACTIVITY DATA Amount			IMPLIED EMISSION FACTORS[1]			EMISSIONS[2]			
	One *row per substance*	Filled into new manufactured products	In operating systems (average annual stocks)	Remaining in products at decommissioning	Product manufacturing factor	Product life factor	Disposal loss factor	From manufacturing	From stocks	From disposal	Recovery[3]
		(t)			%			(t)			
F. Product uses as substitutes for ODS											
1. Refrigeration and air-conditioning											
Commercial refrigeration											
HFC-32	HFC-32	NO	30.61	11.79	NO	11.00	100.00	NO	3.37	11.75	NO
HFC-125	HFC-125	NO	82.20	30.44	NO	15.00	100.00	NO	12.36	30.40	NO
HFC-134a	HFC-134a	NO	265.66	98.87	NO	10.00	100.00	NO	26.11	98.87	NO
HFC-143a	HFC-143a	NO	65.90	7.44	NO	15.00	10.00	NO	9.88	6.74	NO
Domestic refrigeration											
HFC-32	HFC-32	NO	181.32	20.70	NO	18.00	100.00	NO	33.00	20.70	NO
HFC-125	HFC-125	NO	256.25	26.79	NO	16.00	100.00	NO	38.98	26.79	NO
HFC-134a	HFC-134a	NO	154.68	17.61	NO	17.00	100.00	NO	21.32	17.55	NO
HFC-143a	HFC-143a	NO	54.61	6.05	NO	12.00	100.00	NO	6.77	6.05	NO
Industrial refrigeration											
HFC-32	HFC-32	NO	369.18	0.15	NO	8.00	100.00	NO	29.75	0.15	NO
HFC-125	HFC-125	NO	771.27	0.11	NO	8.00	100.00	NO	61.76	0.15	NO
HFC-134a	HFC-134a	NO	40.97	1.54	NO	6.00	100.00	NO	3.36	1.54	NO
HFC-143a	HFC-143a	NO	505.87	20.54	NO	8.00	100.00	NO	43.67	20.54	NO
Transport refrigeration											
HFC-125	HFC-125	NO	47.29	12.12	NO	5.00	100.00	NO	2.36	12.12	NO
HFC-134a	HFC-134a	NO	49.56	10.63	NO	5.00	100.00	NO	1.49	10.63	NO
HFC-143a	HFC-143a	NO	55.88	14.33	NO	5.00	100.00	NO	2.79	14.33	NO
Mobile air-conditioning											
HFC-134a	HFC-134a	NO	412.65	70.46	NO	4.00	100.00	NO	12.38	70.46	NO
Stationary air-conditioning											
HFC-32	HFC-32	NO	183.64	69.64	NO	21.00	100.00	NO	38.57	69.08	NO
HFC-125	HFC-125	NO	411.79	156.16	NO	21.00	100.00	NO	86.46	156.16	NO
HFC-134a	HFC-134a	NO	179.04	75.74	NO	14.50	100.00	NO	34.78	75.74	NO
HFC-143a	HFC-143a	NO	82.27	22.46	NO	15.00	100.00	NO	9.88	22.46	NO
2. Foam blowing agents											
Closed-cells											
Unspecified mix of HFCs	Unspecified mix of HFCs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Unspecified mix of PFCs	Unspecified mix of PFCs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Unspecified mix of HFCs and PFCs	Unspecified mix of HFCs and PFCs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
SF6	SF6	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
NF3	NF3	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Open-cells											
Unspecified mix of HFCs	Unspecified mix of HFCs	NO	NO		NO	NO		NO	NO		NO
Unspecified mix of PFCs	Unspecified mix of PFCs	NO	NO		NO	NO		NO	NO		NO
Unspecified mix of HFCs and PFCs	Unspecified mix of HFCs and PFCs	NO	NO		NO	NO		NO	NO		NO
SF6	SF6	NO	NO		NO	NO		NO	NO		NO
NF3	NF3	NO	NO		NO	NO		NO	NO		NO
3. Fire protection											
Unspecified mix of HFCs	Unspecified mix of HFCs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Unspecified mix of PFCs	Unspecified mix of PFCs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Unspecified mix of HFCs and PFCs	Unspecified mix of HFCs and PFCs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
SF6	SF6	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
NF3	NF3	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Aerosols											
Metered dose inhalers											
HFC-134a	HFC-134a	NO	NO		NO	NO		NO	5.31		NO
Unspecified mix of HFCs	Unspecified mix of HFCs	NA	NA		NA	NA		NA	NA		NA
Unspecified mix of PFCs	Unspecified mix of PFCs	NA	NA		NA	NA		NA	NA		NA
Unspecified mix of HFCs and PFCs	Unspecified mix of HFCs and PFCs	NA	NA		NA	NA		NA	NA		NA
SF6	SF6	NA	NA		NA	NA		NA	NA		NA
NF3	NF3	NA	NA		NA	NA		NA	NA		NA
Other *release sources (if any, one row per substance)*											
5. Solvents											
Unspecified mix of HFCs	Unspecified mix of HFCs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Unspecified mix of PFCs	Unspecified mix of PFCs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Unspecified mix of HFCs and PFCs	Unspecified mix of HFCs and PFCs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
SF6	SF6	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
NF3	NF3	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other applications[4]											
Enclosed											
Unspecified mix of HFCs	Unspecified mix of HFCs	NO	NO		NO	NO		NO	NO		NO
Unspecified mix of PFCs	Unspecified mix of PFCs	NO	NO		NO	NO		NO	NO		NO
Unspecified mix of HFCs and PFCs	Unspecified mix of HFCs and PFCs	NO	NO		NO	NO		NO	NO		NO
SF6	SF6	NO	NO		NO	NO		NO	NO		NO
NF3	NF3	NO	NO		NO	NO		NO	NO		NO
Contained											
Unspecified mix of HFCs	Unspecified mix of HFCs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Unspecified mix of PFCs	Unspecified mix of PFCs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Unspecified mix of HFCs and PFCs	Unspecified mix of HFCs and PFCs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
SF6	SF6	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
NF3	NF3	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Other product manufacture and use											
1. Electrical equipment[5,10]											
Unspecified mix of HFCs	Unspecified mix of HFCs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Unspecified mix of PFCs	Unspecified mix of PFCs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Unspecified mix of HFCs and PFCs	Unspecified mix of HFCs and PFCs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
SF6	SF6	NO	51.99	NO	NO	0.10	NO	NO	0.10	NO	NO
NF3	NF3	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. SF6 and PFCs from other product use[5,10]											
Military application											
Unspecified mix of PFCs	Unspecified mix of PFCs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
SF6	SF6	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Accelerators											
CF4	CF4	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C2F6	C2F6	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C3F8	C3F8	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C4F10	C4F10	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
c-C4F8	c-C4F8	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C5F12	C5F12	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C6F14	C6F14	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C10F18	C10F18	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
c-C5H8	c-C5H8	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Unspecified mix of PFCs	Unspecified mix of PFCs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Unspecified mix of HFCs and PFCs	Unspecified mix of HFCs and PFCs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SF6	SF6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NF3	NF3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NOTE: In the case of prompt emissions (such as from aerosols, open cells, and some of the solvents), the consumption in the same year should be reported as consumption in new manufactured products and consumption in the previous year – as in operational stock. Use column for emissions from manufacturing to also report installation emissions. Use the column for emissions from stock to report emissions from use, leakage, servicing and maintenance. Disposal emissions could also include emissions from recycling and destruction.

(1) The implied emission factors (IEFs) are estimated on the basis of gross emissions as follows: IEF = emissions / activity data (AD).
(2) Final emissions are to be reported (after subtracting the amounts of emission recovery, oxidation, destruction or transformation).
(3) Amounts of emission recovery, oxidation, destruction or transformation, including from disposal emissions, where applicable.
(4) Fugitive emissions include emissions from fluorinated gas (F-gas) production. Some of the possible activities include the telomerization process used in the production of fluorochemicals fluids and polymers, photo oxidation of tetrafluoroethylene to make fluorochemical fluids, sulphur hexafluoride (SO_2) production, halogen exchange processes to make low-boiling PFCs like C_2F_6, HFC-134a and 245fa, and NF_3 manufacturing, and production of monomers (e.g. tetrafluoroethylene and hexafluoropropylene), and of fluorochemical agrochemicals and/or
(5) According to the 2006 IPCC Guidelines possible SF_6 from casting are to be included under Mg production. However, in the current CRF a separate subcategory exists and is reported by Parties.
(6) Include emissions from cover gases and generated secondary compounds in the Mg foundries.
(7) Include data for the consumption of the F-gases in the process, i.e. use (filling) during manufacture. The emissions include evaporative losses and by-product emissions. In the case of by-product emissions, include a separate row and include the information on the relevant AD in the documentation box
(8) Could include emissions from micro-electromechanical systems, hard disk drive manufacturing, device testing, and vapour phase reflow soldering.
(9) Emissions may include HFCs and PFCs used in sterilization equipment, for tobacco expansion applications, as solvents in the manufacture of adhesives, coating and inks.
(10) Include data on electrical switchgear gas, gas circuit breakers, high voltage gas-insulated lines, outdoor gas-insulated instrument transformers and other equipment. Emissions and AD from equipment installation outside should be reported under manufacturing for equipment installed within the country
(11) Category includes SF_6 and PFCs used in military applications (e.g. in airborne radar systems and heat transfer fluids in high-powered electronic applications). SF_6 used in university and research, and PFCs used as heat transfer fluids in commercial and consumer applications, used in cosmetics and in

Documentation box:
• Parties should provide detailed explanations on the industrial processes sector in chapter 4: industrial processes (CRF sector 2) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.
• Where only aggregate figures for activity data are provided, e.g. due to reasons of confidentiality (see footnote 1 to table 2(I)), a note indicating this should be provided in this documentation box.
• Where applying tier 2 and country-specific methods, specify any other relevant activity data used in this documentation box, including a reference to the section of the NIR where more detailed information can be found.
• Use this documentation box for providing clarification on emission recovery, oxidation, destruction and/or transformation, and provide a reference to the section of the NIR where more detailed information can be found.

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TABLE 3 SECTORAL REPORT FOR AGRICULTURE
(Sheet 1 of 2)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2	CH_4	N_2O	NO_x	CO	NMVOC
	(kt)					
3. Total agriculture	4,12	973,46	62,10	36,75	NO	133,36
I. Livestock		953,17	9,70			113,64
A. Enteric fermentation		917,90				
1. Cattle[(1)]		682,59				
Option A:						
Dairy cattle		431,53				
Non-dairy cattle		251,06				
Option B:						
Mature dairy cattle						
Other mature cattle						
Growing cattle						
Option C (country-specific):						
Other *(as specified in table 3(I).A)*						
2. Sheep		145,88				
3. Swine		0,97				
4. Other livestock		88,46				
Buffalo		0,55				
Camels		11,19				
Goats		13,61				
Horses		62,82				
Mules and Asses		0,29				
Other (please specify)		NO				
B. Manure management		35,27	9,70			113,64
1. Cattle[(1)]		24,28	5,12			85,04
Option A:						
Dairy cattle		19,53	2,83			55,03
Non-dairy cattle		4,75	2,29			30,01
Option B:						
Mature dairy cattle						
Other mature cattle						
Growing cattle						
Option C (country-specific):						
Other *(as specified in table 3(I).B)*						
2. Sheep		2,14	0,97			3,62
3. Swine		3,88	0,61			0,53
4. Other livestock		4,97	1,55			24,45
Buffalo		0,05	0,01			0,04
Camels		0,31	NO			0,07
Goats		0,30	0,18			1,48
Horses		3,80	0,51			14,92
Mules and Asses		0,02	0,01			0,04
Poultry		0,48	0,81			7,90
Other (please specify)		0,01	0,03			NE
Rabbit		0,01	0,03			NE
5. Indirect N_2O emissions			1,44			

Note: All footnotes for this table are given at the end of the table on sheet 2.

TABLE 3 SECTORAL REPORT FOR AGRICULTURE
(Sheet 2 of 2)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2	CH_4	N_2O	NO_x	CO	NMVOC
	(kt)					
C. Rice cultivation		20,29				NO
D. Agricultural soils[(2) (3) (4)]		NO	52,40	36,75	NO	19,72
E. Prescribed burning of savannas		NO	NO	NO	NO	NO
F. Field burning of agricultural residues		NO	NO	NO	NO	NO
G. Liming	NO					
H. Urea application	4,12					
I. Other carbon-containing fertilizers	NO					
J. Other *(please specify)*	NO	NO	NO	NO	NO	NO

(1) The sum for cattle would be calculated on the basis of entries made under either option A (dairy and non-dairy cattle), option B (mature dairy cattle, other mature cattle and growing cattle) or option C (other disaggreagtion of cattle categories).

(2) Categories reported under "Agricultural soils" are those reported under table 3.D.

(3) Direct nitrous oxide (N_2O) emissions generated by manure in the system "Pasture, range and paddock" are to be reported under the category "Direct N_2O emissions from managed soils". See also section 10.5 of Volume 4 of the 2006 IPCC Guidelines.

(4) Indirect N_2O emissions generated by manure in the system "Pasture, range and paddock" are to be reported under the category "Indirect N_2O emissions from managed soils". See also section 10.5 of Volume 4 of the 2006 IPCC Guidelines.

Note: The 2006 IPCC Guidelines do not provide methodologies for the calculation of methane (CH_4) emissions and CH_4 and N_2O removals from agricultural soils, or carbon dioxide (CO_2) emissions from prescribed burning of savannas and field burning of agricultural residues. Parties that have estimated such emissions should provide, in the national inventory report (NIR), additional information (activity data and emission factors) used to derive these estimates and include a reference to the section of the NIR in the documentation box of the corresponding Sectoral background data tables.

Documentation box:	
• Parties should provide detailed explanations on the agriculture sector in chapter 5: Agriculture (CRF sector 3) of the NIR. Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.	
• If estimates are reported under category 3(II).H.Other, use this documentation box to provide information regarding activities covered under this category and to provide reference to the section in the NIR where background information can be found.	
Documentation box	ne: Average annual population of livestock was used, explanation is shown in section 5.5 of the NIR3.A.4 Goats Goats: Average annual population of livestock was used, explanation is shown in section 5.5 of the NIR

TABLE 3.A SECTORAL BACKGROUND DATA FOR AGRICULTURE
Enteric Fermentation
(Sheet 1 of 2)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION			IMPLIED EMISSION FACTORS	EMISSIONS
	Population size[1] (1000s)	Average gross energy intake (GE) (MJ/head/day)	Average CH_4 conversion rate (Y_m)[2] (%)	CH_4 (kg CH_4/head/yr)	CH_4 (kt)
1. Cattle	9035,32			75,55	682,59
Option A:					
Dairy cattle[3]	4235,66	238,98	6,50	101,88	431,53
Non-dairy cattle	4799,66	122,69	6,50	52,31	251,06
Option B:					
Mature dairy cattle					
Other mature cattle					
Growing cattle					
Option C (country-specific [4] :					
Other *(please specify)*					
2. Sheep	20447,54			7,13	145,88
Other *(please specify)*	20447,54			7,13	145,88
Sheep	20447,54	23,08	6,50	7,13	145,88
3. Swine	970,15			1,00	0,97
Other *(please specify)*	970,15			1,00	0,97
Swine	970,15	NE	NE	1,00	0,97
4. Other livestock[5]	6493,91			13,62	88,46
Buffalo	9,97	NE	NE	55,15	0,55
Camels	243,37	NE	NE	45,98	11,19
Goats	2721,85	NE	NE	5,00	13,61
Horses	3489,78	NE	NE	18,00	62,82
Mules and Asses	28,95	NE	NE	10,02	0,29
Other (please specify)	NO			NO	NO

(1) Parties are encouraged to provide detailed livestock population data by animal type and region, if available, in the national inventory report (NIR), and provide in the documentation box below a reference to the relevant section. Parties should use the same animal

(2) Y_m refers to the fraction of gross energy in feed converted to CH_4 and should be given in per cent in this table.

(3) Including data on dairy heifers, if available.

(4) Option C should be used when Parties want to report a more disaggregate livestock categorization compared with option A and option B.

(5) If data are available, Parties are encouraged to report at the disaggregated level available from the pre-defined drop-down menu. Furthermore, Parties are encouraged to the extent possible to use the pre-defined category definitions rather than to create similar categories. This ensures the highest possible degree of comparability of the reporting. If detailed data are not available, Parties should include all emissions from other livestock not included in subcategories 3.A.1-3.A.3 under other (please specify).

(6) This could include fox and raccoon and mink and polecat.

Documentation box:

• Parties should provide detailed explanations on the agriculture sector, including information from the additional information box, in chapter 5: Agriculture (CRF sector 3) of the NIR. Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.

• Provide a reference to the relevant section in the NIR, in particular with regard to:

(a) Disaggregation of livestock population (e.g. according to the classification recommended in the 2006 IPCC guidelines;

(b) Parameters relevant to the application of the 2006 IPCC Guidelines.

Documentation box	is shown in section 5.5 of the NIR3.A.4 Goats Goats: Average annual population of livestock was used, explanation is shown in section 5.5 of the NIR

TABLE 3.A SECTORAL BACKGROUND DATA FOR AGRICULTURE
Enteric Fermentation
(Sheet 2 of 2)

Inventory 2021
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Additional information (only for those livestock types for which tier 2 was used) [a]

Disaggregated list of animals [b] Indicators:		Dairy Cattle	Non-Dairy Cattle	Growing Cattle	Mature Dairy Cattle	Other Mature Cattle	Other Cattle	Other Sheep	Sheep	Other Swine	Swine	Other livestock	Buffalo	Camels	Goats	Horses	Mules and Asses	Other (please specify)
Weight	(kg)	475,00	339,00						40,00		NE		NE	NE	NE	NE	NE	
Feeding situation [c]		0,23	0,23						0,01		NE		NE	NE	NE	NE	NE	
Milk yield	(kg/day)	6,43	NO						NE		NE		NE	NE	NE	NE	NE	
Work	(h/day)	NO	NO						NO		NO		NE	NE	NO	NE	NE	
Pregnant	(%)	72,00	NO						60,40		NE		NE	NE	NE	NE	NE	
Digestibility of feed	(%)	60,00	60,00						60,00		NE		NE	NE	NE	NE	NE	
Gross energy	(MJ/day)	238,98	122,69						23,08		NE		NE	NE	NE	NE	NE	

[a] See also tables 10A.1, 10A.2 and 10A.3 of volume 4 of the 2006 IPCC Guidelines. These data are relevant if Parties do not have data on average feed intake.
[b] Disaggregate to the split actually used. Add columns to the table if necessary.
[c] For cattle, buffalo and sheep specify feeding situation in accordance with table 10.5 of volume 4 of the 2006 IPCC Guidelines.

TABLE 3.B(a) SECTORAL BACKGROUND DATA FOR AGRICULTURE
CH_4 Emissions from Manure Management
(Sheet 1 of 2)

Inventory 2021
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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION							IMPLIED EMISSION FACTORS	EMISSIONS
	Population size	Allocation by climate region[1]			Typical animal mass (average)	VS[2] daily excretion (average)	CH_4 producing potential (Bo)[2] (average)	CH_4	CH_4
		Cool	Temperate	Warm					
	(1000s)	(%)			(kg)	(kg dm/head/day)	(m^3 CH_4/kg VS)	(kg CH_4/head/yr)	(kt)
1. Cattle	9035,32							2,69	24,28
Option A:									
Dairy cattle[3]	4235,66	100,00	NO	NO	475,00	5,24	0,24	4,61	19,53
Non-dairy cattle	4799,66	100,00	NO	NO	339,00	2,69	0,10	0,99	4,75
Option B:									
Mature dairy cattle									
Other mature cattle									
Growing cattle									
Option C (country-specific) [4] :									
Other *(please specify)*									
2. Sheep	20447,54							0,10	2,14
Other *(please specify)*	20447,54							0,10	2,14
Sheep	20447,54	100,00	NO	NO	40,00	NE	NE	0,10	2,14
3. Swine	970,15							4,00	3,88
Other *(please specify)*	970,15							4,00	3,88
Swine	970,15	100,00	NO	NO	96,00	NE	NE	4,00	3,88
4. Other livestock[5]	54480,06							0,09	4,97
Buffalo	9,97	100,00	NO	NO	380,00	NE	NE	5,01	0,05
Camels	243,37	100,00	NO	NO	217,00	NE	NE	1,27	0,31
Goats	2721,85	100,00	NO	NO	38,00	NE	NE	0,11	0,30
Horses	3489,78	100,00	NO	NO	238,00	NE	NE	1,09	3,80
Mules and Asses	28,95	100,00	NO	NO	130,00	NE	NE	0,69	0,02
Poultry	47884,70	100,00	NO	NO	1,80	NE	NE	0,01	0,48
Other (please specify)	NO							0,08	0,01
Rabbit	101,45	100,00	NO	NO	NE	NE	NE	0,08	0,01

(1) Climate regions are defined in terms of annual average temperature as follows: cool = less than 15 °C; temperate = 15–25 °C inclusive; and warm = greater than 25 °C (see table 10.17 of chapter 10, volume 4 of the 2006 IPCC Guidelines).

(2) VS = volatile solids; Bo = maximum methane producing capacity for manure (pp. 10.42 and 10.43 of chapter 10, volume 4 of the 2006 IPCC Guidelines); dm = dry matter. Provide average values for VS and Bo where original calculations were made at a more disaggregated level of these livestock categories.

(3) Including data on dairy heifers, if available.

(4) Option C should be used when Parties want to report a more disaggregated livestock categorization compared with option A and option B.

(5) If data are available, Parties are encouraged to report at the disaggregated level available from the pre-defined drop-down menu. Furthermore, Parties are encouraged to the extent possible to use the pre-defined category definitions rather than to create similar categories. This ensures the highest possible degree of comparability of the reporting. If detailed data are not available, Parties should include all emissions from other livestock not included in subcategories 3.B.1-3.B.3 under other (please specify).

(6) This could include fox and raccoon and mink and polecat.

Documentation box:

• Parties should provide detailed explanations on the agriculture sector in chapter 5: Agriculture (CRF sector 3) of the national invenotry report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and further details are needed to understand the content of this table.

• Provide a reference to the relevant section in the NIR, in particular with regard to:

(a) Disaggregation of livestock population (e.g. according to the classification recommended in the 2006 IPCC Guidelines;

(b) Parameters relevant to the application of the 2006 IPCC Guidelines;

(c) Information on how the MCFs are derived, if relevant data could not be provided in the additional information box.

Documentation box	

TABLE 3.B(a) SECTORAL BACKGROUND DATA FOR AGRICULTURE
CH_4 Emissions from Manure Management
(Sheet 2 of 2)

Inventory 2021
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Additional information (for Tier 2) [a]

Animal category		Indicator	Climate region	Manure Management Systems [b]								
				Anaerobic lagoon	Liquid system	Daily spread	Solid storage and dry lot	Pasture, range, and paddock	Composting	Digesters	Burned for fuel or as waste	Other
Option A	Dairy cattle	Allocation (%)	Cool	NO	NO	NO	35,00	65,00	NO	NO	NO	NO
			Temperate	NO	NO	NO	NO	NO	NO	NO	NO	NO
			Warm	NO	NO	NO	NO	NO	NO	NO	NO	NO
		MCF[c]	Cool	NO	NO	NO	2,00	1,00	NO	NO	NO	NO
			Temperate	NO	NO	NO	NO	NO	NO	NO	NO	NO
			Warm	NO	NO	NO	NO	NO	NO	NO	NO	NO
	Non-dairy cattle	Allocation (%)	Cool	NO	NO	NO	35,00	65,00	NO	NO	NO	NO
			Temperate	NO	NO	NO	NO	NO	NO	NO	NO	NO
			Warm	NO	NO	NO	NO	NO	NO	NO	NO	NO
		MCF[c]	Cool	NO	NO	NO	2,00	1,00	NO	NO	NO	NO
			Temperate	NO	NO	NO	NO	NO	NO	NO	NO	NO
			Warm	NO	NO	NO	NO	NO	NO	NO	NO	NO
Option B	Mature dairy cattle	Allocation (%)	Cool									
			Temperate									
			Warm									
		MCF[c]	Cool									
			Temperate									
			Warm									
	Other mature cattle	Allocation (%)	Cool									
			Temperate									
			Warm									
		MCF[c]	Cool									
			Temperate									
			Warm									
	Growing cattle	Allocation (%)	Cool									
			Temperate									
			Warm									
		MCF[c]	Cool									
			Temperate									
			Warm									
			She	NO	NO	NO	11,00	89,00	NO	NO	NO	NO
			She	NO	NO	NO	NO	NO	NO	NO	NO	NO
			She	NO	NO	NO	NO	NO	NO	NO	NO	NO
			She	NO	NO	NO	NE	NE	NO	NO	NO	NO
			She	NO	NO	NO	NO	NO	NO	NO	NO	NO
			She	NO	NO	NO	NO	NO	NO	NO	NO	NO
			Swi	NO	30,00	NO	70,00	NO	NO	NO	NO	NO
			Swi	NO	NO	NO	NO	NO	NO	NO	NO	NO
			Swi	NO	NO	NO	NO	NO	NO	NO	NO	NO
			Swi	NO	NE	NO	NE	NO	NO	NO	NO	NO
			Swi	NO	NO	NO	NO	NO	NO	NO	NO	NO
			Swi	NO	NO	NO	NO	NO	NO	NO	NO	NO
			Rab	NO	NO	NO	100,00	NO	NO	NO	NO	NO
			Rab	NO	NO	NO	NO	NO	NO	NO	NO	NO
			Rab	NO	NO	NO	NO	NO	NO	NO	NO	NO
			Rab	NO	NO	NO	NE		NO	NO	NO	NO
			Rab	NO	NO	NO	NO	NO	NO	NO	NO	NO
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[a] The information required in this table may not be directly applicable to country-specific methods developed for MCF calculations. In such cases, information on MCF derivation should be described in the NIR and references to the relevant sections of the NIR should be provided in the documentation box.

(b) Animal waste management systems not included in the columns of this table should be reported under "Other".

[c] MCF = Methane Conversion Factor (p. 10.43 of chapter 10, volume 4 of the 2006 IPCC Guidelines).

TABLE 3.B(b) SECTORAL BACKGROUND DATA FOR AGRICULTURE
N_2O Emissions from Manure Management
(Sheet 1 of 1)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION															IMPLIED EMISSION FACTORS (IEF)			EMISSIONS		
	Population size	Nitrogen excretion rate	Typical animal mass (average)	Nitrogen excretion per manure management system (MMS) (kg N/yr)									Total N excreted	Total N volatilised as NH_3 and NO_x [4]	N lost through leaching and run-off	Emission factor per animals			N_2O		
																Direct	Indirect		Direct	Indirect	
	(1000s)	(kg N/ head/yr)	(kg/ animal)	Anaerobic lagoon	Liquid system	Daily spread	Solid storage and dry lot	Pasture range and paddock [1]	Composting	Digesters	Burned for fuel or as waste [2]	Other [3]	(kg N/yr)	(kg N/yr)	(kg N/yr)	(kg N_2O/ head/yr)	Atmospheric deposition	Nitrogen leaching and run-off	(kt)	Atmospheric deposition	Nitrogen Leaching and Run-off
																(kg N_2O-N/kg N)					
1. Cattle	9035,32			NO	NO	NO	#########	#########	NO	NO	NO	NO	464888082,00			0,57			5,12		
Option A:																					
Dairy cattle [4]	4235,66	60,68	475,00	NO	NO	NO	#########	#########	NO	NO	NO	NO	257019788,00			0,67			2,83		
Non-dairy cattle	4799,66	43,31	339,00	NO	NO	NO	#########	#########	NO	NO	NO	NO	207868294,00			0,48			2,29		
Option B:																					
Mature dairy cattle																					
Other mature cattle																					
Growing cattle																					
Option C (country-specific) [5] :																					
Other *(please specify)*																					
2. Sheep	20447,54			NO	NO	NO	#########	#########	NO	NO	NO	NO	281481703,00			0,05			0,97		
Other *(please specify)*	20447,54			NO	NO	NO	#########	#########	NO	NO	NO	NO	281481703,00			0,05			0,97		
Sheep	20447,54	13,14	40,00	NO	NO	NO	#########	#########	NO	NO	NO	NO	281481703,00			0,05			0,97		
3. Swine	970,15			NO	#########	NO	#########	NO	NO	NO	NO	NO	25155886,00			0,63			0,61		
Other *(please specify)*	970,15			NO	#########	NO	#########	NO	NO	NO	NO	NO	25155886,00			0,63			0,61		
Swine	970,15	25,93	96,00	NO	#########	NO	#########	NO	NO	NO	NO	NO	25155886,00			0,63			0,61		
4. Other livestock [6]	54480,06			NO	NO	NO	#########	#########	NO	NO	NO	NO	174115933,00			0,03			1,55		
Buffalo	9,97	44,38	380,00	NO	NO	NO	442557,00	NO	NO	NO	NO	NO	442557,00			1,40			0,01		
Camels	243,37	30,10	217,00	NO	NO	NO	NO	#########	NO	NO	NO	NO	7325287,00			NO			NO		
Goats	2721,85	17,75	38,00	NO	NO	NO	#########	#########	NO	NO	NO	NO	48312749,00			0,07			0,18		
Horses	3489,78	26,06	238,00	NO	NO	NO	#########	#########	NO	NO	NO	NO	90943589,00			0,15			0,51		
Mules and Asses	28,95	14,24	130,00	NO	NO	NO	412276,00	NO	NO	NO	NO	NO	412276,00			0,45			0,01		
Poultry	47884,70	0,54	1,80	NO	NO	NO	#########	NO	NO	NO	NO	NO	25857738,00			0,02			0,81		
Other (please specify)	NO			NO	NO	NO	821737,00	NO	NO	NO	NO	NO	821737,00			0,25			0,03		
Rabbit	101,45	8,10	NE	NO	NO	NO	821737,00	NO	NO	NO	NO	NO	821737,00			0,25			0,03		
5. Indirect N_2O emission														91972865,00	NE		0,02	NE		1,44	NE
Total N handled per MMS (kg N/year)				NO	#########	NO	#########		NO	NO		NO									
IEF direct N_2O (kg N_2O-N/kg N handled)				NO	0,00	NO	0,02		NO	NO		NO									
Direct N_2O emissions per MMS (Gg[kt] N_2O)				NO	0,06	NO	8,20		NO	NO		NO				0,03			8,25		

[1] Direct and indirect nitrous oxide (N_2O) emissions associated with the manure deposited on agricultural soils and pasture, range and paddock systems are included under N_2O emissions from managed soils (see table 3(III).D-E).
[2] The emissions associated with the burning of dung are to be reported under fuel combustion, if used as fuel and under waste incineration, if burned without energy recovery.
[3] This could include pit storage, deep bedding, poultry manure with and without litter, aerobic treatment.
[4] Total nitrogen (N) volatilized does not include N volatilized from manure deposited in pasture, range and paddock systems.
[5] Option C should be used when Parties want to report a more disaggregated livestock categorization compared with option A and option B.
[6] If data are available, Parties are encouraged to report at the disaggregated level available from the pre-defined drop-down menu. Furthermore, Parties are encouraged to the extent possible to use the pre-defined category definitions rather than to create similar categories. This ensures the highest possible degree of comparability of the reporting. If
[7] This could include fox and raccoon and mink and polecat.

Documentation box:

• Parties should provide detailed explanations on the agriculture sector in chapter 5: Agriculture (CRF sector 3) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.

• Provide a reference to the relevant section in the NIR, in particular with regard to:
(a) Disaggregation of livestock population (e.g. according to the classification recommended in the 2006 IPCC Guidelines);
(b) Information on other MMS, if reported.

Documentation box	

TABLE 3.C SECTORAL BACKGROUND DATA FOR AGRICULTURE
Rice Cultivation
(Sheet 1 of 1)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION			IMPLIED EMISSION FACTOR [1]	EMISSIONS
	Harvested area[2]	Organic amendments added[3]		CH_4	CH_4
	(10^9 m^2/yr)	type	(t/ha)	(g/m^2)	(kt)
1. Irrigated					20,29
Continuously flooded	NO	NO	NO	NO	NO
Intermittently flooded Single aeration	NO	NO	NO	NO	NO
Intermittently flooded Multiple aeration	0,97	NO	NO	21,00	20,29
2. Rainfed					NO
Flood prone	NO	NO	NO	NO	NO
Drought prone	NO	NO	NO	NO	NO
3. Deep water					NO
Water depth 50–100 cm	NO	NO	NO	NO	NO
Water depth > 100 cm	NO	NO	NO	NO	NO
4. Other *(please specify)*					NO
Upland rice(4)	NO				
Total(4)	0,97				

[1] The implied emission factor implicitly takes account of all relevant corrections for continuously flooded fields without organic amendment, the correction for the organic amendments and the effect of different soil characteristics, if considered in the calculation of methane (CH_4) emissions.

[2] Harvested area is the cultivated area multiplied by the number of cropping seasons per year.

[3] Specify dry weight or wet weight for organic amendments in the documentation box.

[4] These rows are included to allow comparison with international statistics. CH_4 emissions from upland rice are assumed to be zero.

Documentation box:	
• Parties should provide detailed explanations on the agriculture sector in chapter 5: Agriculture (CRF sector 3) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.	
• When disaggregating by more than one region within a country, and/or by growing season, provide additional information on disaggregation and related data in the NIR and provide a reference to the relevant section in the NIR.	
• Where available, provide activity data and scaling factors by soil type and rice cultivar in the NIR.	
Documentation box	

TABLE 3.D SECTORAL BACKGROUND DATA FOR AGRICULTURE

Direct and indirect N_2O emissions from agricultural soils

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION		IMPLIED EMISSION FACTORS	EMISSIONS
	Description	Value kg N/yr	kg N_2O-N/kg N[(1)(2)]	N_2O (kt)
a. Direct N_2O emissions from managed soils				46,48
1. Inorganic N fertilizers[(3)]	N input from application of inorganic fertilizers to cropland and grassland	81018370,00	0,01	1,15
2. Organic N fertilizers[(3)]	N input from organic N fertilizers to cropland and grassland	160603385,00	0,01	2,52
a. Animal manure applied to soils	N input from manure applied to soils	160603385,00	0,01	2,52
b. Sewage sludge applied to soils	N input from sewage sludge applied to soils	NE	NE	NE
c. Other organic fertilizers applied to soils	N input from application of other organic fertilizers	NO	NO	NO
3. Urine and dung deposited by grazing animals	N excretion on pasture, range and paddock	677110218,00	0,01	15,39
4. Crop residues	N in crop residues returned to soils	180750000,00	0,01	2,81
5. Mineralization/immobilization associated with loss/gain of soil organic matter [(4)(5)]	N in mineral soils that is mineralized in association with loss of soil C	1567700000,00	0,01	24,61
6. Cultivation of organic soils (i.e. histosols)[(2)]	Area of cultivated organic soils	NO	NO	NO
7. Other		NO	NO	NO
b. Indirect N_2O Emissions from managed soils				5,92
1. Atmospheric deposition[(6)]	Volatilized N from agricultural inputs of N	175644558,00	0,01	2,76
2. Nitrogen leaching and run-off	N from fertilizers and other agricultural inputs that is lost through leaching and run-off	267431197,00	0,01	3,16

(1) To convert from N_2O-N to N_2O emissions, multiply by 44/28.

(2) For cultivation of histosols the unit of the IEF is kg N_2O–N/ha. The emissions from cultivation/management of croplands and grasslands are to be included. For a definition of organic soils, see footnote 4, page 11.6 of chapter 11 of volume 4 of

(3) Include the application of fertilizers on cropland and grassland. If the application of fertilizers to other land categories cannot be separately identified, this application should be included here.

(4) Emissions from management changes in cropland remaining cropland would be reported in this table.

(5) Methodologies for N_2O emissions from N mineralization/immobilization associated with loss/gain of soil organic matter resulting management of mineral soils are based on equations 11.1, 11.2 and 11.8 of the 2006 IPCC Guidelines. N_2O

(6) Only atmospheric deposition of nitrogen (N) volatilised from agricultural inputs of N are to be reported here, not including NOx associated with the burning of savannahs and crop residues.

Additional information

Fraction [(a)]	Description	Value
$Frac_{GASF}$	Fraction of synthetic fertilizer N applied to soils that volatilises as NH_3 and NO_X	0,10
$Frac_{GASM}$	Fraction of livestock N excretion that volatilises as NH_3 and NO_X	0,20
$Frac_{LEACH-(H)}$	Fraction of N input to managed soils that is lost through leaching and run-off	0,10
Other fractions *(please specify)*		

(a) Use the definitions for fractions as specified in the 2006 IPCC Guidelines (pp. 11.13-11.22 of chapter 11 of volume 4)

Documentation box:	
• Parties should provide detailed explanations on the agriculture sector in chapter 5: Agriculture (CRF sector 3) of the NIR. Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table. • Provide a reference to the relevant section in the NIR, in particular with regard to: (a) Background information on methane (CH_4) emissions from agricultural soils, if accounted for under the agriculture sector; (b) Full list of assumptions and fractions used.	
Documentation box	

TABLE 3.E SECTORAL BACKGROUND DATA FOR AGRICULTURE
Prescribed burning of savannas
(Sheet 1 of 1)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION					IMPLIED EMISSION FACTORS		EMISSIONS [2]	
	Area of savanna burned	Average above-ground biomass density	Fraction of savanna burned	Biomass burned	Nitrogen fraction in biomass	CH_4	N_2O	CH_4	N_2O
	(k ha/yr)	(t dm/ha)		(kt dm)		(kg/t dm)		(kt)	
Forest land (specify ecological zone) [1]								NO	NO
Grassland *(specify ecological zone)* [1]								NO	NO

[1] If possible, fires on forest land and grassland defined as savannah should be separately identified and reported here. If it is not possible to separate those fires from other forest and grassland fires reported under category
[2] Parties who wish to do so could report CH_4 and N_2O emissions from burning of organic soils here. N2O emissions from burning of organic soils could be included when higher tier methods are used.

Documentation box:	
Parties should provide detailed explanations on the agriculture sector in chapter 5: Agriculture (CRF sector 3) of the NIR. Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.	
Documentation box	

TABLE 3.F SECTORAL BACKGROUND DATA FOR AGRICULTURE

Inventory 2021

Field burning of agricultural residues[1]

Submission 2023 v1

(Sheet 1 of 1)

KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION				IMPLIED EMISSION FACTORS		EMISSIONS	
	Area burned (k ha/yr)	Biomass available[1] (t dm/ha)	Combustion factor	Total biomass burned[2] (kt dm)	CH_4 (kg/t dm)	N_2O (kg/t dm)	CH_4 (kt)	N_2O (kt)
1. Cereals				NO	NO	NO	NO	NO
Wheat	NO	NO	NO	NO	NO	NO	NO	NO
Barley	NO	NO	NO	NO	NO	NO	NO	NO
Maize	NO	NO	NO	NO	NO	NO	NO	NO
Other *(please specify)*				NO	NO	NO	NO	NO
2. Pulses				NO	NO	NO	NO	NO
Other *(please specify)*				NO	NO	NO	NO	NO
3. Tubers and roots				NO	NO	NO	NO	NO
Other *(please specify)*				NO	NO	NO	NO	NO
4. Sugar cane	NO	NO	NO	NO	NO	NO	NO	NO
5. Other *(please specify)*				NO	NO	NO	NO	NO

[1] Mass of fuel available for combustion.

[2] If Parties use a different methodology than the IPCC default, e.g. based on crop production, the estimate for total biomass burned can be reported without data on area, fuel available and combustion factor. In this case the additional information table should be used to report the parameters used to derive the total biomass burned.

Additional information

	Wheat	Barley	Maize	Other *(please specify)*
Crop production (t)	NO	NO	NO	
Residue/ Crop ratio	NO	NO	NO	
Dry matter (dm) fraction of residue	NO	NO	NO	
Fraction burned in fields	NO	NO	NO	
Fraction oxidized	NO	NO	NO	

Note: Parties are encouraged to supply the additional information regardless of the methodology applied.

Documentation box:	
Parties should provide detailed explanations on the agriculture sector in chapter 5: Agriculture (CRF sector 3) of the national invnetory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.	
Documentation box	

TABLE 3.G-I SECTORAL BACKGROUND DATA FOR AGRICULTURE

Inventory 2021

CO_2 emissions from liming, urea application and other carbon-containing fertilizers

Submission 2023 v1

(Sheet 1 of 1)

KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA	IMPLIED EMISSION FACTORS	EMISSIONS
	Amount applied	CO_2-C per unit	CO_2
	(t/yr)	(t CO_2–C /t)	(kt)
G. Liming[(1)]			NO
Limestone $CaCO_3$	NO	NO	NO
Dolomite $CaMg(CO_3)_2$	NO	NO	NO
H. Urea application	5612,23	0,20	4,12
I. Other carbon-containing fertlizers	NO	NO	NO
J. Other (please specify)	NO	NO	NO

[(1)] Emissions should include all national liming regardless of land use. A Party should report total estimates for total lime application.

Documentation box:	
Parties should provide detailed explanations on the agriculture sector in chapter 5: Agriculture (CRF sector 3) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.	
Documentation box	
Documentation box	
Documentation box	
Documentation box	

TABLE 4 SECTORAL REPORT FOR LAND USE, LAND-USE CHANGE AND FORESTRY
(Sheet 1 of 1)

Inventory 2021
Submission 2023 v1
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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals[(1), (2)]	CH_4[(2)]	N_2O[(2)]	NO_x	CO	NMVOC
	(kt)					
4. Total LULUCF	6007,59	2,25	0,18	3,83	78,41	17,27
A. Forest land	-22613,05	0,71	0,04	1,21	34,77	3,17
1. Forest land remaining forest land	-22613,05	0,71	0,04	1,21	34,77	3,17
2. Land converted to forest land	NO,IE	NO,IE	NO,IE	NO	NO	NO
B. Cropland	52888,44	NO,IE	NO,IE	NO	NO	NO
1. Cropland remaining cropland	52888,44	NO,IE	NO,IE	NO	NO	NO
2. Land converted to cropland	NO	NO	NO,IE	NO	NO	NO
C. Grassland	-24267,80	1,54	0,14	2,62	43,64	14,10
1. Grassland remaining grassland	-24267,80	1,54	0,14	2,62	43,64	14,10
2. Land converted to grassland	NO,IE	NO	NO	NO	NO	NO
D. Wetlands[(3)]	NO,NE,NA	NO,IE,NA	NO,IE,NA	NO	NO	NO
1. Wetlands remaining wetlands	NO,NE,NA	NO,IE	NO,IE	NO	NO	NO
2. Land converted to wetlands	NO	NO	NO	NO	NO	NO
E. Settlements	NO,NE,IE,NA	NO	NO	NO	NO	NO
1. Settlements remaining settlements	NO	NO	NO	NO	NO	NO
2. Land converted to settlements	NO,NE,IE,NA	NO	NO	NO	NO	NO
F. Other land [(4)]	NO	NO	NO	NO	NO	NO
1. Other land remaining other land						
2. Land converted to other land	NO	NO	NO	NO	NO	NO
G. Harvested wood products [(5)]	NO,IE					
H. Other ***(please specify)***	NO	NO	NO	NO	NO	NO

(1) For the purposes of reporting, the signs for removals are always negative (–) and for emissions positive (+).
(2) For each land-use category and subcategory, this table sums the net carbon dioxide ($CO_{2)}$ emissions and removals shown in tables 4.A to 4.F, and the CO_2, methane (CH_4) and nitrous oxide (N_2O) emissions shown in
(3) Parties may decide not to prepare estimates for CH4 emissions from flooded land contained in Appendix 3 of volume 4 of the 2006 IPCC Guidelines, although they may do so if they wish.
(4) This category includes bare soil, rock, ice, and all land areas that do not fall into any of the other five categories. It allows the total of identified land areas to match the national area.
(5) Non-CO_2 emissions from HWP are covered in the energy sector or waste sector.

Documentation box:
• Parties should provide detailed explanations on the land use, land-use change and forestry sector in chapter 6: Land Use, Land-Use Change and Forestry (CRF sector 4) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.

• If estimates are reported under the category 4.H. Other, use this documentation box to provide information regarding activities covered under this category and to provide a reference to the section in the NIR where background information can be found.

Documentation box	rboard: 4.G.A HWP in SWDS: Carbon stock change not include in CRF tables. Comment is shown in ch. 7 of NIR

Table 4.1 LAND TRANSITION MATRIX

Areas and changes in areas between the previous and the current inventory year[1]

Inventory 2021

Submission 2023 v1

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TO: / FROM:	Forest land (managed)	Forest land (unmanaged)	Cropland	Grassland (managed)	Grassland (unmanaged)	Wetlands (managed)	Wetlands (unmanaged)	Settlements	Other land	**Total unmanaged land**	**Initial area**
FROM:	**(kha)**										
Forest land (managed)[2]	19334,10	NO	NO	NO	NO	NO	NO	NO	NO	NO	19334,10
Forest land (unmanaged)[2]	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Cropland[2]	NO	NO	35380,20	NO	NO	NO	NO	NO	NO	NO	35380,20
Grassland (managed)[2]	NO	NO	NO	183994,20	NO	NO	NO	352,40	NO	NO	184346,60
Grassland (unmanaged)[2]	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Wetlands (managed)[2]	NO	NO	NO	NO	NO	801,20	NO	NO	NO	NO	801,20
Wetlands (unmanaged)[2]	NO	NO	NO	NO	NO	NO	7609,40	NO	NO	NO	7609,40
Settlements[2]	NO	NO	NO	NO	NO	NO	NO	1974,00	NO	NO	1974,00
Other land[2]	NO	NO	NO	NO	NO	NO	NO	NO	23045,50	NO	23045,50
Total unmanaged land [3]	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Final area	19334,10	NO	35380,20	183994,20	NO	801,20	7609,40	2326,40	23045,50	NO	272491,00
Net change[4]	0,00	NO	0,00	-352,40	NO	0,00	0,00	352,40	0,00	NO	0,00

[1] For Parties using reporting approach 1 to represent land areas, only data on the initial and final area per land use should be filled in. Notation key "NA" (not applicable) should be used in such cases for the specific land use transitions, allowing for the formulas in the cells for final and initial areas to be overwritten. Coastal wetlands areas which are not part of total land area should not be included in this land

[2] Definitions for the respective land use categories used by the Party should be provided in the NIR, in accordance with the definitions of land use categories in Volume 4, chapter 3, section 3.2 of the 2006

[3] Parties may report only the total area of unmanaged land area and enter the notation key IE under the individual unmanaged land uses categories.

[4] Net change is the final area minus the initial area for each of the conversion categories shown at the head of the corresponding row. In the final area row the net change equals zero.

TABLE 4.A SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY

Forest land

(Sheet 1 of 1)

Inventory 2021

Submission 2023 v1

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES		ACTIVITY DATA			IMPLIED CARBON-STOCK-CHANGE FACTORS							CHANGES IN CARBON STOCK AND NET CO_2 EMISSIONS/REMOVALS FROM SOILS							Net CO_2 emissions/ removals [4] [7]
Land-use category	Subdivision[1]	Total area[2] (kha)	Area of mineral soil (kha)	Area of organic soil (kha)	Carbon stock change in living biomass per area[3] [4]			Net carbon stock change in dead wood per area[4]	Net carbon stock change in litter per area[4]	Net carbon stock change in soils per area[4]		Carbon stock change in living biomass[3] [4]			Net carbon stock change in dead wood[4]	Net carbon stock change in litter[4]	Net carbon stock change in soils [4] [5] [6]		
					Gains	Losses	Net change			Mineral soils[5]	Organic soils	Gains	Losses	Net change			Mineral soils	Organic soils	
					(t C/ha)							(kt C)							(kt)
A. Total forest land		18834,30	18834,30	NO	0,15	NO,IE	0,15	0,02	0,02	0,13	NO	2914,55	NO,IE	2914,55	447,70	376,26	2493,38	NO	-22850,26
1. Forest land remaining forest land		18834,30	18834,30	NO	0,15	IE	0,15	0,02	0,02	0,13	NO	2914,55	IE	2914,55	447,70	376,26	2493,38	NO	-22850,26
2. Land converted to forest land[8]		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.1 Cropland converted to forest land		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.2 Grassland converted to forest land		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.3 Wetlands converted to forest land		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.4 Settlements converted to forest land		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.5 Other land converted to forest land		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

(1) Land categories may be further divided according to climate zone, management system, soil type, including whether the soil is drained, rewetted or categorized as other, vegetation type, tree species, ecological zone or national land classification. When Parties estimate emissions and removals or carbon stock change on dry and wet soils separately, they are encouraged to use this column to provide this disaggregation. When a Party reports emissions and removals from coastal wetlands areas that are not part of the total land area of the country, a Party may use appropriate subcategories for indicating whether

(2) The total area of the subcategories, in accordance with the subdivision used, should be entered here. For lands converted to forest land report the cumulative area remaining in the category in the reporting year. The total area should equal the area of mineral soil plus the area of organic soil by subcategory.

(3) Carbon stock gains and losses should be listed separately except in cases where, due to the methods used, it is technically impossible to separate information on gains and losses.

(4) The signs for estimates of gains in carbon stocks are positive (+) and of losses in carbon stocks are negative (–).

(5) When Parties cannot estimate carbon stock changes for organic and mineral soil separately, these should be reported under mineral soils.

(6) Parties who wish to do so may report annual on-site CO2-C emissions/removals and off-site CO2-C emissions from drained and rewetted organic soils here.

(7) Where Parties directly estimate emissions and removals rather than carbon stock changes, they may report emissions/removals directly in this column and use notation keys in the stock change columns.

(8) A Party may report aggregated estimates for all conversions of land to forest land when data are not available to report them separately. A Party should specify in the documentation box which types of land conversion are included.

Documentation box:	
Parties should provide detailed explanations on the land use, land-use change and forestry sector in Chapter 6: Land Use, Land-Use Change and Forestry (CRF sector 4) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.	
Documentation box	4.A.1 Carbon stock change:
Documentation box	

TABLE 4.B SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY
Cropland
(Sheet 1 of 1)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		ACTIVITY DATA			IMPLIED CARBON-STOCK-CHANGE FACTORS						CHANGES IN CARBON STOCK AND NET CO_2 EMISSIONS/REMOVALS FROM SOILS						
Land-use category	Subdivision[1]	Total area[2] (kha)	Area of mineral soil (kha)	Area of organic soil (kha)	Carbon stock change in living biomass per area[3] [4]			Net carbon stock change in dead organic matter per area[4]	Net carbon stock change in soils per area[4]		Carbon stock change in living biomass[3], [4], [6]			Net carbon stock change in dead organic matter[4] [7]	Net carbon stock change in soils[4] [5] [8]		Net CO_2 emissions/ removals[4] [9]
					Gains	Losses	Net change		Mineral soils	Organic soils	Gains	Losses	Net change		Mineral soils	Organic soils	
					(t C/ha)						(kt C)						(kt)
B. Total Cropland		35943,00	35943,00	NO	0,01	-0,02	-0,01	NO,IE	-0,39	NO	310,70	-540,82	-230,12	NO,IE	-14194,00	NO	52888,44
1. Cropland remaining cropland		35943,00	35943,00	NO	0,01	-0,02	-0,01	IE	-0,39	NO	310,70	-540,82	-230,12	IE	-14194,00	NO	52888,44
2. Land converted to cropland[10]		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.1 Forest land converted to cropland .		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.2 Grassland converted to cropland		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.3 Wetlands converted to cropland		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.4 Settlements converted to cropland		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.5 Other land converted to cropland		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

(1) Land categories may be further divided according to climate zone, management system, soil type, including whether the soil is drained, rewetted or categorized as other, vegetation type, tree species, ecological zone or national land classification. When Parties estimate emissions
(2) The total area of the subcategories, in accordance with the subdivision used, should be entered here. For lands converted to cropland report the cumulative area remaining in the category in the reporting year. The total area should equal the area of mineral soil plus the area of organic soil by subcategor
(3) Carbon stock gains and losses should be listed separately except in cases where, due to the methods used, it is technically impossible to separate information on gains and losses.
(4) The signs for estimates of gains in carbon stocks are positive (+) and for losses in carbon stocks are negative (–).
(5) Parties who wish to do so may report annual on-site CO2-C emissions/removals and off-site CO2-C emissions from drained and rewetted organic soils here.
(6) For category 4.B.1 Cropland remaining cropland this column only includes changes in perennial woody biomass.
(7) No reporting on dead organic matter pools is required for category 4.B.1. Cropland remaining cropland.
(8) When Parties cannot estimate carbon stock changes for organic and mineral soil separately, these should be reported under mineral soils.
(9) Where Parties directly estimate emissions and removals rather than carbon stock changes, they may report emissions/removals directly in this column and use notation keys in the stock change columns.
(10) A Party may report aggregated estimates for all land conversions to cropland, when data are not available to report them separately. A Party should specify in the documentation box which types of land conversion are included.

Documentation box:	
Parties should provide detailed explanations on the land use, land-use change and forestry sector in Chapter 6: Land Use, Land-Use Change and Forestry (CRF sector 4) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.	
Documentation box	4.B.1 Carbon stock change:
Documentation box	

TABLE 4.C SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY
Grassland
(Sheet 1 of 1)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		ACTIVITY DATA			IMPLIED CARBON-STOCK-CHANGE FACTORS						CHANGES IN CARBON STOCK AND NET CO_2 EMISSIONS/REMOVALS FROM SOILS						Net CO_2 emissions/ removals[(4) (8)]
Land-use category	Subdivision[(1)]	Total area[(2)] (kha)	Area of mineral soil (kha)	Area of organic soil (kha)	Carbon stock change in living biomass per area[(3) (4)]			Net carbon stock change in dead organic matter per area[(4)]	Net carbon stock change in soils per area[(4)]		Carbon stock change in living biomass[(3), (4)]			Net carbon stock change in dead organic matter[(4) (6)]	Net carbon stock change in soils[(4) (5) (7)]		
					Gains	Losses	Net change		Mineral soils	Organic soils	Gains	Losses	Net change		Mineral soils	Organic soils	
					(t C/ha)						(kt C)						(kt)
C. Total grassland		183994,00	183994,00	NO	0,00	NO	0,00	0,00	0,03	NO	513,50	NO	513,50	193,00	6207,30	NO	-25350,60
1. Grassland remaining grassland		183994,00	183994,00	NO	0,00	NO	0,00	0,00	0,03	NO	513,50	NO	513,50	193,00	6207,30	NO	-25350,60
2. Land converted to grassland[(9)]		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.1 Forest land converted to grassland		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.2 Cropland converted to grassland		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.3 Wetlands converted to grassland		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.4 Settlements converted to grassland		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.5 Other Land converted to grassland		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

(1) Land categories may be further divided according to climate zone, management system, soil type, including whether the soil is drained, rewetted or categorized as other, vegetation type, tree species, ecological zone or national land classification. When Parties estimate emissions and removals or carbon stock change on dry and wet soils

(2) The total area of the subcategories, in accordance with the sub-division used, should be entered here. For lands converted to grassland report the cumulative area remaining in the category in the reporting year. The total area should equal the area of mineral soil plus the area of organic soil by subcategory.

(3) Carbon stock gains and losses should be listed separately except in cases where, due to the methods used, it is technically impossible to separate information on gains and losses.

(4) The signs for estimates of gains in carbon stocks are positive (+) and of losses in carbon stocks are negative (–).

(5) Parties who wish to do so may report annual on-site CO2-C emissions/removals and off-site CO2-C emissions from drained and rewetted organic soils here.

(6) No reporting on dead organic matter pools is required for category 4.C.1 Grassland remaining grassland.

(7) When Parties cannot estimate carbon stock changes for organic and mineral soil separately, these should be reported under mineral soils.

(8) Where Parties directly estimate emissions and removals rather than carbon stock changes, they may report emissions/removals directly in this column and use notation keys in the stock change columns.

(9) A Party may report aggregated estimates for all land conversions to grassland, when data are not available to report them separately. A Party should specify in the documentation box which types of land conversion are included.

Documentation box:	
Parties should provide detailed explanations on the land use, land-use change and forestry sector in Chapter 6: Land Use, Land-Use Change and Forestry (CRF sector 4) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.	
Documentation box	
Documentation box	

TABLE 4.D SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY
Wetlands
(Sheet 1 of 1)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		ACTIVITY DATA			IMPLIED CARBON-STOCK-CHANGE FACTORS						CHANGES IN CARBON STOCK AND NET CO_2 EMISSIONS/REMOVALS FROM SOILS						Net CO_2 emissions/ removals[4] [5] [6]
Land-use category	Subdivision[1]	Total area[2] (kha)	Area of mineral soil (kha)	Area of organic soil (kha)	Carbon stock change in living biomass per area[3] [4]			Net carbon stock change in dead organic matter per area[4]	Net carbon stock change in soils per area[4]		Carbon stock change in living biomass[3] [4]			Net carbon stock change in dead organic matter[4]	Net carbon stock change in soils[4]		
					Gains	Losses	Net change		Mineral soils	Organic soils	Gains	Losses	Net change		Mineral soils	Organic soils	
					(t C/ha)						(kt C)						(kt)
D. Total wetlands		8410,60	8410,60	NO	NO,NA	NO	NO,NA	NO	NO	NO	NO,NA	NO	NO,NA	NO	NO	NO	NO,NA
1. Wetlands remaining wetlands		8410,60	8410,60	NO	NO,NA	NO	NO,NA	NO	NO	NO	NO,NA	NO	NO,NA	NO	NO	NO	NO,NA
1.1 Peat extraction remaining peat extraction		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
1.2 Flooded land remaining flooded land		801,20	801,20	NO	NA	NO	NO,NA	NO	NO	NO	NA	NO	NO,NA	NO	NO	NO	NO,NA
1.3 Other wetlands remaining other wetlands [7]		7609,40	7609,40	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Land converted to wetlands[8]		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.1 Land converted to peat extraction		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.2 Land converted to flooded land		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.3 Land converted to other wetlands		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

(1) Land categories may be further divided according to climate zone, management system, soil type, including whether the soil is drained, rewetted or categorized as other, vegetation type, tree species, ecological zone or national land classification. When Parties estimate emissions and removals or carbon stock change on dry and wet soils separately, they
(2) The total area of the subcategories, in accordance with the subdivision used, should be entered here. For lands converted to wetlands report the cumulative area remaining in the category in the reporting year. The total area should equal the area of mineral soil plus the area of organic soil by subcategory.
(3) Carbon stock gains and losses should be listed separately except in cases where, due to the methods used, it is technically impossible to separate information on gains and losses.
(4) The signs for estimates of gains in carbon stocks are positive (+) and of losses in carbon stocks are negative (–).
(5) Where Parties directly estimate emissions and removals rather than carbon stock changes, they may report emissions/removals directly in this column and use notation keys in the stock change columns.
(6) There is no default methodology for estimating CO2 emissions from flooded land remaining flooded land.
(7) Detailed information on Other wetlands should be included in the NIR.
(8) A Party may report aggregated estimates for all land conversions to wetlands, when data are not available to report them separately. A Party should specify in the documentation box which types of land conversion are included.

Documentation box:	
Parties should provide detailed explanations on the land use, land-use change and forestry sector in Chapter 6: Land Use, Land-Use Change and Forestry (CRF sector 4) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additi	
Documentation box	
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TABLE 4.E SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY
Settlements
(Sheet 1 of 1)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		ACTIVITY DATA			IMPLIED CARBON-STOCK-CHANGE FACTORS						CHANGES IN CARBON STOCK AND NET CO_2 EMISSIONS/REMOVALS FROM SOILS						Net CO_2 emissions/ removals[4] [5]
Land-use category	Subdivision[1]	Total area[2] (kha)	Area of mineral soil (kha)	Area of organic soil (kha)	Carbon stock change in living biomass per area[3] [4]			Net carbon stock change in dead organic matter per area[4]	Net carbon stock change in soils per area[4]		Carbon stock change in living biomass[3], [4]			Net carbon stock change in dead organic matter[4]	Net carbon stock change in soils[4]		
					Gains	Losses	Net change		Mineral soils	Organic soils	Gains	Losses	Net change		Mineral soils	Organic soils	
					(t C/ha)						(kt C)						(kt)
E. Total settlements		2306,70	2306,70	NO	NO,NA	NO	NO,NA	NO,IE	NO,NE	NO	NO,NA	NO	NO,NA	NO,IE	NO,NE	NO	NO,NE,IE,NA
1. Settlements remaining settlements		2306,70	2306,70	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Land converted to settlements		NO	NO	NO	NO,NA	NO	NO,NA	NO,IE	NO,NE	NO	NO,NA	NO	NO,NA	NO,IE	NO,NE	NO	NO,NE,IE,NA
2.1 Forest land converted to settlements		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.2 Cropland converted to settlements		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.3 Grassland converted to settlements		NO	NO	NO	NA	NO	NO,NA	IE	NE	NO	NA	NO	NO,NA	IE	NE	NO	NO,NE,IE,NA
2.4 Wetlands converted to settlements		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.5 Other Land converted to settlements		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

[1] Land categories may be further divided according to climate zone, management system, soil type, including whether the soil is drained, rewetted or categorized as other, vegetation type, tree species, ecological zone or national land classification. When Parties estimate emissions and removals or carbon stock change on dry and wet soils separately, they are encouraged to use this column to provide this disaggregation. When a Party reports emissions and removals from coastal wetlands areas that are not part of the total land area of the country, a Party may use appropriate subcategories for indicating whether the emissions and removals come from areas included or excluded from the total land area of the country.

[2] The total area of the subcategories, in accordance with the subdivision used, should be entered here. For lands converted to settlements report the cumulative area remaining in the category in the reporting year. The total area should equal the area of mineral soil plus the area of organic soil by subcategory.

[3] Carbon stock gains and losses should be listed separately except in cases where, due to the methods used, it is technically impossible to separate information on gains and losses.

[4] The signs for estimates of gains in carbon stocks are positive (+) and of losses in carbon stocks are negative (–).

[5] Where Parties directly estimate emissions and removals rather than carbon stock changes, they may report emissions/removals directly in this column and use notation keys in the stock change columns.

Documentation box:	
Parties should provide detailed explanations on the land use, land-use change and forestry sector in Chapter 6: Land Use, Land-Use Change and Forestry (CRF sector 4) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.	
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TABLE 4.F SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY
Other land
(Sheet 1 of 1)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		ACTIVITY DATA			IMPLIED CARBON-STOCK-CHANGE FACTORS						CHANGES IN CARBON STOCK AND NET CO_2 EMISSIONS/REMOVALS FROM SOILS						Net CO_2 emissions/ removals[4] [5]
Land-use category	Subdivision[1]	Total area[2] (kha)	Area of mineral soil (kha)	Area of organic soil (kha)	Carbon stock change in living biomass per area[3] [4]			Net carbon stock change in dead organic matter per area[4]	Net carbon stock change in soils per area[4]		Carbon stock change in living biomass[3] [4]			Net carbon stock change in dead organic matter[4]	Net carbon stock change in soils[4]		
					Gains	Losses	Net change		Mineral soils	Organic soils	Gains	Losses	Net change		Mineral soils	Organic soils	
					(t C/ha)						(kt C)						(kt)
F. Total other land		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
1. Other land remaining other land[6]		NO		NO													
2. Land converted to other land[7]		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.1 Forest land converted to other land		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.2 Cropland converted to other land		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.3 Grassland converted to other land		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.4 Wetlands converted to other land		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.5 Settlements converted to other land		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

(1) Land categories may be further divided according to climate zone, management system, soil type, including whether the soil is drained, rewetted or categorized as other, vegetation type, tree species, ecological zone or national land classification. When Parties estimate emissions and removals or carbon stock change on dry and wet soils separately, they are encouraged to use this column to provide this disaggregation.

(2) The total area of the subcategories, in accordance with the subdivision used, should be entered here. For lands converted to Other land report the cumulative area remaining in the category in the reporting year. The total area should equal the area of mineral soil plus the area

(3) Carbon stock gains and losses should be listed separately except in cases where, due to the methods used, it is technically impossible to separate information on gains and losses.

(4) The signs for estimates of gains in carbon stocks are positive (+) and of losses in carbon stocks are negative (–).

(5) Where Parties directly estimate emissions and removals rather than carbon stock changes, they may report emissions/removals directly in this column and use notation keys in the stock change columns.

(6) This land-use category is to allow the total of identified land area to match the national area. It includes bare soil, rock, ice and all land areas that do not fall into any other of the other five land-use categories.

(7) A Party may report aggregated estimates for all land conversions to other land, when data are not available to report them separately. A Party should specify in the documentation box which types of land conversion are included.

Documentation box:	
Parties should provide detailed explanations on the land use, land-use change and forestry sector in chapter 6: Land Use, Land-Use Change and Forestry (CRF sector 4) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.	
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TABLE 4(I) SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTI

Direct nitrous oxide (N_2O) emissions from nitrogen (N) inputs[1] to managed soils

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION	IMPLIED EMISSION FACTORS	EMISSIONS[4]
Land-use category[2]	Value kg N/yr	N_2O–N emissions per unit of N-input kg N_2O–N/kg N[3]	N_2O (kt)
Total for all land use categories	NO	NO	NO
A. Forest land[5]	NO	NO	NO
1. Forest land remaining forest land	NO	NO	NO
1. Inorganic N fertilizers[6]	NO	NO	NO
2. Organic N fertilizers[7]	NO	NO	NO
2. Land converted to forest land	NO	NO	NO
1. Inorganic N fertilizers[6]	NO	NO	NO
2. Organic N fertilizers[7]	NO	NO	NO
D. Wetlands[5]	NO	NO	NO
1. Wetlands remaining wetlands	NO	NO	NO
1. Inorganic N fertilizers[6]	NO	NO	NO
2. Organic N fertilizers[7]	NO	NO	NO
2. Land converted to wetlands	NO	NO	NO
1. Inorganic N fertilizers[6]	NO	NO	NO
2. Organic N fertilizers[7]	NO	NO	NO
E. Settlements[5]	NO	NO	NO
1. Settlements remaining settlements	NO	NO	NO
1. Inorganic N fertilizers[6]	NO	NO	NO
2. Organic N fertilizers[7]	NO	NO	NO
2. Land converted to settlements	NO	NO	NO
1. Inorganic N fertilizers[6]	NO	NO	NO
2. Organic N fertilizers[7]	NO	NO	NO
H. Other (please specify)[5] [8]	NO	NO	NO

[1] Direct N_2O emissions from N input to managed soils are estimated using equations 11.1, 11.2, 11.3, 11.4, 11.5 and 11.6 of the volume 4 of the 2006 IPCC Guidelines based on the amounts of N

[2] N_2O emissions from N fertilization of cropland and grassland are reported in the agriculture sector.

[3] In the calculation of the implied emission factor, N_2O emissions are converted to N_2O–N by multiplying by 28/44.

[4] Emissions are reported with a positive sign.

[5] If a Party is not able to separate the N inputs applied to land-use categories, other than cropland and grasslands, it may report all N_2O emissions from N inputs to managed soils in the agriculture

[6] N input from application of inorganic fertilizers to land use categories other than cropland and grasslands.

[7] N input from organic N fertilizers to land use categories other than cropland and grassland.

[8] If a Party is not able to separate the N inputs applied to forest land and to other land-use categories, other than cropland and grasslands, it may report all N_2O emissions from N inputs to

Documentation box:	
Parties should provide detailed explanations on the land use, land-use change and forestry sector in Chapter 6: Land Use, Land-Use Change and Forestry (CRF sector 4) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.	
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TABLE 4(II) SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY
Emissions and removals from drainage and rewetting and other management of organic
(Sheet 1 of 1)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		ACTIVITY DATA	IMPLIED EMISSION FACTORS			EMISSIONS		
Land-use category[1]	Subdivision[2]	Area (kha)	CO_2 per area (kg CO_2/ha)	N_2O–N per area[3] (kg N_2O–N/ha)	CH_4 per area (kg CH_4/ha)	CO_2[4]	N_2O	CH_4
						(kt)		
Total for all land use categories						NO,NA	NO,NA	NO,NA
A. Forest land[5]						NO	NO	NO
Total organic soils		NO	NO	NO	NO	NO	NO	NO
Drained organic soils		NO	NO	NO	NO	NO	NO	NO
Rewetted organic soils		NO	NO	NO	NO	NO	NO	NO
Other *(please specify)*		NO	NO	NO	NO	NO	NO	NO
Total mineral soils		NO	NO	NO	NO	NO	NO	NO
Rewetted mineral soils		NO	NO	NO	NO	NO	NO	NO
Other *(please specify)*		NO	NO	NO	NO	NO	NO	NO
B. Cropland [5], [6]						NO	NO	NO
Total organic soils		NO	NO		NO	NO		NO
Drained organic soils		NO	NO		NO	NO		NO
Rewetted organic soils		NO	NO		NO	NO		NO
Other *(please specify)*		NO	NO		NO	NO		NO
Total mineral soils		NO	NO	NO	NO	NO	NO	NO
Rewetted mineral soils		NO	NO		NO	NO		NO
Other *(please specify)*		NO	NO	NO	NO	NO	NO	NO
C. Grassland [5]						NO	NO	NO
Total organic soils		NO	NO		NO	NO		NO
Drained organic soils		NO	NO		NO	NO		NO
Rewetted organic soils		NO	NO		NO	NO		NO
Other *(please specify)*		NO	NO		NO	NO		NO
Total mineral soils		NO	NO	NO	NO	NO	NO	NO
Rewetted mineral soils		NO	NO		NO	NO		NO
Other *(please specify)*		NO	NO	NO	NO	NO	NO	NO
D. Wetlands [5]						NO,NA	NO,NA	NO,NA
D.1 Peat extraction lands						NO	NO	NO
Total organic soils		NO	NO	NO	NO	NO	NO	NO
Drained organic soils		NO	NO	NO	NO	NO	NO	NO
Rewetted organic soils		NO	NO	NO	NO	NO	NO	NO
Other *(please specify)*		NO	NO	NO	NO	NO	NO	NO
Total mineral soils		NO	NO	NO	NO	NO	NO	NO
Rewetted mineral soils		NO	NO	NO	NO	NO	NO	NO
Other *(please specify)*		NO	NO	NO	NO	NO	NO	NO
D.2 Flooded lands						NO,NA	NO,NA	NO,NA
Total organic soils		NO	NO	NO	NO	NO	NO	NO
Drained organic soils		NO	NO	NO	NO	NO	NO	NO
Rewetted organic soils		NO	NO	NO	NO	NO	NO	NO
Other *(please specify)*		NO	NO	NO	NO	NO	NO	NO
Total mineral soils		NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
Rewetted mineral soils		NA	NA	NA	NA	NA	NA	NA
Other *(please specify)*		NO	NO	NO	NO	NO	NO	NO
D.3 Other wetlands *(please specify)*						NO	NO	NO
H. Other *(please specify)* [5]						NO	NO	NO

[1] Nitrous oxide (N_2O) emissions from drained cropland and grassland soils are covered in the agriculture tables of the CRF under cultivation of organic soils.

[2] A Party should report further disaggregations of drained soils corresponding to the methods used. Tier 1 disaggregates soils into "nutrient rich" and "nutrient poor" areas, whereas higher-tier methods can further disaggregate soils into different peatland types, soil fertility or tree species.

[3] In the calculation of the implied emission factor, N_2O emissions are converted to N_2O-N by multiplying by 28/44.

[4] If CO_2 emissions or removals from drainage of wetland soils are not already included in tables 4.A to 4.F, they are to be reported here. Parties may also choose to report CO_2 emissions or removals from rewetting and other management

[5] In table 4, these emissions will be added to the respective land-use category.

[6] On-site CH_4 emissions /removals from rice cultivation are included in the agriculture sector.

Documentation box:	
Parties should provide detailed explanations on the land use, land-use change and forestry sector in Chapter 6: Land Use, Land-Use Change and Forestry (CRF sector 4) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.	
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TABLE 4(III) SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY

Inventory 2021

Submission 2023 v1

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Direct nitrous oxide (N_2O) emissions from nitrogen (N) mineralization/immobilization associated with loss/gain of soil organic matter resulting from change of land use or management of mineral soils[1]

(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA	IMPLIED EMISSION FACTORS	EMISSIONS
Land-use category[2]	**Area [3] (kha)**	**N_2O–N emissions per area[4] (kg N_2O–N/ha)**	**N_2O (kt)**
Total all land-use categories	18834,30	NO,IE,NA	NO,IE,NA
A. Forest land	18834,30	NA	NA
1. Forest land remaining forest land	18834,30	NA	NA
2. Lands converted to forest land[5]			
B. Cropland[2]	NO	IE	IE
2. Lands converted to cropland[5]	NO	IE	IE
C. Grasslands	NO	NO	NO
1. Grasslands remaining grasslands	NO	NO	NO
2. Lands converted to grasslands[5]	NO	NO	NO
D. Wetlands	NO	NO	NO
1. Wetlands remaining wetlands	NO	NO	NO
2. Lands converted to wetlands[5]	NO	NO	NO
E. Settlements	NO	NO	NO
1. Settlements remaining settlements	NO	NO	NO
2. Lands converted to settlements[5]	NO	NO	NO
F. Other land	NO	NO	NO

[1] Methodologies for N2O emissions from N mineralization associated with loss of soil organic matter resulting from change of land use or management of mineral soils are based on equations 11.1, 11.2 and 11.8 of the 2006 IPCC Guidelines. N2O immobilization associated with gain of organic matter resulting from change of land use or management of mineral soils can be reported only when a Party applies a tier 3 approach in the relevant calculation.

[2] N_2O emissions from Cropland remaining cropland are included in the agriculture sector

[3] The total area of the subcategories, in accordance with the subdivision used, should be entered here. For lands remaining in the category, the area su

[4] In the calculation of the implied emission factor, N2O emissions are converted to N2O–N by multiplying by 28/44.

[5] If data are available, Parties are encouraged to report at the disaggregated level available from the pre-defined drop-down menu. Furthermore, Parties are encouraged to the extent possible to use the pre-defined category definitions rather than to create similar categories. This ensures the highest possible degree of comparability of the reporting. If detailed data are not available, Parties should include all emissions from land conversion here.

Documentation box:	
Parties should provide detailed explanations on the land use, land-use change and forestry sector in Chapter 6: Land Use, Land-Use Change and Forestry (CRF sector 4) of the national inventory report (NIR). Use this documentation box to provide	
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TABLE 4(IV) SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY

Indirect nitrous oxide (N_2O) emissions from managed soils[(1)(2)]

Inventory 2021

Submission 2023 v1

KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION		IMPLIED EMISSION FACTORS	EMISSIONS
	Description	Value kg N/yr	kg N_2O–N/kg N[(3)]	N_2O (kt)
1. Atmospheric deposition[(4)]	N volatized from managed soils from inputs of N	IE	IE	IE
2. Nitrogen leaching and run-off[(4)]	N from fertlizers and other that is lost through leaching and run-off from managed soils	IE	IE	IE

(1) If the sources of nitrogen (N) cannot be separated other than between cropland and grasslands they should be included in the agriculture sector and reported in table 3.D(b). This should be explicitly indicated in the documentation box.

(2) Methodologies for indirect N_2O emissions are based on equations 11.9, 11.10 and 11.11 of the 2006 IPCC Guidelines.

(3) To convert from N_2O–N to N_2O emissions, multiply by 44/28.

(4) Report atmospheric deposition and leaching and runoff of N from the following sources of N inputs: synthetic and organic N fertlizer from land use categories, other than cropland and grassland (these emissions are reported in the agriculture sector), and N mineralization associated with loss of soil organic matter resulting from change of land use or management on mineral soils in all land use categories except for cropland remaining cropland.

Documentation box:	
Parties should provide detailed explanations on the land use, land-use change and forestry sector in Chapter 6: Land Use, Land-Use Change and Forestry (CRF sector 4) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.	
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TABLE 4(V) SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY

Inventory 2021

Biomass Burning[1]

Submission 2023 v1

(Sheet 1 of 1)

KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		ACTIVITY DATA			IMPLIED EMISSION FACTOR			EMISSIONS		
		Description[4]	Unit	Values	CO_2	CH_4	N_2O	CO_2[5][6]	CH_4	N_2O
Land-use category[2]	**Subdivision [3]**		**(ha or kg dm)**		**(t/activity data unit)**			**(kt)**		
Total for land-use categories			ha	9750,00	135,39	0,23	0,02	1320,01	2,25	0,18
A. Forest land			ha	9750,00	24,33	0,07	0,00	237,21	0,71	0,04
1. Forest land remaining forest land[7]			ha	9750,00	24,33	0,07	0,00	237,21	0,71	0,04
Controlled burning			ha	NO	NO	NO	NO	NO	NO	NO
Wildfires			ha	9750,00	24,33	0,07	0,00	237,21	0,71	0,04
2. Land converted to forest land			ha	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE
Controlled burning			ha	NO	NO	NO	NO	NO	NO	NO
Wildfires			ha	IE	IE	IE	IE	IE	IE	IE
B. Cropland			ha	NO,IE	NO,NE	NO,IE	NO,IE	NO,NE	NO,IE	NO,IE
1. Cropland remaining cropland[8]			ha	NO,IE	NO,NE	NO,IE	NO,IE	NO,NE	NO,IE	NO,IE
Controlled burning			ha	NO	NO	NO	NO	NO	NO	NO
Wildfires			ha	IE	NE	IE	IE	NE	IE	IE
2. Land converted to cropland			ha	NO	NO	NO	NO	NO	NO	NO
Controlled burning			ha	NO	NO	NO	NO	NO	NO	NO
Wildfires			ha	NO	NO	NO	NO	NO	NO	NO
C. Grassland			ha	NO	NO	NO	NO	1082,80	1,54	0,14
1. Grassland remaining grassland[6]			ha	NO	NO	NO	NO	1082,80	1,54	0,14
Controlled burning			ha	NO	NO	NO	NO	NO	NO	NO
Wildfires			ha					1082,80	1,54	0,14
2. Land converted to grassland			ha	NO	NO,IE	NO	NO	NO,IE	NO	NO
Controlled burning			ha	NO	NO	NO	NO	NO	NO	NO
Wildfires			ha	NO	IE	NO	NO	IE	NO	NO
D. Wetlands			ha	NO,IE	NO,NE	NO,IE	NO,IE	NO,NE	NO,IE	NO,IE
1. Wetlands remaining wetlands			ha	NO,IE	NO,NE	NO,IE	NO,IE	NO,NE	NO,IE	NO,IE
Controlled burning			ha	NO	NO	NO	NO	NO	NO	NO
Wildfires			ha	IE	NE	IE	IE	NE	IE	IE
2. Land converted to wetlands			ha	NO	NO	NO	NO	NO	NO	NO
Controlled burning			ha	NO	NO	NO	NO	NO	NO	NO
Wildfires			ha	NO	NO	NO	NO	NO	NO	NO
E. Settlements			ha	NO	NO	NO	NO	NO	NO	NO
F. Other land			ha	NO	NO	NO	NO	NO	NO	NO
H. Other (please specify)										

(1) The methodology for estimating non-CO_2 emissions from biomass burning is described in section 2.4 of chapter 2 of volume 4 of the 2066 IPCC Guidelines.

(2) Parties should report both controlled/prescribed burning and wildfires emissions, where appropriate, in a separate manner.

(3) When Parties estimate emissions from biomass burning on mineral and organic soils separately they are encouraged to use this column to provide this disaggregation.

(4) For each category, activity data should be selected between area burned or biomass burned. The units for area will be ha and for biomass burned will be kg dm. The implied emission factor will refer to the selected activity data with an automatic

documentation box and in the national inventory report (NIR). Double counting should be avoided. Parties that include all carbon stock changes in the carbon stock tables (4.A–F), should report "IE" (included elsewhere) in this column.

(6) Parties who wish to do so may report CO2 emissions from burning of organic soils here.

(7) CH_4 and N_2O emissions associated with the burning of forest land and grassland defined as savannah should be reported under the agriculture sector. CO2 emissions/removals associated

(8) In situ above-ground woody biomass burning is reported here. Agricultural residue burning is reported in the agriculture

Documentation box:	
Parties should provide detailed explanations on the land use, land-use change and forestry sector in Chapter 6: Land Use, Land-Use Change and Forestry (CRF sector 4) of the NIR. Use this documentation box to provide references to relevant sections of	
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TABLE 4.G SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY
Harvested wood products (HWP)[1]
(Sheet 1 of 2)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

APPROACH A[2]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES[3]	HWP in use (IU) from domestic consumption				Net emissions/ removals from HWP in use [6]
	Gains[4]	Losses[4]	Half-life[5]	Annual change in stock (AC HWP IU DC)	
	(t C)		(yr)	(kt C)	(kt CO_2)
TOTAL HWP consumed domestically (AC HWPdom IU DC)	NO	NO,IE		NO	NO,IE
1. Solid wood[7]	NO	NO		NO	NO
2. Paper and paperboard	NO	IE	2,08	NO	IE
3. Other *(please specify)*	NO	NO		NO	NO

Information item:[8]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	HWP in solid waste disposal sites (SWDS) from domestic consumption[9]				Net CO_2 emissions/ removals from HWP in SWDS	Net CO_2 emissions/ removals from HWP from domestic consumption (IU+SWDS)
	Gains[4]	Losses[4]	Half-life[5][10]	Annual change in stock (AC HWP SWDS DC)		
	(t C)		(yr)	(kt C)	(kt CO_2)	(kt CO_2)
HWP in SWDS [11]	NO	NO	NO	NO	NO	NO

APPROACH B[12]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES[3]	HWP in use from domestic harvest				Net emissions/ removals from HWP in use [6]
	Gains[4]	Losses[4]	Half-life[5]	Annual Change in stock (AC HWP IU DH)	
	(t C)		(yr)	(kt C)	(kt CO_2)
TOTAL HWP from domestic harvest (AC HWP IU DH)					
1. Solid wood[7]					
2. Paper and paperboard					
3. Other *(please specify)*					
HWP produced and consumed domestically (AC HWPdom IU DH)[13]					
Total					
1. Solid wood[7]					
2. Paper and paperboard					
3. Other *(please specify)*					
HWP produced and exported (AC HWPexp IU DH)[13]					
Total					
1. Solid wood[7]					
2. Paper and paperboard					
3. Other *(please specify)*					

Information item:[8]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	HWP in solid waste disposal sites (SWDS) produced from domestic harvest[9]				Net CO_2 emissions/ removals from HWP in SWDS	Net CO_2 emissions/ removals from HWP from domestic harvest (IU + SWDS)
	Gains[4]	Losses[4]	Half-life[5][10]	Annual change in stock (AC HWP SWDS DH)		
	(t C)		(yr)	(kt C)	(kt CO_2)	(kt CO_2)
HWP in SWDS [11]						

APPROACH C[14]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES[3]	HWP in use from domestic consumption			
	Gains[4]	Losses[4]	Half-life[5]	Annual change in stock (AC HWP IU DC)
	(t C)		(yr)	(kt C)
TOTAL				
1. Solid wood[7]				
2. Paper and paperboard				
3. Other *(please specify)*				

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Additional variables			Net CO_2 emissions/ removals from HWP in use [6]
	Annual domestic harvest (H)	Annual imports of wood, and paper products + wood fuel, pulp, recovered paper, roundwood/chips (Pim)	Annual exports of wood, and paper products + wood fuel, pulp, recovered paper, roundwood/chips (Pex)	
	(kt C)	(kt C)	(kt C)	(kt CO_2)
1. Solid wood				
2. Paper and paperboard				
3. Other *(please specify)*				

Information item:[8]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	HWP in solid waste disposal sites (SWDS) from domestic consumption[9]				Net CO_2 emissions/ removals from HWP in SWDS	Net CO_2 emissions/ removals from HWP (IU+SWDS)[10]
	Gains[4]	Losses[4]	Half-life[5][10]	Annual change in stock (AC HWP SWSD DC)		
	(t C)		(yr)	(kt C)	(kt CO_2)	(kt CO_2)
HWP in SWDS [11]						

[1] A Party should only provide data for the approach it has chosen to use for reporting on harvested wood products.
[2] Stock change approach. Refer to equations 12.1, 12.2 and 12.A.2 of volume 4 of the 2006 IPCC Guidelines.
[3] Categories are defined in table 12.5 of volume 4 of the 2006 IPCC Guidelines. Countries may apply more detailed category breakdowns that better reflect their wood product industry.
[4] Gains refers to annual carbon inflow to HWP pool, losses refers to annual carbon outflow from HWP pool.
[5] Half-lives are needed when applying flux data methodology as suggested in equation 12.1 of volume 4 of the 2006 IPCC Guidelines. Following default half-lives may be used for HWP in use: sawnwood 35 years,
[6] For the purposes of reporting, the signs for removals are always negative (–) and for emissions positive (+).
[7] If data are available, Parties are encouraged to report at the disaggregated level available from the pre-defined drop-down menu. Furthermore, Parties are encouraged to the extent possible to use the pre-defined category definitions rather than to create similar categories. This ensures the highest possible degree of comparability of the reporting. If detailed data are not available, Parties should include all emissions from solid
[8] Information reported in this table as an information item should be used to check consistency with the estimation in the waste sector.
[9] Data on HWP in SWDS may be provided on a voluntary basis. It excludes the carbon in CH_4 emissions which is reported in the waste sector.
[10] See table 3.4 of volume 5 of the 2006 IPCC Guidelines.
[11] Waste subcategories as suggested in chapter 2.3.1 of volume 5 of the 2006 IPCC Guidelines may be used.
[12] Production approach. Refer to equations 12.1, 12.3 and 12.A.6 of volume 4 of the 2006 IPCC Guidelines or any other IPCC methodological guidance reflecting this approach.
[13] A Party may choose to separately report HWP for domestically produced and consumed, and domestically produced and exported HWP.
[14] Atmospheric flow approach. Refer to equations 12.1, 12.2 and 12.A.4 of volume 4 of the 2006 IPCC Guidelines.

Documentation box:	
Documentation box	A Solid Wood: 4.G.A Paper and Paperboard: 4.G.A HWP in SWDS: Carbon stock change not include in CRF tables. Comment is shown in ch. 7 of NIR

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TABLE 4.G SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY
Harvested wood products (HWP)[1]
(Sheet 2 of 2)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

HWP activity data[2]

	Sawnwood			Wood panels			Paper and paperboard		
	Production	Imports	Exports	Production	Imports	Exports	Production	Imports	Exports
Inventory 2021	m^3	m^3	m^3	m^3	m^3	m^3	metric t	metric t	metric t
….[3]									
1960									
1961									
1962									
1963									
1964									
1965									
1966									
1967									
1968									
1969									
1970									
1971									
1972									
1973									
1974									
1975									
1976									
1977									
1978									
1979									
1980									
1981									
1982									
1983									
1984									
1985									
1986									
1987									
1988									
1989									
1990	NO	NO	NO	NO	NO	NO	NO	NO	NO
1991	NO	NO	NO	NO	NO	NO	NO	NO	NO
1992	NO	NO	NO	NO	NO	NO	NO	NO	NO
1993	NO	NO	NO	NO	NO	NO	NO	NO	NO
1994	NO	NO	NO	NO	NO	NO	NO	NO	NO
1995	NO	NO	NO	NO	NO	NO	NO	NO	NO
1996	NO	NO	NO	NO	NO	NO	NO	NO	NO
1997	NO	NO	NO	NO	NO	NO	NO	NO	NO
1998	NO	NO	NO	NO	NO	NO	NO	NO	NO
1999	NO	NO	NO	NO	NO	NO	NO	NO	NO
2000	NO	NO	NO	NO	NO	NO	NO	NO	NO
2001	NO	NO	NO	NO	NO	NO	NO	NO	NO
2002	NO	NO	NO	NO	NO	NO	NO	NO	NO
2003	NO	NO	NO	NO	NO	NO	NO	NO	NO
2004	NO	NO	NO	NO	NO	NO	NO	NO	NO
2005	NO	NO	NO	NO	NO	NO	NO	NO	NO
2006	NO	NO	NO	NO	NO	NO	NO	NO	NO
2007	NO	NO	NO	NO	NO	NO	NO	NO	NO
2008	NO	NO	NO	NO	NO	NO	NO	NO	NO
2009	NO	NO	NO	NO	NO	NO	NO	NO	NO
2010	NO	NO	NO	NO	NO	NO	NO	NO	NO
2011	NO	NO	NO	NO	NO	NO	NO	NO	NO
2012	NO	NO	NO	NO	NO	NO	NO	NO	NO
2013	NO	NO	NO	NO	NO	NO	NO	NO	NO
2014	NO	NO	NO	NO	NO	NO	NO	NO	NO
2015	NO	NO	NO	NO	NO	NO	NO	NO	NO
2016	NO	NO	NO	NO	NO	NO	NO	NO	NO
2017	NO	NO	NO	NO	NO	NO	NO	NO	NO
2018	NO	NO	NO	NO	NO	NO	NO	NO	NO
2019	NO	NO	NO	NO	NO	NO	NO	NO	NO
2020	NO	NO	NO	NO	NO	NO	NO	NO	NO
2021	NO	NO	NO	NO	NO	NO	NO	NO	NO

[1] This table is only included for the latest reported inventory year in the CRF.

[2] Information should be provided on how activity data from the period from 1900 to the first year of the tabulated time series has been computed (equations 12.1 and 12.6 of volume 4 of the 2006

[3] Provide activity data from the first year for which they are available.

Note: Information as outlined in the table above should be provided where tier 1 or tier 2 methods have been used (volume 4 of the 2006 IPCC Guidelines). Further information shall be provided in

Additional information

Factors used to convert from product units to carbon

1. Solid wood[a]	NO
2. Paper and paperboard[a]	NO
3. Other *(please specify)*	

[a] A Party may apply different categories in case tier 3 methods are available.

Documentation box:
Documentation box

TABLE 5 SECTORAL REPORT FOR WASTE
(Sheet 1 of 1)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [(1)]	CH_4	N_2O	NO_x	CO	NMVOC	SO_2
	(kt)						
Total waste	0,10	235,32	1,27	NO,NE	NO,NE	NO,NE	NO,NE
A. Solid waste disposal	NO	129,08		NO,NE	NO,NE	NO,NE	
1. Managed waste disposal sites	NO	7,57		NE	NE	NE	
2. Unmanaged waste disposal sites	NO	121,51		NO	NO	NO	
3. Uncategorized waste disposal sites	NO	NO		NO	NO	NO	
B. Biological treatment of solid waste		NO	NO	NO,NE	NO,NE	NO,NE	
1. Composting		NO	NO	NO	NO	NO	
2. Anaerobic digestion at biogas facilities		NO	NO	NE	NE	NE	
C. Incineration and open burning of waste	0,10	0,00	0,00	NO,NE	NO,NE	NO,NE	NO,NE
1. Waste incineration	0,10	0,00	0,00	NO	NO	NO	NO
2. Open burning of waste	NO	NO,NE	NO,NE	NE	NE	NE	NE
D. Wastewater treatment and discharge		106,24	1,27	NO	NO	NO	
1. Domestic wastewater		94,60	1,27	NO	NO	NO	
2. Industrial wastewater		11,64	NE	NO	NO	NO	
3. Other *(as specified in table 5.D)*		NO	NO	NO	NO	NO	
E. Other *(please specify)*	NO	NO	NO	NO	NO	NO	NO
Memo item:[(2)]							
Long-term storage of C in waste disposal sites	NO						
Annual change in total long-term C storage	NO						
Annual change in total long-term C storage in HWP waste[(3)]	NO						

(1) CO_2 emissions from the categories solid waste disposal on land and waste incineration should only be included if they derive from non-biological or inorganic waste sources.

(2) Long-term storage of carbon in waste disposal sites, Annual change in total long-term storage of carbon stored and Annual change in long-term storage of carbon in HWP waste should be entered as carbon dioxide (CO_2).

(3) Carbon stored in wood, paper, cardboard, garden and park waste (equals to the annual change in stocks of harvested wood products in solid waste disposal sites from consumption, second activity data in the table for harvested wood products).

Documentation box:
• If estimates are reported under 5.E Other, use this documentation box to provide information regarding activities covered under this category and to provide reference to the section in the NIR where background information can be found.

Documentation box	age system. According to IPCC 2006, Volume 5, p 6.11, CH4 emissions from industrial wastewater and sludge are estimated together.

TABLE 5.A SECTORAL BACKGROUND DATA FOR WASTE
Solid waste disposal
(Sheet 1 of 1)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION			IMPLIED EMISSION FACTOR		EMISSIONS			
				CH_4 [(1)]	CO_2	CH_4			CO_2 [(4)]
	Annual waste at the SWDS	MCF	DOC_f			Emissions [(2)]	Amount of CH_4 flared	Amount of CH_4 for energy recovery [(3)]	
	(kt)		%	(t/t waste)		(kt)			
1. Managed waste disposal sites	335,15			0,02	NO	7,57	NO	NO	NO
a. Anaerobic	335,15	1,00	0,50	0,02	NO	7,57	NO	NO	NO
b. Semi-aerobic	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Unmanaged waste disposal sites	4006,49	0,40	0,50	0,03	NO	121,51	NO	NO	NO
3. Uncategorized waste disposal sites	NO	NO	NO	NO	NO	NO	NO	NO	NO

Note: SWDS = solid waste disposal site, MCF = methane correction factor, DOC_f = fraction of degradable organic carbon that decomposes, DOC = degradable organic carbon (IPCC Guidelines (Volume 5, section 3.2.3)).
Note: Annual waste includes household waste, yard/garden waste, commercial/institutional waste, sludge, industrial and other waste.
Note: The is no methodology in the 2006 IPCC Guidelines to estimate emissions from flaring based on recovered biogas from solid waste disposal sites and wastewater handling. If data are available, Parties are encouraged to report emissions of methane (CH_4) and nitrous oxide (N_2O) under

(1) The CH_4 implied emission factor (IEF) is calculated on the basis of gross CH_4 emissions as follows: IEF = (CH_4 emissions + CH_4 recovered)/annual waste at the SWDS.
(2) Actual emissions (after flaring and recovery).
(3) When recovered CH_4 emissions are used for energy, the emissions from the combustion should be reported under category 1.A and are provided here for information only.
(4) Under solid waste disposal, CO_2 emissions should be reported only when the disposed waste is combusted at the disposal site as a management practice. CO_2 emissions from non-biogenic waste are included in the total emissions, whereas the CO_2 emissions from biogenic waste are not included in the total emissions.

Documentation box:	
• Parties should provide detailed explanations on the waste sector in chapter 7: waste (CRF sector 5) of the national invnetory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table. • Parties that use country-specific models should provide a reference in the documentation box to the relevant section in the NIR where these models are described, and fill in only the relevant cells of table 5.A. • Provide a reference to the relevant section in the NIR, in particular with regard to: (a) The population size (total or urban population) used in the calculations and the rationale for doing so; (b) The composition of landfilled waste. • Parties should specify the category in the energy sector under which the emissions from energy recovery are reported.	
Documentation box	

TABLE 5.B SECTORAL BACKGROUND DATA FOR WASTE
Biological Treatment of Solid Waste
(Sheet 1 of 1)

Inventory 2021
Submission 2023 v1
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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION	IMPLIED EMISSION FACTOR		EMISSIONS			
		CH_4[(1)]	N_2O	CH_4			N_2O
	Annual waste amount treated			Emissions[(2)]	Amount of CH_4 flared	Amount of CH_4 for energy recovery[(3)]	
	(kt dm)	(g/kg waste)		(kt)			
1. Composting	NO	NO	NO	NO	NO		NO
Municipal solid waste	NO	NO	NO	NO	NO		NO
Other (please specify)[(4)]	NO	NO	NO	NO	NO		NO
2. Anaerobic digestion at biogas facilities[(3)]	NO	NO	NO	NO	NO	NO	NO
Municipal solid waste	NO	NO	NO	NO	NO	NO	NO
Other (please specify)[(4)]	NO	NO	NO	NO	NO	NO	NO

[(1)] The CH_4 implied emission factor (IEF) is calculated on the basis of gross methane (CH_4) emissions as follows IEF = (CH_4 emissions + CH_4 recovered/flared)/annual waste at the solid waste disposal sites.
[(2)] Actual emissions (after recovery and flaring).
[(3)] When CH_4 emissions recovered are used for energy, the emissions from the combustion should be reported under category 1.A.
[(4)] This category should include all organic waste from sources not covered by municipal solid waste.

Documentation box:
• Parties should provide detailed explanations on the waste sector in chapter 7: waste (CRF sector 5) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and/or further details are needed to understand the content of this table.
• Parties should specify the category in the energy sector under which the emissions from energy recovery are reported.

Documentation box	

TABLE 5.C SECTORAL BACKGROUND DATA FOR WASTE
Incineration and open burning of waste
(Sheet 1 of 1)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA Amount of wastes (incinerated/open burned) (kt wet weight)	IMPLIED EMISSION FACTOR			EMISSIONS		
		CO_2	CH_4	N_2O	CO_2	CH_4	N_2O
		(kg/t waste)			(kt)		
1. Waste Incineration	NO	NO	NO	NO	0,10	0,00	0,00
Biogenic [(1)]	NO	NO	NO	NO	NO	NO	NO
Municipal solid waste	NO	NO	NO	NO	NO	NO	NO
Other *(please specify)* [(2)]	NO	NO	NO	NO	NO	NO	NO
Non-biogenic	NO	NO	NO	NO	0,10	0,00	0,00
Municipal solid waste	NO	NO	NO	NO	NO	NO	NO
Other *(please specify)* [(3)]	NO	NO	NO	NO	0,10	0,00	0,00
2. Open burning of waste	NO,NE	NO	NO,NE	NO,NE	NO	NO,NE	NO,NE
Biogenic [(1)]	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE
Municipal solid waste	NE	NE	NE	NE	NE	NE	NE
Other *(please specify)*	NO	NO	NO	NO	NO	NO	NO
Non-biogenic	NO	NO	NO	NO	NO	NO	NO
Municipal solid waste	NO	NO	NO	NO	NO	NO	NO
Other *(please specify)*	NO	NO	NO	NO	NO	NO	NO

Note: Only emissions from waste incineration without energy recovery are to be reported under the waste sector. Emissions from incineration with energy recovery are to be

[(1)] The CO_2 emissions from combustion of biomass materials (e.g. paper, food and wood waste) contained in the waste are biogenic emissions and should not be included in

[(2)] If data are available, Parties are encouraged to report at the disaggregated level available from the pre-defined drop-down menu. Furthermore, Parties are encouraged to the extent possible to use the pre-defined category definitions rather than to create similar categories. This ensures the highest possible degree of comparability of the

[(3)] If data are available, Parties are encouraged to report at the disaggregated level available from the pre-defined drop-down menu. Furthermore, Parties are encouraged to the extent possible to use the pre-defined category definitions rather than to create similar categories. This ensures the highest possible degree of comparability of the

[(4)] This category includes lubricants, solvents and waste oil. Unless fossil liquid waste is included in other types of waste (e.g. industrial or hazardous waste), the emissions

Documentation box:	
• Parties should provide detailed explanations on the waste sector in Chapter 7: Waste (CRF sector 5) of the national inventory report (NIR). Use this documentation box to	
• Parties that use country-specific models should provide a reference in the documentation box to the relevant section in the NIR where these models are described, and fill	
• Provide a reference to the relevant section of the NIR, in particular with regard to the amount of incinerated waste (specify whether the reported data relate to wet or dry	
Documentation box	5.C.1.1.b: 5.C.1.2.b: Clinical waste

TABLE 5.D SECTORAL BACKGROUND DATA FOR WASTE
Wastewater treatment and discharge
(Sheet 1 of 1)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND RELATED INFORMATION			IMPLIED EMISSION FACTOR		EMISSIONS			
						CH_4			
	Total organic product	Sludge removed[1]	N in effluent	CH_4[2]	N_2O[3]	Emissions[4]	Amount of CH_4 flared	Amount of CH_4 for Energy Recovery[5]	N_2O[3]
	(kt DC[6]/yr)		(kt N/yr)	(kg/kg DC)	kg N2O-N/kg N	(kt)			
1. Domestic wastewater	533,90	NO	161,33	0,18	0,01	94,60	NO	NO	1,27
2. Industrial wastewater	155,16	NO	NO	0,08	NE	11,64	NO	NO	NE
3. Other *(please specify)*	NO	NO	NO	NO	NO	NO	NO	NO	NO

(1) If sludge removal is reported in the wastewater inventory, it should be consistent with the estimates for sludge applied to agricultural soils, sludge incinerated and sludge deposited in solid waste disposal sites.
(2) The methane (CH_4) implied emission factor (IEF) is calculated on the basis of gross CH_4 emissions as follows: IEF = (CH_4 emissions + CH_4 recovered or flared) / total organic product.
(3) Parties using methods other than those from the IPCC for estimating nitrous oxide (N_2O) emissions from human sewage or wastewater treatment should provide aggregate data in this table.
(4) Actual emissions (after flaring and recovery).
(5) When CH_4 recovered is used for energy production, the emissions should be reported under category 1.A.
(6) DC = degradable organic component. DC indicators are COD (chemical oxygen demand) for industrial waste water and BOD (biochemical oxygen demand) for domestic/commercial wastewater/sludge (2006 IPCC Guidelines (Volume 5. Section

Additional information

Population (1000s)	19503,16
Protein consumption (kg/person/yr)	37,60
Fraction of nitrogen in protein	0,16
$F_{NON-CON}$	1,10
$F_{IND-COM}$	NO
T_{PLANT}	NO

Note: Parties are encouraged to supply the additional information regardless of the methodology applied
$F_{NON-CON}$ = Fraction of non-consumed protein added to the wastewater
discharged protein into the sewer system
T_{PLANT} = Degree of utilization of modern, centralized WWT plants

Documentation box:
• Regarding the estimates for N_2O from human sewage, specify whether total or urban population is used in the calculations and the rationale for doing so. Provide an explanation in the documentation box.
• Parties using methods other than those from the IPCC for estimating N_2O emissions from wastewater treatment should provide, in the national inventory report (NIR), corresponding information on methods, activity data and emission factors used,

Documentation box	rial and commercial co-discharged protein into the sewage system. According to IPCC 2006, Volume 5, p 6.11, CH4 emissions from industrial wastewater and sludge are estimated together.

SUMMARY 1.A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES
(Sheet 1 of 3)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs(1)	PFCs(1)	Unspecified mix of HFCs and PFCs(1)	SF_6	NF_3	NO_x	CO	NMVOC	SO_2
	(kt)			(kt CO_2 equivalent)			(kt)					
Total national emissions and removals	284259,76	2397,81	68,74	2706,49	9,65	NO,NA	0,00	NO,NA	93400,37	625063,89	521,08	592,93
1. Energy	254061,34	1186,37	4,42						93359,27	624953,97	103,51	592,93
A. Fuel combustion Reference approach(2)	229077,70											
Sectoral approach(2)	243409,04	72,84	4,36						93359,27	624953,97	103,51	592,93
1. Energy industries	120170,37	1,70	1,63						356,81	26,03	6,65	414,31
2. Manufacturing industries and construction	40959,61	2,27	0,39						42,55	3,95	1,16	40,05
3. Transport	24448,44	9,58	1,61						92925,76	624649,16	67,61	55,37
4. Other sectors	38995,28	56,67	0,54						13,18	98,10	9,99	34,59
5. Other	18835,35	2,62	0,19						20,96	176,73	18,09	48,61
B. Fugitive emissions from fuels	10652,30	1113,53	0,06						NO,NA	NO,NA	NO,NA	NO,NA
1. Solid fuels	1978,55	308,06	0,03						NO	NO	NO	NO
2. Oil and natural gas and other emissions from energy production	8673,75	805,47	0,04						NO,NA	NO,NA	NO,NA	NO,NA
C. CO_2 Transport and storage	NO,NA											
2. Industrial processes and product use	24186,61	0,41	0,77	2706,49	9,65	NO,NA	0,00	NO,NA	0,52	31,51	266,94	0,00
A. Mineral industry	8626,53								NO	NO	NO	NO
B. Chemical industry	451,00	NO	0,77	NO	NO	NO	NO	NO	0,26	0,03	NO	0,00
C. Metal industry	14869,50	0,41	NO	NO	9,65	NO	NO	NO	0,26	31,48	1,16	NO,NA
D. Non-energy products from fuels and solvent use	239,59	NO,NA	NO,NA						NO,NA	NO,NA	265,78	NO,NA
E. Electronic industry				NO	NO	NO	NO	NO				
F. Product uses as substitutes for ODS				2706,49	NO,NA	NO,NA	NO,NA	NO,NA				
G. Other product manufacture and use	NO	NO	NO,NE	NO	NO	NO	0,00	NO	NO	NO	NO	NO
H. Other(3)	NA	NA	NA	NO,NA	NO,NA	NA	NA	NA	NA	NA	NA	NA

Note: All footnotes for this table are given at the end of the table on sheet 3.

SUMMARY 1.A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES
(Sheet 2 of 3)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2	CH_4	N_2O	HFCs [1]	PFCs[1]	Unspecified mix of HFCs	SF_6	NF_3	NO_x	CO	NMVOC	SO_2
	(kt)			(kt CO_2 equivalent)			(kt)					
3. Agriculture	4,12	973,46	62,10						36,75	NO	133,36	NO
A. Enteric fermentation		917,90										
B. Manure management		35,27	9,70								113,64	
C. Rice cultivation		20,29									NO	
D. Agricultural soils		NO	52,40						36,75	NO	19,72	
E. Prescribed burning of savannas		NO	NO						NO	NO	NO	
F. Field burning of agricultural residues		NO	NO						NO	NO	NO	
G. Liming	NO											
H. Urea application	4,12											
I. Other carbon-contining fertilizers	NO											
J. Other	NO	NO	NO						NO	NO	NO	NO
4. Land use, land-use change and forestry [4]	6007,59	2,25	0,18						3,83	78,41	17,27	NO
A. Forest land [4]	-22613,05	0,71	0,04						1,21	34,77	3,17	
B. Cropland [4]	52888,44	NO,IE	NO,IE						NO	NO	NO	
C. Grassland [4]	-24267,80	1,54	0,14						2,62	43,64	14,10	
D. Wetlands [4]	NO,NE,NA	NO,IE,NA	NO,IE,NA						NO	NO	NO	
E. Settlements [4]	NO,NE,IE,NA	NO	NO						NO	NO	NO	
F. Other land [4]	NO	NO	NO						NO	NO	NO	
G. Harvested wood products	NO,IE											
H. Other [4]	NO	NO	NO						NO	NO	NO	NO
5. Waste	0,10	235,32	1,27						NO,NE	NO,NE	NO,NE	NO,NE
A. Solid waste disposal [5]	NO	129,08							NO,NE	NO,NE	NO,NE	
B. Biological treatment of solid waste [5]		NO	NO						NO,NE	NO,NE	NO,NE	
C. Incineration and open burning of waste [5]	0,10	0,00	0,00						NO,NE	NO,NE	NO,NE	NO,NE
D. Wastewater treatment and discharge		106,24	1,27						NO	NO	NO	
E. Other [5]	NO	NO	NO						NO	NO	NO	NO
6. Other ***(please specify)*** [6]	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Note: All footnotes for this table are given at the end of the table on sheet 3.

SUMMARY 1.A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (IPCC TABLE 7A)
(Sheet 3 of 3)

Inventory 2021
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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals	CH_4	N_2O	HFCs[1]	PFCs[1]	Unspecified mix of HFCs and PFCs[1]	SF_6	NF_3	NO_x	CO	NMVOC	SO_2
	(kt)			(kt CO_2 equivalent)					(kt)			
Memo items:[7]												
International bunkers	669,43	0,01	0,02						NO	NO	NO	NO
Aviation	664,41	0,00	0,02						NO	NO	NO	NO
Navigation	5,02	0,00	0,00						NO	NO	NO	NO
Multilateral operations												
CO_2 emissions from biomass	2146,06											
CO_2 captured	NO,IE,NA											
Long-term storage of C in waste disposal sites	NO											
Indirect N_2O			NO,NA									
Indirect CO_2	NO,NE,NA											

(1) The emissions of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), unspecified mix of HFCs and PFCs and other fluorinated gases are to be expressed as carbon dioxide (CO_2) equivalent emissions. Data on disaggregated emissions of

(2) For verification purposes, Parties are requested to report the results of their calculations using the Reference approach and to explain any differences with the Sectoral approach in the documentation box to table 1.A(c). For estimating national

(3) 2.H. Other includes pulp and paper and food and beverages industry.

(4) For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(5) CO_2 from categories solid waste disposal on land and waste incineration should only be included if it stems from non-biogenic or inorganic waste streams. Only emissions from waste incineration without energy recovery are to be reported in the waste sector, whereas emissions from incineration with energy recovery are to be reported in the energy sector.

(6) If reporting any country-specific category under sector "6. Other", detailed explanations should be provided in Chapter 8: Other (CRF sector 6) of the national inventory report (NIR).

(7) Parties are asked to report emissions from international aviation and international navigation and multilateral operations, as well as CO_2 emissions from biomass and CO_2 captured, under Memo Items. These emissions should not be included in the national total emissions from the energy sector. Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO_2 emissions are accounted for as a loss of biomass stocks in the Land Use, Land-use Change and Forestry sector.

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 2021
Submission 2023 v1
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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [(1)]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total
	CO_2 equivalent (kt)								
Total (net emissions)[(1)]	284259,76	59945,27	20483,60	2706,49	9,65	2,37	NO,NA	NO,NA	367407,13
1. Energy	254061,34	29659,21	1317,40						285037,94
A. Fuel combustion (sectoral approach)	243409,04	1821,05	1298,22						246528,31
1. Energy industries	120170,37	42,38	486,49						120699,23
2. Manufacturing industries and construction	40959,61	56,82	116,36						41132,79
3. Transport	24448,44	239,44	478,60						25166,48
4. Other sectors	38995,28	1416,84	161,64						40573,76
5. Other	18835,35	65,58	55,13						18956,06
B. Fugitive emissions from fuels	10652,30	27838,16	19,17						38509,63
1. Solid fuels	1978,55	7701,51	8,07						9688,13
2. Oil and natural gas	8673,75	20136,65	11,11						28821,51
C. CO_2 transport and storage	NO,NA								NO,NA
2. Industrial processes and product use	24186,61	10,33	229,22	2706,49	9,65	2,37	NO,NA	NO,NA	27144,68
A. Mineral industry	8626,53								8626,53
B. Chemical industry	451,00	NO	229,22	NO	NO	NO	NO	NO	680,22
C. Metal industry	14869,50	10,33	NO	NO	9,65	NO	NO	NO	14889,48
D. Non-energy products from fuels and solvent use	239,59	NO,NA	NO,NA						239,59
E. Electronic Industry				NO	NO	NO	NO	NO	NO
F. Product uses as ODS substitutes				2706,49	NO,NA	NO,NA	NO,NA	NO,NA	2706,49
G. Other product manufacture and use	NO	NO	NO,NE	NO	NO	2,37	NO	NO	2,37
H. Other	NA	NA	NA	NO,NA	NO,NA	NA	NA	NA	NO,NA
3. Agriculture	4,12	24336,45	18504,86						42845,43
A. Enteric fermentation		22947,50							22947,50
B. Manure management		881,70	2889,66						3771,36
C. Rice cultivation		507,25							507,25
D. Agricultural soils		NO	15615,20						15615,20
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		NO	NO						NO
G. Liming	NO								NO
H. Urea application	4,12								4,12
I. Other carbon-containing fertilizers	NO								NO
J. Other	NO	NO	NO						NO
4. Land use, land-use change and forestry[(1)]	6007,59	56,35	53,64						6117,58
A. Forest land	-22613,05	17,75	11,62						-22583,68
B. Cropland	52888,44	NO,IE	NO,IE						52888,44
C. Grassland	-24267,80	38,60	42,02						-24187,18
D. Wetlands	NO,NE,NA	NO,IE,NA	NO,IE,NA						NO,NE,IE,NA
E. Settlements	NO,NE,IE,NA	NO	NO						NO,NE,IE,NA
F. Other land	NO	NO	NO						NO
G. Harvested wood products	NO,IE								NO,IE
H. Other	NO	NO	NO						NO
5. Waste	0,10	5882,93	378,48						6261,51
A. Solid waste disposal	NO	3227,00							3227,00
B. Biological treatment of solid waste		NO	NO						NO
C. Incineration and open burning of waste	0,10	0,00	0,02						0,12
D. Waste water treatment and discharge		2655,93	378,46						3034,39
E. Other	NO	NO	NO						NO
6. Other *(as specified in summary 1.A)*	NO	NO	NO	NO	NO	NO	NO	NO	NO

Memo items:[(2)]									
International bunkers	669,43	0,13	5,63						675,19
Aviation	664,41	0,12	5,54						670,07
Navigation	5,02	0,01	0,09						5,12
Multilateral operations									
CO_2 emissions from biomass	2146,06								2146,06
CO_2 captured	NO,IE,NA								NO,IE,NA
Long-term storage of C in waste disposal sites	NO								NO
Indirect N_2O			NO,NA						
Indirect CO_2 [(3)]	NO,NE,NA								
Total CO_2 equivalent emissions without land use, land-use change and forestry									361289,56
Total CO_2 equivalent emissions with land use, land-use change and forestry									367407,13
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									NA
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									NA

(1) For carbon dioxide (CO_2) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive

(2) See footnote 7 to table Summary 1.A.

(3) In accordance with the UNFCCC Annex I inventory reporting guidelines, for Parties that decide to report indirect CO_2, the national totals shall be provided with and without indirect CO_2.

SUMMARY 3 SUMMARY REPORT FOR METHODS AND EMISSION FACTORS USED
(Sheet 1 of 2)

Inventory 2021
Submission 2023 v1
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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2		CH_4		N_2O		HFCs		PFCs		SF_6		Unspecified mix of HFCs and PFCs		NF_3	
	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor
1. Energy	T1,T2	CS,D	T1,T2	CS,D	T1,T2	D										
A. Fuel combustion	T1,T2	D	T1,T2	D	T1,T2	D										
1. Energy industries	T1	D	T1	D	T1	D										
2. Manufacturing industries and construction	T1	D	T1	D	T1	D										
3. Transport	T1,T2	D	T1,T2	D	T1,T2	D										
4. Other sectors	T1	D	T1	D	T1	D										
5. Other	T1	D	T1	D	T1	D										
B. Fugitive emissions from fuels	T1	CS,D	T1	CS,D	T1	D										
1. Solid fuels	T1	CS,D	T1	D	T1	D										
2. Oil and natural gas	T1	D	T1	CS,D	T1	D										
C. CO_2 transport and storage																
2. Industrial processes	T1,T2,T3	CS,D	D	D	T1	D	T2	D	T1	D	T1	D				
A. Mineral industry	T1,T2	CS,D														
B. Chemical industry	T2	CS			T1	D										
C. Metal industry	T1,T2,T3	CS,D	D	D					T1	D						
D. Non-energy products from fuels and solvent use	T1	D														
E. Electronic industry																
F. Product uses as ODS substitutes							T2	D								
G. Other product manufacture and use											T1	D				
H. Other																

Use the following notation keys to specify the method applied:

D (IPCC default) **T1a, T1b, T1c** (IPCC Tier 1a, Tier 1b and Tier 1c, respectively) **CR** (CORINAIR) **M** (model)
RA (Reference Approach) **T2** (IPCC Tier 2) **CS** (Country Specific)
T1 (IPCC Tier 1) **T3** (IPCC Tier 3) **OTH** (Other)

If using more than one method within one source category, list all the relevant methods. Explanations regarding country-specific methods, other methods or any modifications to the default IPCC methods, as well as information regarding the use of different methods per source category where more than one method is indicated, should be provided in the documentation box. Also use the documentation box to explain the use of notation OTH.

Use the following notation keys to specify the emission factor used:

D (IPCC default) **CS** (Country Specific) **OTH** (Other)
CR (CORINAIR) **PS** (Plant Specific) **M** (model)

Where a mix of emission factors has been used, list all the methods in the relevant cells and give further explanations in the documentation box. Also use the documentation box to explain the use of notation OTH.

SUMMARY 3 SUMMARY REPORT FOR METHODS AND EMISSION FACTORS USED
(Sheet 2 of 2)

Inventory 2021
Submission 2023 v1
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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2		CH_4		N_2O		HFCs		PFCs		SF_6		Unspecified mix of HFCs and PFCs		NF_3	
	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor	Method applied	Emission factor
3. Agriculture	T1	D	T1,T2	CS,D	T1,T2	CS,D										
A. Enteric fermentation			T1,T2	CS,D												
B. Manure management			T1,T2	CS,D	T1,T2	CS,D										
C. Rice cultivation			T1	D												
D. Agricultural soils[3]					T1,T2	CS,D										
E. Prescribed burning of savannas																
F. Field burning of agricultural residues																
G. Liming																
H. Urea application	T1	D														
I. Other carbon-containing fertilizers																
J. Other																
4. Land use, land-use change and forestry	T2	CS	T2	D	T2	D										
A. Forest land	T2	CS	T2	D	T2	D										
B. Cropland	T2	CS														
C. Grassland	T2	CS		D		D										
D. Wetlands																
E. Settlements																
F. Other land																
G. Harvested wood products																
H. Other																
5. Waste	T1	D	M,T1	D,M	T1	D										
A. Solid waste disposal			M	M												
B. Biological treatment of solid waste																
C. Incineration and open burning of waste	T1	D	T1	D	T1	D										
D. Waste water treatment and discharge			T1	D	T1	D										
E. Other																
6. Other ***(as specified in summary 1.A)***																

Use the following notation keys to specify the method applied:

D (IPCC default) **T1a, T1b, T1c** (IPCC Tier 1a, Tier 1b and Tier 1c, respectively) **CR** (CORINAIR) **M** (model)
RA (Reference Approach) **T2** (IPCC Tier 2) **CS** (Country Specific)
T1 (IPCC Tier 1) **T3** (IPCC Tier 3) **OTH** (Other)

If using more than one method within one source category, list all the relevant methods. Explanations regarding country-specific methods, other methods or any modifications to the default IPCC methods, as well as information regarding the use of different methods per source category where more than one method is indicated, should be provided in the documentation box. Also use the documentation box to explain the use of notation OTH.

Use the following notation keys to specify the emission factor used:

D (IPCC default) **CS** (Country Specific) **OTH** (Other)
CR (CORINAIR) **PS** (Plant Specific) **M** (model)

Where a mix of emission factors has been used, list all the methods in the relevant cells and give further explanations in the documentation box. Also use the documentation box to explain the use of notation OTH.

Documentation box:

• Parties should provide the full information on methodological issues, such as methods and emission factors used, in the relevant sections of chapters 3 to 8 (see section 2.2 of each of Chapters 3 - 8) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and further details are needed to understand the content of this table.

• Where a mix of methods/emission factors has been used within one source category, use this documentation box to specify those methods/emission factors for the various sub-sources where they have been applied.
• Where the notation OTH (Other) has been entered in this table, use this documentation box to specify those other methods/emission factors.

Documentation box	

TABLE 6 CROSS-SECTORAL REPORT: Indirect emissions of N_2O and CO_2
(Sheet 1 of 1)

Inventory 2021
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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	SOURCE EMISSIONS					INDIRECT EMISSIONS	
	CH_4	CO	NMVOC	NOx	NH_3	CO_2 (1)	N_2O(2)
	(kt)					(kt)	
Total	2397,81	625063,89	521,08	93400,37	NO,NE,NA	NO,NE,NA	NO,NA
1. Energy	1186,37	624953,97	103,51	93359,27	NE	NE	NO
2. Industrial processes and product use	0,41	31,51	266,94	0,52	NA	NA	NA
3. Agriculture (3)	973,46	NO	133,36	36,75		NO	NO
4. LULUCF (3)	2,25	78,41	17,27	3,83		NO	NO
5. Waste	235,32	NO,NE	NO,NE	NO,NE	NO	NA	NA
6. Other *(please specify)*	NO	NO	NO	NO	NO	NO	NO

(1) Parties may report indirect CO_2 from the atmospheric oxidation of CH_4, CO and NMVOCs.

(2) Parties may report indirect emissions of N_2O from sources other than agriculture and LULUCF.

(3) Indirect emissions of N_2O resulting from ammonia emissions are covered in the sectoral tables for agriculture and LULUCF. In this table, only indirect N_2O emissions

TABLE 7 SUMMARY OVERVIEW FOR KEY CATEGORIES [1]
(Sheet 1 of 1)

Inventory 2021
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KEY CATEGORIES OF EMISSIONS AND REMOVALS	Gas	Criteria used for key source identification		Key category excluding LULUCF	Key category including LULUCF
		L	T		
1.A.1 Fuel combustion - Energy Industries - Liquid Fuels	CO2	X	X	X	X
1.A.1 Fuel combustion - Energy Industries - Liquid Fuels	CH4				
1.A.1 Fuel combustion - Energy Industries - Liquid Fuels	N2O				
1.A.1 Fuel combustion - Energy Industries - Solid Fuels	CO2	X	X	X	X
1.A.1 Fuel combustion - Energy Industries - Solid Fuels	CH4				
1.A.1 Fuel combustion - Energy Industries - Solid Fuels	N2O				
1.A.1 Fuel combustion - Energy Industries - Gaseous Fuels	CO2	X	X	X	X
1.A.1 Fuel combustion - Energy Industries - Gaseous Fuels	CH4				
1.A.1 Fuel combustion - Energy Industries - Gaseous Fuels	N2O				
1.A.1 Fuel combustion - Energy Industries - Other Fossil Fuels	CO2		X	X	X
1.A.1 Fuel combustion - Energy Industries - Other Fossil Fuels	CH4				
1.A.1 Fuel combustion - Energy Industries - Other Fossil Fuels	N2O				
1.A.1 Fuel combustion - Energy Industries - Peat	CO2				
1.A.1 Fuel combustion - Energy Industries - Peat	CH4				
1.A.1 Fuel combustion - Energy Industries - Peat	N2O				
1.A.1 Fuel combustion - Energy Industries - Biomass	CH4				
1.A.1 Fuel combustion - Energy Industries - Biomass	N2O				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Liquid Fuels	CO2	X	X	X	X
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Liquid Fuels	CH4				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Liquid Fuels	N2O				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Solid Fuels	CO2	X	X	X	X
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Solid Fuels	CH4				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Solid Fuels	N2O				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Gaseous Fuels	CO2	X	X	X	X
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Gaseous Fuels	CH4				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Gaseous Fuels	N2O				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Other Fossil Fuels	CO2				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Other Fossil Fuels	CH4				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Other Fossil Fuels	N2O				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Peat	CO2				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Peat	CH4				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Peat	N2O				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Biomass	CH4				
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Biomass	N2O				
1.A.3.a Domestic Aviation	CO2		X	X	
1.A.3.a Domestic Aviation	CH4				
1.A.3.a Domestic Aviation	N2O				
1.A.3.b Road Transportation	CO2	X	X	X	X
1.A.3.b Road Transportation	CH4				
1.A.3.b Road Transportation	N2O				
1.A.3.c Railways	CO2		X	X	X
1.A.3.c Railways	CH4				
1.A.3.c Railways	N2O				
1.A.3.d Domestic Navigation - Liquid Fuels	CO2				
1.A.3.d Domestic Navigation - Liquid Fuels	CH4				
1.A.3.d Domestic Navigation - Liquid Fuels	N2O				
1.A.3.d Domestic Navigation - Gaseous Fuels	CO2				
1.A.3.d Domestic Navigation - Gaseous Fuels	CH4				
1.A.3.d Domestic Navigation - Gaseous Fuels	N2O				
1.A.3.d Domestic Navigation - Other Fossil Fuels	CO2				
1.A.3.d Domestic Navigation - Other Fossil Fuels	CH4				
1.A.3.d Domestic Navigation - Other Fossil Fuels	N2O				
1.A.3.d Domestic Navigation - Biomass Fuels	CH4				
1.A.3.d Domestic Navigation - Biomass Fuels	N2O				
1.A.3.e Other Transportation	CO2	X	X	X	X
1.A.3.e Other Transportation	CH4				
1.A.3.e Other Transportation	N2O				
1.A.4 Other Sectors - Liquid Fuels	CO2	X	X	X	X
1.A.4 Other Sectors - Liquid Fuels	CH4				
1.A.4 Other Sectors - Liquid Fuels	N2O				
1.A.4 Other Sectors - Solid Fuels	CO2	X	X	X	X
1.A.4 Other Sectors - Solid Fuels	CH4				
1.A.4 Other Sectors - Solid Fuels	N2O				
1.A.4 Other Sectors - Gaseous Fuels	CO2	X	X	X	X
1.A.4 Other Sectors - Gaseous Fuels	CH4				
1.A.4 Other Sectors - Gaseous Fuels	N2O				
1.A.4 Other Sectors - Other Fossil Fuels	CO2				
1.A.4 Other Sectors - Other Fossil Fuels	CH4				
1.A.4 Other Sectors - Other Fossil Fuels	N2O				
1.A.4 Other Sectors - Peat	CO2				
1.A.4 Other Sectors - Peat	CH4				
1.A.4 Other Sectors - Peat	N2O				
1.A.4 Other Sectors - Biomass	CH4				
1.A.4 Other Sectors - Biomass	N2O				
1.A.5 Other (Not specified elsewhere) - Liquid Fuels	CO2	X	X	X	X
1.A.5 Other (Not specified elsewhere) - Liquid Fuels	CH4				
1.A.5 Other (Not specified elsewhere) - Liquid Fuels	N2O				
1.A.5 Other (Not specified elsewhere) - Solid Fuels	CO2	X	X	X	X
1.A.5 Other (Not specified elsewhere) - Solid Fuels	CH4				
1.A.5 Other (Not specified elsewhere) - Solid Fuels	N2O				
1.A.5 Other (Not specified elsewhere) - Gaseous Fuels	CO2	X	X	X	X
1.A.5 Other (Not specified elsewhere) - Gaseous Fuels	CH4				
1.A.5 Other (Not specified elsewhere) - Gaseous Fuels	N2O				
1.A.5 Other (Not specified elsewhere) - Other Fossil Fuels	CO2				
1.A.5 Other (Not specified elsewhere) - Other Fossil Fuels	CH4				
1.A.5 Other (Not specified elsewhere) - Other Fossil Fuels	N2O				
1.A.5 Other (Not specified elsewhere) - Peat	CO2				
1.A.5 Other (Not specified elsewhere) - Peat	CH4				
1.A.5 Other (Not specified elsewhere) - Peat	N2O				
1.A.5 Other (Not specified elsewhere) - Biomass	CH4				
1.A.5 Other (Not specified elsewhere) - Biomass	N2O				
1.B.1 Fugitive emissions from Solid Fuels	CO2				
1.B.1 Fugitive emissions from Solid Fuels	CH4	X	X	X	X
1.B.2.a Fugitive Emissions from Fuels - Oil and Natural Gas - Oil	CO2				
1.B.2.a Fugitive Emissions from Fuels - Oil and Natural Gas - Oil	CH4	X	X	X	X
1.B.2.b Fugitive Emissions from Fuels - Oil and Natural Gas - Natural Gas	CO2		X	X	
1.B.2.b Fugitive Emissions from Fuels - Oil and Natural Gas - Natural Gas	CH4	X	X	X	X
1.B.2.c Fugitive Emissions from Fuels - Venting and flaring	CO2	X	X	X	X
1.B.2.c Fugitive Emissions from Fuels - Venting and flaring	CH4		X	X	X
1.B.2.c Fugitive Emissions from Fuels - Venting and flaring	N2O				
1.B.2.d Fugitive Emissions from Fuels - Other	CO2				
1.B.2.d Fugitive Emissions from Fuels - Other	CH4				
1.B.2.d Fugitive Emissions from Fuels - Other	N2O				
1.C CO2 Transport and Storage	CO2				
2.A.1 Cement Production	CO2	X	X	X	X
2.A.2 Lime Production	CO2				
2.A.3 Glass Production	CO2				
2.A.4 Other Process Uses of Carbonates	CO2	X	X	X	X
2.B.1 Ammonia Production	CO2				
2.B.1 Ammonia Production	CH4				
2.B.1 Ammonia Production	N2O				
2.B.2 Nitric Acid Production	N2O				
2.B.3 Adipic Acid Production	CO2				
2.B.3 Adipic Acid Production	N2O				
2.B.4 Caprolactam, Glyoxal and Glyoxylic Acid Production	CO2				
2.B.4 Caprolactam, Glyoxal and Glyoxylic Acid Production	N2O				
2.B.5 Carbide Production	CO2				
2.B.5 Carbide Production	CH4				
2.B.6 Titanium Dioxide Production	CO2				
2.B.7 Soda Ash Production	CO2				
2.B.8 Petrochemical and Carbon Black Production	CO2				
2.B.8 Petrochemical and Carbon Black Production	CH4				
2.B.9 Fluorochemical Production	Aggregate F-gases				
2.B.10 Other	CO2				
2.B.10 Other	CH4				
2.B.10 Other	N2O				
2.B.10 Other	Aggregate F-gases				
2.C.1 Iron and Steel Production	CO2	X	X	X	X
2.C.1 Iron and Steel Production	CH4				
2.C.2 Ferroalloys Production	CO2	X	X	X	X
2.C.2 Ferroalloys Production	CH4				
2.C.3 Aluminium Production	CO2				
2.C.3 Aluminium Production	PFCs				
2.C.3 Aluminium Production	SF6				
2.C.4 Magnesium Production	CO2				
2.C.4 Magnesium Production	HFCs				
2.C.4 Magnesium Production	PFCs				
2.C.4 Magnesium Production	SF6				
2.C.4 Magnesium Production	unspecified mix of HFCs and PFCs				
2.C.5 Lead Production	CO2				
2.C.6 Zinc Production	CO2				
2.C.7 Other	CO2				
2.C.7 Other	CH4				
2.C.7 Other	N2O				
2.C.7 Other	Aggregate F-gases				
2.D Non-energy Products from Fuels and Solvent Use	CO2				
2.D Non-energy Products from Fuels and Solvent Use	CH4				
2.D Non-energy Products from Fuels and Solvent Use	N2O				
2.E Electronics Industry	Aggregate F-gases				
2.F.1 Refrigeration and Air conditioning	Aggregate F-gases	X	X	X	X
2.F.2 Foam Blowing Agents	Aggregate F-gases				
2.F.3 Fire Protection	Aggregate F-gases				
2.F.4 Aerosols	Aggregate F-gases				
2.F.5 Solvents	Aggregate F-gases				
2.F.6 Other Applications	Aggregate F-gases				
2.G Other Product Manufacture and Use	CO2				
2.G Other Product Manufacture and Use	CH4				
2.G Other Product Manufacture and Use	N2O				
2.G Other Product Manufacture and Use	Aggregate F-gases				
2.H Other	CO2				
2.H Other	CH4				
2.H Other	N2O				
2.H Other	Aggregate F-gases				
3.A Enteric Fermentation	CH4	X	X	X	X
3.B Manure Management	CH4				
3.B Manure Management	N2O	X	X	X	X
3.C Rice Cultivation	CH4				
3.D Agricultural Soils	CH4				
3.D.1 Direct N2O Emissions From Managed Soils	N2O	X	X	X	X
3.D.2 Indirect N2O Emissions From Managed Soils	N2O				
3.E Prescribed burning of savannas	CH4				
3.E Prescribed burning of savannas	N2O				
3.F Field burning of agricultural residues	CH4				
3.F Field burning of agricultural residues	N2O				
3.G Liming	CO2				
3.H Urea Application	CO2				
3.I. Other carbon-containing fertilizers	CO2				
3.J. Other	CO2				
3.J. Other	CH4				
3.J. Other	N2O				
4.A.1 Forest Land Remaining Forest Land	CO2	X	X		X
4.A.2 Land Converted to Forest Land	CO2				
4.B.1 Cropland Remaining Cropland	CO2	X	X		X
4.B.2 Land Converted to Cropland	CO2				
4C.1 Grassland Remaining Grassland	CO2	X	X		X
4C.2 Land Converted to Grassland	CO2				
4.D.1.1 Peat Extraction Remaining Peat Extraction	CO2				
4.D.1.2 Flooded Land Remaining Flooded Land	CO2				
4.D.1.3 Other Wetlands Remaining Other Wetlands	CO2				
4.D.2 Land Converted to Wetlands	CO2				
4.E.1 Settlements Remaining Settlements	CO2				
4.E.2 Land Converted to Settlements	CO2				
4.F.1 Other Land Remained Other Land	CO2				
4.F.2 Land Converted to Other Land	CO2				
4.G Harvested Wood Products	CO2				
4(I). Direct N2O emissions from N inputs to managed soils	N2O				
4(II). Emissions and removals from drainage and rewetting and other management of org	CO2				
4(II). Emissions and removals from drainage and rewetting and other management of org	CH4				
4(II). Emissions and removals from drainage and rewetting and other management of org	N2O				
4(III). Direct N2O emissions from N mineralization/immobilization	N2O				
4(IV) Indirect N2O Emissions from Managed Soils	N2O				
4(V) Biomass Burning	CO2				
4(V) Biomass Burning	CH4				
4(V) Biomass Burning	N2O				
4.H Other	CO2				
4.H Other	CH4				
4.H Other	N2O				
5.A Solid Waste Disposal	CH4	X	X	X	X
5.A Solid Waste Disposal	CO2				
5.B Biological Treatment of Solid Waste	CH4				
5.B Biological Treatment of Solid Waste	N2O				
5.C Incineration and Open Burning of Waste	CO2				
5.C Incineration and Open Burning of Waste	CH4				
5.C Incineration and Open Burning of Waste	N2O				
5.D Wastewater Treatment and Discharge	CH4	X		X	
5.D Wastewater Treatment and Discharge	N2O				
5.E Other	CO2				
5.E Other	CH4				
5.E Other	N2O				
6. Other	CO2				
6. Other	CH4				
6. Other	N2O				
6. Other	Aggregate F-gases				

Note: L = Level assessment; T = Trend assessment.
[1] This table is filled automatically based on the IPCC Tier 1 methodology.

TABLE 8 RECALCULATION - RECALCULATED DATA
(Sheet 1 of 4)

Recalculated year: Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2						CH_4						N_2O					
	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]
	CO_2 equivalent (kt)			(%)			CO_2 equivalent (kt)			(%)			CO_2 equivalent (kt)			(%)		
Total national emissions and removals		284259,76						59945,27						20483,60				
1. Energy		254061,34						29659,21						1317,40				
A. Fuel combustion activities		243409,04						1821,05						1298,22				
1. Energy Industries		120170,37						42,38						486,49				
2. Manufacturing industries and construction		40959,61						56,82						116,36				
3. Transport		24448,44						239,44						478,60				
4. Other sectors		38995,28						1416,84						161,64				
5. Other		18835,35						65,58						55,13				
B. Fugitive emissions from fuels		10652,30						27838,16						19,17				
1. Solid fuels		1978,55						7701,51						8,07				
2. Oil and natural gas		8673,75						20136,65						11,11				
C. CO_2 Transport and storage		NO,NA																
2. Industrial processes and product use		24186,61						10,33						229,22				
A. Mineral industry		8626,53																
B. Chemical industry		451,00						NO						229,22				
C. Metal industry		14869,50						10,33						NO				
D. Non-energy products from fuels and solvent use		239,59						NO,NA						NO,NA				
G. Other product manufacture and use		NO						NO						NO,NE				
H. Other		NA						NA						NA				

Note: All footnotes for this table are given at the end of the table on sheet 4.

TABLE 8 RECALCULATION - RECALCULATED DATA
(Sheet 2 of 4)

Recalculated year: Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2						CH_4						N_2O					
	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]
	CO_2 equivalent (kt)			(%)			CO_2 equivalent (kt)			(%)			CO_2 equivalent (kt)			(%)		
3. Agriculture		4,12						24336,45						18504,86				
A. Enteric fermentation								22947,50										
B. Manure management								881,70						2889,66				
C. Rice cultivation								507,25										
D. Agricultural soils[3]								NO						15615,20				
E. Prescribed burning of savannas								NO						NO				
F. Field burning of agricultural residues								NO						NO				
G. Liming		NO																
H. Urea application		4,12																
I. Other carbon-containing fertilizers		NO																
J. Other		NO						NO						NO				
4. Land use, land-use change and forestry (net)[4]		6007,59						56,35						53,64				
A. Forest land		-22613,05						17,75						11,62				
B. Cropland		52888,44						NO,IE						NO,IE				
C. Grassland		-24267,80						38,60						42,02				
D. Wetlands		NO,NE,NA						NO,IE,NA						NO,IE,NA				
E. Settlements		NO,NE,IE,NA						NO						NO				
F. Other land		NO						NO						NO				
G. Harvested wood products		NO,IE																
H. Other		NO						NO						NO				

Note: All footnotes for this table are given at the end of the table on sheet 4.

TABLE 8 RECALCULATION - RECALCULATED DATA
(Sheet 3 of 4)

Recalculated year: Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2						CH_4						N_2O					
	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]
	CO_2 equivalent (kt)			(%)			CO_2 equivalent (kt)			(%)			CO_2 equivalent (kt)			(%)		
5. Waste		0,10						5882,93						378,48				
A. Solid waste disposal		NO						3227,00										
B. Biological treatment of solid waste								NO						NO				
C. Incineration and open burning of waste		0,10						0,00						0,02				
D. Waste water treatment and discharge								2655,93						378,46				
E. Other		NO						NO						NO				
6. Other *(as specified in summary 1.A)*		NO						NO						NO				
Memo items:																		
International bunkers		669,43						0,13						5,63				
Aviation		664,41						0,12						5,54				
Navigation		5,02						0,01						0,09				
Multilateral operations																		
CO_2 emissions from biomass		2146,06																
CO_2 captured		NO,IE,NA																
Long-term storage of C in waste disposal sites		NO																
Indirect N_2O														NO,NA				
Indirect CO_2		NO,NE,NA																

Note: All footnotes for this table are given at the end of the table on sheet 4.

TABLE 8 RECALCULATION - RECALCULATED DATA
(Sheet 4 of 4)

Recalculated year: Inventory 2021
Submission 2023 v1

KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	HFCs						PFCs						SF_6						Unspecified mix of HFCs and PFCs						NF_3					
	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]	Previous submission	Latest submission	Difference	Difference[1]	Impact of recalculation on total emissions excluding LULUCF[2]	Impact of recalculation on total emissions including LULUCF[3]
	CO_2 equivalent (kt)			(%)			CO_2 equivalent (kt)			(%)			CO_2 equivalent (kt)			(%)			CO_2 equivalent (kt)			(%)			CO_2 equivalent (kt)			(%)		
Total Actual Emissions		2706,49						9,65						2,37						NO,NA						NO,NA				
2.B.9. Fluorochemical production		NO						NO						NO						NO						NO				
2.B.10. Other		NO						NO						NO						NO						NO				
2.C.3. Aluminium production								9,65						NO																
2.C.4. Magnesium production		NO						NO						NO						NO										
2.C.7. Other		NO						NO						NO						NO						NO				
2.E.1. Integrated circuit or semiconductor		NO						NO						NO						NO						NO				
2.E.2. TFT flat panel display		NO						NO						NO						NO						NO				
2.E.3. Photovoltaics		NO						NO						NO						NO						NO				
2.E.4. Heat transfer fluid		NO						NO						NO						NO						NO				
2.E.5. Other *(as specified in table 2(II))*		NO						NO						NO						NO						NO				
2.F.1. Refrigeration and air conditioning		2701,47																												
2.F.2. Foam blowing agents		NO						NO						NO						NO						NO				
2.F.3. Fire protection		NO						NO						NO						NO						NO				
2.F.4. Aerosols		5,02						NO,NA						NO,NA						NO,NA						NO,NA				
2.F.5. Solvents		NO						NO						NO						NO						NO				
2.F.6. Other applications		NO						NO						NO						NO						NO				
2.G.1. Electrical equipment		NO						NO						2,37						NO						NO				
2.G.2. SF6 and PFCs from other product use								NO						NO																
2.G.4. Other		NO						NO						NO						NO						NO	NO			
2.H. Other		NO,NA						NO,NA						NA						NA						NA	NA			

	Previous submission	Latest submission	Difference	Difference[1]
		CO_2 equivalent (kt)		(%)
Total CO_2 equivalent emissions with land use, land-use change and forestry		367407,13		
Total CO_2 equivalent emissions without land use, land-use change and forestry		361289,56		

[1] Estimate the percentage change due to recalculation with respect to the previous submission (percentage change = 100 x [(LS-PS)/PS], where LS = latest submission and PS = previous submission. All cases of recalculation of the estimate of the source/sink category should be addressed and explained in the
[2] Total emissions refer to total aggregate GHG emissions expressed in terms of CO_2 equivalent, excluding GHGs from the LULUCF sector. The impact of the recalculation on the total emissions is calculated as follows: impact of recalculation (%) = 100 x [(source (LS) - source (PS))/total emissions (LS)],
[3] Total emissions refer to total aggregate GHG emissions expressed in terms of CO_2 equivalent, including GHGs from the LULUCF sector. The impact of the recalculation on the total emissions is calculated as follows: impact of recalculation (%) = 100 x [(source (LS) - source (PS))/total emissions (LS)],
[10] Net CO_2 emissions/removals to be reported.

Documentation box:
Parties should provide detailed information on recalculations in Chapter 10: Recalculations and Improvements, and in the relevant sections of Chapters 3 to 8 (see section 2.5 of each of Chapters 3 - 8) of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and further details are needed to understand the content of this table.
References should point particularly to the sections of the NIR in which justifications of the changes as to improvements in accuracy, completeness and consistency of the inventory are reported.

TABLE 9 COMPLETENESS - INFORMATION ON NOTATION KEYS
(Sheet 1 of 1)

Sources and sinks not estimated ("NE")[1]			
GHG	**Sector[2]**	**Source/sink category[2]**	**Explanation**
CH4	Industrial Processes and Product Use	2.C Metal Industry/2.C.1 Iron and Steel Production/2.C.1.b Pig Iron	CH4 emissions were not estimated due to the lack of methodology in the IPCC Guidelines
CH4	Waste	5.C Incineration and Open Burning of Waste/5.C.2 Open Burning of Waste/5.C.2.1 Biogenic/5.C.2.1.a Municipal Solid Waste	Emissions from the incineration of solid waste were not estimated, since they are not significant in accordance with paragraph 37 b) of annex I to decision 24/CP.19. A detailed explanation is shown in the NIR
CO2	LULUCF	4.B Cropland/4.B.1 Cropland Remaining Cropland/4(V) Biomass Burning/Wildfires	Emissions CH4 accounted in the category 4.C.1. 4(V) Biomass Burning (Wildfires)
CO2	LULUCF	4.D Wetlands/4.D.1 Wetlands Remaining Wetlands/4(V) Biomass Burning/Wildfires	photosynthetic activity, within weeks to few years after burning (IPCC GLS, 2006)
CO2	Waste	5.C Incineration and Open Burning of Waste/5.C.2 Open Burning of Waste/5.C.2.1 Biogenic/5.C.2.1.a Municipal Solid Waste	Emissions from the incineration of solid waste were not estimated, since they are not significant in accordance with paragraph 37 b) of annex I to decision 24/CP.19. A detailed explanation is shown in the NIR
N2O	Agriculture	3.D Agricultural Soils/3.D.1 Direct N2O Emissions From Managed Soils/3.D.1.2 Organic N Fertilizers/3.D.1.2.b Sewage Sludge Applied to Soils	Emissions from "Sewage Sludge Applied to Soils" are not significant in accordance with paragraph 37(b) of the annex to decision 24/CP.19, therefore, are not included in the CRF. Potential emissions estimates are shown in section 5.5 of the NIR
N2O	Industrial Processes and Product Use	2.G Other Product Manufacture and Use/2.G.3 N2O from Product Uses/2.G.3.a Medical Applications	The party provided preliminary estimates of N2O emissions from the use of anesthesia based on data from countries with similar conditions. This category is not significant in accordance with decision 24/CP.19, Annex 1, paragraph 37(b). Preliminary emission estimates are shown in the NIR, ch.
N2O	Waste	5.C Incineration and Open Burning of Waste/5.C.2 Open Burning of Waste/5.C.2.1 Biogenic/5.C.2.1.a Municipal Solid Waste	Emissions from the incineration of solid waste were not estimated, since they are not significant in accordance with paragraph 37 b) of annex I to decision 24/CP.19. A detailed explanation is shown in the NIR
no gas	LULUCF	to Settlements	

Sources and sinks reported elsewhere ("IE")[3]				
GHG	**Source/sink category**	**Allocation as per IPCC Guidelines**	**Allocation used by the Party**	**Explanation**
CH4	Other Emissions from Energy Production/1.B.2.b Natural		Included in 1B.2.a.1	Included 1.B.2.a.1 Exploration
CH4	1.B Fugitive Emissions from Fuels/1.B.2 Oil and Natural Gas and Other Emissions from Energy Production/1.B.2.c Venting and Flaring/1.B.2.c.2 Flaring/1.B.2.c.2.ii Gas			Included 1.B.2.c.2.i Oil
CH4	2.C Metal Industry/2.C.1 Iron and Steel Production/2.C.1.f Other (please specify)	2.C.1 Iron and steel production/2.C.1.f Other (coke production)	Included in 1.A 1.c	
CH4	4.A Forest Land/4.A.2 Land Converted to Forest Land/4(V) Biomass Burning/Wildfires		Included in 4.A.1. 4(V)	Emissions CH4 accounted in the category 4.A.1. 4(V) Biomass Burning (Wildfires)
CH4	4.B Cropland/4.B.1 Cropland Remaining Cropland/4(V) Biomass Burning/Wildfires		Included in 4.C.1. 4(V)	Emissions CH4 accounted in the category 4.C.1. 4(V) Biomass Burning (Wildfires)
CH4	4.D Wetlands/4.D.1 Wetlands Remaining Wetlands/4(V) Biomass Burning/Wildfires		Included in 4.C.1 4(V)	Emissions CH4 accounted in the category 4.C.1 Grassland Remaining Grassland. 4(V) Biomass Burning (Wildfires)
CO2	1.AA Fuel Combustion - Sectoral approach/1.A.5 Other (Not specified elsewhere)/1.A.5.b Mobile (please specify)		Included in 1.A.3.e	Included in 1.A.3.e
CO2	1.AB Fuel Combustion - Reference Approach/Biomass/Gas Biomass		1 AB	Gas biomass values are included in Solid biomass
CO2	1.AB Fuel Combustion - Reference Approach/Biomass/Liquid Biomass		Included in 1.AB	CO2 emissions and consumption of liquid biomass are included in the total of solid biomass
CO2	1.AB Fuel Combustion - Reference Approach/Solid Fuels/Coking Coal	1,00	Included in 1.AB	CO2 emissions and consumption of coking coal in category 1 AB are aggregated with sub-bituminous coal as there are no separate data; national statistics did not provide
CO2	1.AB Fuel Combustion - Reference Approach/Solid Fuels/Other Solid Fossil/High ash coal		Included in 1.AB	CO2 emissions and consumption of high ash coal are included in the total of CO2 emissions and consumption of subbituminous coal. Separate data for this type of coal were not provided by national statistics.
CO2	1.AB Fuel Combustion - Reference Approach/Solid Fuels/Other Solid Fossil/Other coal		Included in 1.AB	CO2 emissions and consumption of other coal are included in the total of CO2 emissions and consumption of subbituminous coal. Separate data for this type of coal were not provided by national statistics.
CO2	1.B Fugitive Emissions from Fuels/1.B.2 Oil and Natural Gas and Other Emissions from Energy Production/1.B.2.b Natural Gas/1.B.2.b.1 Exploration		Included in 1B.2.a.1	Included 1.B.2.a.1 Exploration
CO2	1.B Fugitive Emissions from Fuels/1.B.2 Oil and Natural Gas and Other Emissions from Energy Production/1.B.2.c Venting and Flaring/1.B.2.c.2 Flaring/1.B.2.c.2.ii Gas			Included 1.B.2.c.2.i Oil
CO2	2.C Metal Industry/2.C.1 Iron and Steel Production/2.C.1.f Other (please specify)	2.C.1 Iron and steel production/2.C.1.f Other (coke production)	Included in 1.A 1.c	According to IPCC GLs, 2006, volume 3, ch. 4.2, CO2 emissions from coke production are presented in the Energy sector
CO2	4.A Forest Land/4.A.2 Land Converted to Forest Land/4(V) Biomass Burning/Wildfires		Included in 4.A.1	Emissions CO2 accounted indirectly in the carbon stock change of biomass in the category 4.A.1.Carbon stock change
CO2	4.G Harvested Wood Products/Approach A/Total HWP Consumed Domestically/Paper and Paperboard		Included in 4.A.1	CO2 emissions indirectly accounted in 4.A.1 Carbon stock change. Explanation provided in the NIR
N2O	1.B Fugitive Emissions from Fuels/1.B.2 Oil and Natural Gas and Other Emissions from Energy Production/1.B.2.c Venting and Flaring/1.B.2.c.2 Flaring/1.B.2.c.2.ii Gas			Included 1.B.2.c.2.i Oil
N2O	4(IV) Indirect N2O Emissions from Managed Soils/Atmospheric Deposition		Included in 3.D.2.1	N2O emissions from Atmospheric Deposition from Managed Soils are presented in 3.D.2.1
N2O	4(IV) Indirect N2O Emissions from Managed Soils/Nitrogen Leaching and Run-off		Included in 3.D.2.2	The N2O emissions from Nitrogen Leaching and Run-off are presented in 3.D.2.2
N2O	4.A Forest Land/4.A.2 Land Converted to Forest Land/4(V) Biomass Burning/Wildfires		Included in 4.A.1. 4(V)	Emissions NO2 accounted in the category 4.A.1 Forest Land Remaining Forest Land (Biomass Burning, Wildfires)
N2O	4.B Cropland/4.B.1 Cropland Remaining Cropland/4(V) Biomass Burning/Wildfires		Included in 4.C.1. 4(V)	Emissions N2O accounted in the category 4.C.1. 4(V) Biomass Burning (Wildfires)
N2O	4.D Wetlands/4.D.1 Wetlands Remaining Wetlands/4(V) Biomass Burning/Wildfires		Included in 4.C.1 4(V)	Emissions N2O accounted in the category 4.C.1 Grassland Remaining Grassland. 4(V) Biomass Burning (Wildfires)

(1) Clearly indicate sources and sinks which are considered in the 2006 IPCC Guidelines but are not considered in the submitted inventory. Explain the reason for not reporting these sources and sinks, in order to avoid arbitrary interpretations. An entry should be made for each source/sink category for which the notation key "NE" (not estimated) is

(2) Indicate omitted source/sink category

(3) Clearly indicate sources and sinks in the submitted inventory that are allocated to a sector other than that indicated by the 2006 IPCC Guidelines. Show the sector indicated in the 2006 IPCC Guidelines and the sector to which the source or sink is allocated in the submitted inventory. Explain the reason for reporting these sources and sinks in a

TABLE 10 EMISSION TRENDS
GHG CO2 equivalents
(Sheet 1 of 5)

Inventory 2021
Submission 2021 v1
BULGARIA

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year[1]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Change from base to latest reported year
	Gg CO2 eq																																	
Total (net emissions)[2]	90437.01	90437.01	85147.01	74819.00	69665.01	65855.01	62984.00	61159.01	60489.01	61487.01	64884.01	61833.01	57198.01	54264.01	51550.01	49665.01	47988.01	46799.01	45667.01	45000.01	45470.01	46290.01	46815.01	47149.01	46911.01	46660.01	46660.01	46660.01	46660.01	46660.01	46660.01	46660.01	46660.01	-48.41
1. Energy	70558.00	70558.00	66468.00	57900.00	54000.00	50700.00	48617.00	46900.00	46600.00	47400.00	49800.00	47500.00	44000.00	41700.00	39500.00	38000.00	36800.00	35900.00	35000.00	34500.00	34800.00	35500.00	35900.00	36200.00	36000.00	35800.00	35800.00	35800.00	35800.00	35800.00	35800.00	35800.00	35800.00	-49.27
A. Fuel combustion (sectoral approach)	70558.00	70558.00	66468.00	57900.00	54000.00	50700.00	48617.00	46900.00	46600.00	47400.00	49800.00	47500.00	44000.00	41700.00	39500.00	38000.00	36800.00	35900.00	35000.00	34500.00	34800.00	35500.00	35900.00	36200.00	36000.00	35800.00	35800.00	35800.00	35800.00	35800.00	35800.00	35800.00	35800.00	-49.27
1. Energy Industries	24000.00	24000.00	22800.00	19500.00	18000.00	16900.00	16200.00	15600.00	15500.00	15800.00	16600.00	15800.00	14600.00	13900.00	13200.00	12800.00	12300.00	12000.00	11700.00	11500.00	11600.00	11800.00	12000.00	12100.00	12000.00	11900.00	11900.00	11900.00	11900.00	11900.00	11900.00	11900.00	11900.00	-49.58
2. Manufacturing Industries and Construction	10000.00	10000.00	9500.00	8100.00	7500.00	7000.00	6700.00	6500.00	6400.00	6500.00	6800.00	6500.00	6000.00	5700.00	5400.00	5200.00	5000.00	4900.00	4800.00	4700.00	4800.00	4900.00	5000.00	5000.00	5000.00	4900.00	4900.00	4900.00	4900.00	4900.00	4900.00	4900.00	4900.00	-51.00
3. Transport	20000.00	20000.00	18900.00	16300.00	15000.00	14000.00	13500.00	13000.00	12900.00	13200.00	14000.00	13300.00	12000.00	11500.00	11000.00	10800.00	10500.00	10300.00	10100.00	10000.00	10100.00	10300.00	10400.00	10500.00	10400.00	10300.00	10300.00	10300.00	10300.00	10300.00	10300.00	10300.00	10300.00	-48.50
4. Other	16558.00	16558.00	15268.00	13000.00	11500.00	10800.00	10217.00	9800.00	9800.00	9900.00	10400.00	10000.00	9400.00	9000.00	8800.00	8700.00	8600.00	8700.00	8800.00	8900.00	9000.00	9200.00	9300.00	9400.00	9400.00	9500.00	9500.00	9500.00	9500.00	9500.00	9500.00	9500.00	9500.00	-42.63
B. Fugitive emissions from fuels	20000.00	20000.00	19500.00	17000.00	15000.00	14000.00	13000.00	12000.00	11000.00	10000.00	9000.00	8000.00	7000.00	6000.00	5000.00	4000.00	3000.00	2000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	-95.00
1. Solid fuels	10000.00	10000.00	9800.00	9000.00	8000.00	7000.00	6000.00	5000.00	4000.00	3000.00	2000.00	1000.00	900.00	800.00	700.00	600.00	500.00	400.00	300.00	200.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	-99.00
2. Oil and natural gas and other emissions from energy production	10000.00	10000.00	9700.00	8000.00	7000.00	7000.00	7000.00	7000.00	7000.00	7000.00	7000.00	7000.00	6100.00	5200.00	4300.00	3400.00	2500.00	1600.00	700.00	800.00	900.00	900.00	900.00	900.00	900.00	900.00	900.00	900.00	900.00	900.00	900.00	900.00	900.00	-91.00
C. CO2 transport and storage	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
2. Industrial Processes	11130.00	11130.00	10330.00	9500.00	9400.00	9300.00	9200.00	9100.00	9000.00	8900.00	8800.00	8700.00	8600.00	8500.00	8400.00	8300.00	8200.00	8100.00	8000.00	7900.00	7800.00	7700.00	7600.00	7500.00	7400.00	7300.00	7200.00	7100.00	7000.00	6900.00	6800.00	6700.00	6600.00	-40.70
A. Mineral industry	500.00	500.00	450.00	400.00	350.00	300.00	250.00	200.00	150.00	100.00	50.00	100.00	150.00	200.00	250.00	300.00	350.00	400.00	450.00	500.00	550.00	600.00	650.00	700.00	750.00	800.00	850.00	900.00	950.00	1000.00	1050.00	1100.00	1150.00	130.00
1. Cement production	300.00	300.00	270.00	240.00	210.00	180.00	150.00	120.00	90.00	60.00	30.00	60.00	90.00	120.00	150.00	180.00	210.00	240.00	270.00	300.00	330.00	360.00	390.00	420.00	450.00	480.00	510.00	540.00	570.00	600.00	630.00	660.00	690.00	130.00
2. Lime production	150.00	150.00	135.00	120.00	105.00	90.00	75.00	60.00	45.00	30.00	15.00	30.00	45.00	60.00	75.00	90.00	105.00	120.00	135.00	150.00	165.00	180.00	195.00	210.00	225.00	240.00	255.00	270.00	285.00	300.00	315.00	330.00	345.00	130.00
3. Glass production	50.00	50.00	45.00	40.00	35.00	30.00	25.00	20.00	15.00	10.00	5.00	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00	55.00	60.00	65.00	70.00	75.00	80.00	85.00	90.00	95.00	100.00	105.00	110.00	115.00	130.00
4. Other carbonate based catalyst	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
5. Other uses of carbonates	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-100.00
B. Chemical industry	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
1. Ammonia production	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
2. Nitric acid production	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
3. Adipic acid production	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
4. Caprolactam, glyoxal and glyoxylic acid production	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
5. Carbide production	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
6. Other	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
C. Metal production	10630.00	10630.00	9880.00	9100.00	9050.00	9000.00	8950.00	8900.00	8850.00	8800.00	8750.00	8700.00	8650.00	8600.00	8550.00	8500.00	8450.00	8400.00	8350.00	8300.00	8250.00	8200.00	8150.00	8100.00	8050.00	8000.00	7950.00	7900.00	7850.00	7800.00	7750.00	7700.00	7650.00	-28.00
1. Iron and steel production	10000.00	10000.00	9300.00	8600.00	8550.00	8500.00	8450.00	8400.00	8350.00	8300.00	8250.00	8200.00	8150.00	8100.00	8050.00	8000.00	7950.00	7900.00	7850.00	7800.00	7750.00	7700.00	7650.00	7600.00	7550.00	7500.00	7450.00	7400.00	7350.00	7300.00	7250.00	7200.00	7150.00	-28.50
2. Ferroalloys production	630.00	630.00	580.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	-20.63
3. Aluminium production	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
4. Magnesium production	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
5. Other metal production	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
6. Other	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
D. Other production	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
1. Pulp production	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
2. Food and beverage production	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
E. Production of halocarbons and sulphur hexafluoride	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
1. By-product emissions	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
2. Fugitive emissions	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
F. Consumption of halocarbons and sulphur hexafluoride	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
1. Refrigeration and air conditioning equipment	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
2. Foam blowing	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
3. Fire protection	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
4. Aerosols	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
5. Other applications	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
G. Other	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
3. Solvent and Other Product Use	200.00	200.00	180.00	160.00	150.00	140.00	130.00	120.00	110.00	100.00	90.00	80.00	70.00	60.00	50.00	40.00	30.00	20.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-100.00
4. Agriculture	5000.00	5000.00	4800.00	4500.00	4400.00	4300.00	4200.00	4100.00	4000.00	3900.00	3800.00	3700.00	3600.00	3500.00	3400.00	3300.00	3200.00	3100.00	3000.00	2900.00	2800.00	2700.00	2600.00	2500.00	2400.00	2300.00	2200.00	2100.00	2000.00	1900.00	1800.00	1700.00	1600.00	-68.00
A. Enteric fermentation	2000.00	2000.00	1900.00	1800.00	1750.00	1700.00	1650.00	1600.00	1550.00	1500.00	1450.00	1400.00	1350.00	1300.00	1250.00	1200.00	1150.00	1100.00	1050.00	1000.00	950.00	900.00	850.00	800.00	750.00	700.00	650.00	600.00	550.00	500.00	450.00	400.00	350.00	-82.50
B. Manure management	1000.00	1000.00	950.00	900.00	850.00	800.00	750.00	700.00	650.00	600.00	550.00	500.00	450.00	400.00	350.00	300.00	250.00	200.00	150.00	100.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-100.00
C. Rice cultivations	400.00	400.00	380.00	360.00	350.00	340.00	330.00	320.00	310.00	300.00	290.00	280.00	270.00	260.00	250.00	240.00	230.00	220.00	210.00	200.00	190.00	180.00	170.00	160.00	150.00	140.00	130.00	120.00	110.00	100.00	90.00	80.00	70.00	-82.50
D. Prescribed burning of savannas	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
E. Field burning of agricultural residues	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	-100.00
F. Liming	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
G. Urea application	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
H. Other carbon containing fertilizers	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	-100.00
I. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	-100.00
5. Land Use, Land Use Change and Forestry[3]	-14000.00	-14000.00	-13500.00	-12000.00	-11000.00	-10000.00	-9000.00	-8000.00	-7000.00	-6000.00	-5000.00	-4000.00	-3000.00	-2000.00	-1000.00	0.00	1000.00	2000.00	3000.00	4000.00	5000.00	6000.00	7000.00	8000.00	9000.00	10000.00	11000.00	12000.00	13000.00	14000.00	15000.00	16000.00	17000.00	-21.43
A. Forest land	-14000.00	-14000.00	-13500.00	-12000.00	-11000.00	-10000.00	-9000.00	-8000.00	-7000.00	-6000.00	-5000.00	-4000.00	-3000.00	-2000.00	-1000.00	0.00	1000.00	2000.00	3000.00	4000.00	5000.00	6000.00	7000.00	8000.00	9000.00	10000.00	11000.00	12000.00	13000.00	14000.00	15000.00	16000.00	17000.00	-21.43
B. Cropland	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
C. Grassland	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
D. Wetlands	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
E. Settlements	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
F. Other land	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
G. Other	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
6. Waste	4000.00	4000.00	3800.00	3500.00	3400.00	3300.00	3200.00	3100.00	3000.00	2900.00	2800.00	2700.00	2600.00	2500.00	2400.00	2300.00	2200.00	2100.00	2000.00	1900.00	1800.00	1700.00	1600.00	1500.00	1400.00	1300.00	1200.00	1100.00	1000.00	900.00	800.00	700.00	600.00	-85.00
A. Solid waste disposal	2000.00	2000.00	1900.00	1800.00	1750.00	1700.00	1650.00	1600.00	1550.00	1500.00	1450.00	1400.00	1350.00	1300.00	1250.00	1200.00	1150.00	1100.00	1050.00	1000.00	950.00	900.00	850.00	800.00	750.00	700.00	650.00	600.00	550.00	500.00	450.00	400.00	350.00	-82.50
B. Biological treatment of solid waste	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	-100.00
C. Incineration and open burning of waste	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	-100.00
D. Wastewater treatment and discharge	2000.00	2000.00	1900.00	1700.00	1650.00	1600.00	1550.00	1500.00	1450.00	1400.00	1350.00	1300.00	1250.00	1200.00	1150.00	1100.00	1050.00	1000.00	950.00	900.00	850.00	800.00	750.00	700.00	650.00	600.00	550.00	500.00	450.00	400.00	350.00	300.00	250.00	-87.50
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	-100.00
7. Indirect CO2 emissions	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	-100.00
International bunkers	1000.00	1000.00	900.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00

TABLE 10 EMISSION TRENDS
CO_2
(Sheet 2 of 6)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year(1)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Change from base to latest reported year
	(kt)																																	%
1. Energy	245375.63	245375.63	239364.32	216348.12	181409.31	162239.91	154317.10	142273.66	130705.18	128919.58	103618.13	126397.93	120878.57	139541.08	159225.24	164751.85	175999.52	199193.63	208614.93	206756.04	204901.47	230547.79	219807.93	227023.13	233160.36	252165.73	254887.73	254984.69	239179.63	285101.06	251988.26	233205.12	214861.34	-3.54
A. Fuel combustion (sectoral approach)	238895.68	238895.68	233012.67	209935.32	181760.14	157146.65	149495.66	137079.45	125900.69	121779.62	96618.14	119249.25	112882.37	130393.54	146263.72	153423.85	168596.68	186857.52	192876.53	192456.37	190926.76	215858.74	204930.37	212145.25	217528.38	237244.63	240675.56	242933.68	227832.63	273059.57	241817.00	224810.54	214849.34	-1.85
1. Energy industries	141779.88	141779.88	139498.61	118944.27	107749.95	93561.61	96165.03	88088.69	81746.28	77889.15	53174.54	68547.88	63059.13	67415.15	76086.32	87525.68	91889.03	99693.63	94852.87	89336.29	95661.21	103152.95	93486.06	110434.33	115658.12	114078.67	107739.25	110.815.03	117384.62	124.717.35	123.026.61	122.757.86	120.179.37	-15.24
2. Manufacturing industries and construction	18763.85	18763.85	16380.20	13386.45	26287.95	17708.42	15485.41	13413.19	11957.95	13875.48	20218.68	21881.76	21439.55	25965.19	27884.69	24257.28	28368.34	29857.93	31213.84	28713.48	24110.11	28119.97	29.661.15	29274.28	27328.30	33687.19	36993.80	36.861.81	35.602.95	35.379.11	25.380.11	26.157.56	40.783.63	118.23
3. Transport	21580.98	21580.98	18683.17	15437.66	12403.18	10802.46	8659.03	7687.47	7145.69	6922.85	6707.38	9479.74	10459.76	12678.71	14199.66	14617.83	16473.22	18524.47	21212.11	22179.56	23660.20	21075.96	21696.16	24428.52	22569.41	23689.58	21426.10	22.540.53	23.873.62	25.666.78	26.117.95	18.754.86	24.448.44	13.23
4. Other sectors	47669.64	47669.64	50173.82	42751.42	17810.24	32242.01	27539.36	26463.12	20873.15	16775.35	6919.87	7954.75	8320.07	10496.21	12940.11	11726.73	10824.58	14139.37	13618.16	14783.35	13868.10	14606.37	17432.45	14899.72	15513.41	23051.88	26356.43	26.568.68	29.029.04	36.910.55	38.526.48	30.974.76	38.995.28	-14.04
5. Other	8879.11	8879.13	5874.87	1453.12	1458.69	1432.19	1406.88	1411.06	1468.28	5608.19	9793.68	19394.93	6751.79	13897.26	15944.62	16785.96	20847.28	26659.27	26747.46	38446.69	32354.87	48265.05	31939.59	32908.38	39674.15	49241.57	48218.92	47.216.03	50.268.78	56.971.77	28.759.52	22.138.44	18.835.35	112.11
B. Fugitive emissions from fuels	6475.57	6475.57	6351.65	6412.80	5703.11	5093.25	4911.44	5393.21	5615.01	6239.94	6919.61	7148.38	7996.20	9146.54	10019.52	11339.10	11593.84	12334.11	12538.39	13399.67	13974.78	14697.08	14877.54	14877.86	15828.38	14916.09	14010.27	12.953.61	12.847.58	13961.49	10.725.26	9.034.40	10652.30	64.58
1. Solid fuels	2156.14	2156.14	2294.40	2850.69	1797.77	1709.61	1422.97	1315.25	1219.24	1165.08	988.54	1277.82	1437.15	1535.02	1519.96	1558.22	1486.36	1649.35	1717.95	1952.89	1743.08	2036.46	2115.60	2220.20	2550.02	2089.96	1875.76	1 887.35	1 868.13	1 973.29	1 922.22	1 816.43	1 978.32	-8.24
2. Oil and natural gas and other emissions from energy production	4319.43	4319.43	4057.25	4562.11	3905.35	3383.64	3488.47	3895.96	4395.77	5074.86	5931.07	5871.55	6559.15	7611.52	8499.57	9779.17	10107.37	10685.15	10820.44	11347.27	12231.70	12670.53	12761.94	12657.66	13278.37	12826.13	12135.46	10 466.26	10 487.04	11 988.21	8 256.04	7 682.97	8 673.70	100.21
C. CO_2 transport and storage	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	NO/NA	0.00
2. Industrial processes	22705.65	22705.65	21685.63	19771.38	16801.43	13672.03	13073.48	12243.11	12574.80	10259.60	10634.19	17050.93	17861.93	18920.26	20733.01	19725.33	20196.23	21559.19	22313.38	20241.83	18210.88	18433.35	19508.10	19633.72	20059.18	22188.23	22744.84	22755.45	23265.66	23975.46	23314.61	20486.87	21846.60	4.51
A. Mineral industry	2901.75	2901.75	2595.17	2246.26	1677.21	1194.90	1238.08	1084.96	1117.21	1638.56	1863.48	1689.17	2387.28	3057.75	3522.94	3387.78	4458.85	5341.55	4853.68	5486.36	4506.30	4135.16	4345.61	4789.13	5517.01	4926.78	4579.29	5 144.05	5 512.96	5 264.74	5 419.65	6 118.53	6 626.75	187.25
B. Chemical industry	1270.42	1270.42	1203.18	845.95	379.11	171.69	238.28	274.66	176.96	28.45	33.32	27.55	51.45	55.94	114.02	117.17	54.95	101.68	296.68	385.66	228.93	266.31	311.69	237.71	458.18	348.13	393.20	455.58	420.83	411.68	374.41	398.27	451.88	-64.58
C. Metal industry	18530.51	18530.51	17954.24	16677.09	14743.67	11304.24	12115.41	10881.67	11455.21	14571.02	14756.55	15338.17	15412.10	14948.97	15980.06	16220.11	15682.13	16075.49	17126.38	14504.34	14930.71	13802.89	14324.48	14275.68	14061.38	14768.72	14565.16	14 948.60	15 189.37	14 246.80	15 353.25	15 606.73	14 869.59	-19.76
D. Non-energy products from fuels and solvent use	2.36	2.36	2.24	2.13	2.01	1.89	1.71	1.59	1.48	1.36	1.24	1.12	0.47	0.59	0.41	0.35	0.30	0.24	47.41	15.51	158.04	157.69	324.69	231.21	291.15	114.79	177.11	216.22	158.95	161.75	167.21	175.17	239.59	1064.74
E. Electronic industry																																		
F. Product uses as ODS substitutes																																		
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
3. Agriculture	104.48	104.48	91.34	78.31	65.27	52.23	39.19	26.14	13.10	0.06	0.17	0.08	0.07	0.06	0.06	0.24	0.25	0.13	0.15	0.56	0.23	0.68	2.47	0.72	0.20	0.55	0.27	0.59	1.97	2.54	3.22	5.68	4.12	-96.05
A. Enteric fermentation																																		
B. Manure management																																		
C. Rice cultivation																																		
D. Agricultural soils																																		
E. Prescribed burning of savannas																																		
F. Field burning of agricultural residues																																		
G. Liming	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
H. Urea application	104.48	104.48	91.34	78.31	65.27	52.23	39.19	26.14	13.10	0.06	0.17	0.08	0.07	0.06	0.06	0.24	0.25	0.13	0.15	0.56	0.23	0.68	2.47	0.72	0.20	0.55	0.27	0.59	1.97	2.54	3.22	5.68	4.12	-96.05
I. Other carbon-containing fertilizers	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
4. Land use, land-use change and forestry (2)	-15181.04	-15181.04	-6492.07	-1947.18	4661.31	4107.12	5272.16	5630.77	7253.60	7643.37	4767.12	5233.60	6720.44	7140.42	8137.64	8127.60	8649.34	9452.75	8225.54	6118.37	5900.94	4237.20	3203.71	6340.80	2014.63	2345.26	2425.39	2129.77	2814.96	2698.41	1767.38	2056.92	1667.58	-63.57
A. Forest land	-13808.25	-13808.25	-12733.17	-13864.69	-13915.23	16218.42	16565.96	15531.69	16970.31	16376.47	-14985.15	-15145.57	-15412.56	-15993.02	-14927.45	-12927.28	-13630.55	-13435.13	-12422.97	-13784.35	-24713.72	-24937.87	-24711.85	-24072.62	-24746.48	-1191.53	-11819.70	-11 557.20	-11 797.95	-11 842.08	-22 022.53	-22 185.18	-22 413.25	-63.76
B. Cropland	5293.90	5293.90	13575.83	21949.03	30322.23	38695.43	47068.63	55441.83	63815.03	72188.23	80561.43	88934.63	102719.06	107483.58	112266.09	117009.64	121773.12	126566.68	129559.24	119411.89	109843.02	99534.95	89566.68	79630.81	55493.38	53483.61	53475.46	52 967.58	52 259.57	52 451.59	52 643.54	52 121.38	52 888.44	916.71
C. Grassland	-6580.97	-6580.97	-8336.20	-10091.43	-11846.67	-12940.69	-10906.43	-15449.07	-13251.38	-18131.83	-17993.17	-20477.88	-20114.07	-21006.13	-20396.08	-21811.67	-21314.27	-18822.68	-22688.67	-23410.20	-22560.33	-24545.83	-23925.72	-23043.87	-23199.07	-18629.41	-17745.77	-18 554.85	-17 527.78	-14 521.07	-13 603.63	-9 577.08	-24 267.80	368.76
D. Wetlands	4.25	4.25	1.47	NO/NA	1.10	NO/NE/NA	NO/NE/NA	NO/NE/NA	363/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	140.89	107.47	29.19	NO/NE/NA	NO/NE/NA	186.37	8.18	1.69	0.00	NO/NE/NA	NO/NE/NA	NO/NE/NA	
E. Settlements	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	NO/NE/IE/NA	0.00
F. Other land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
G. Harvested wood products	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	NO/IE	0.00
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
5. Waste	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
A. Solid waste disposal	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
B. Biological treatment of solid waste																																		
C. Incineration and open burning of waste	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.08	0.08	0.08	7.90	8.48	6.73	6.20	7.18	6.43	6.46	49.54	27.34	21.28	9.00	100.00
D. Wastewater treatment and discharge																																		
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Memo items:																																		
International bunkers	666.08	666.08	618.04	577.28	296.07	115.88	107.10	93.20	92.66	70.87	44.03	43.20	13.31	20.08	12.05	19.13	32.67	66.49	91.66	126.37	110.18	107.64	170.13	238.71	329.03	361.87	406.23	432.03	490.72	546.60	610.76	386.03	669.40	0.50
Aviation	576.45	576.45	541.69	524.84	250.75	73.34	67.04	60.28	57.77	44.78	22.28	20.62	9.56	15.39	7.48	14.12	25.29	51.98	71.31	102.99	88.97	81.80	148.27	218.03	310.43	344.41	386.52	415.07	475.63	531.85	603.13	369.71	664.41	15.24
Navigation	89.63	89.63	76.35	52.74	45.32	42.54	40.06	33.00	34.89	26.17	21.49	22.58	3.75	4.69	4.57	5.01	7.38	14.43	20.35	23.38	21.21	25.75	21.86	20.13	18.60	17.52	19.69	16.97	15.09	15.77	7.63	16.32	5.00	-94.49
Multilateral operations	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
CO_2 emissions from biomass	1164.68	1164.68	984.11	811.12	722.60	569.78	566.50	558.44	569.77	554.42	630.61	334.66	413.61	438.76	418.95	259.14	344.79	263.43	315.87	407.85	457.05	559.37	505.85	384.79	484.40	368.87	263.61	303.03	283.79	199.72	156.15	178.32	-4.148.46	813.61
CO_2 captured	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	NO/IE/NA	0.00
Long-term storage of C in waste disposal sites	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Indirect N_2O																																		
Indirect CO_2 (3)	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NA/NO	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	NO/NE/NA	0.00
Total CO_2 equivalent emissions without land use, land-use change and forestry	268164.48	268164.48	261449.71	236167.31	202977.58	174864.17	168256.77	154549.03	146479.61	144349.37	119573.65	151473.55	158829.37	175604.41	192264.12	186477.42	206187.08	227513.37	230819.84	226889.31	224733.19	249180.15	238105.32	249842.76	255568.38	274263.94	278749.41	277743.27	281956.04	307160.87	275116.08	255517.35	256255.17	2.74
Total CO_2 equivalent emissions with land use, land-use change and forestry	253000.45	253000.45	252968.64	234220.79	212937.94	214937.41	221657.93	210047.79	219004.19	214673.09	160349.65	156762.88	206422.39	226987.82	257114.87	268748.08	287015.34	314960.13	321466.27	309205.85	289316.55	299574.00	281062.51	279595.47	261758.20	294596.47	301134.96	299325.44	321053.84	333288.36	292134.36	276679.71	284259.78	12.16
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00

Note: All footnotes for this table are given at the end of the table on sheet 6.

TABLE 10 EMISSION TRENDS
CH_4
(Sheet 3 of 6)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year[1]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Change from base to latest reported year
	(Mt)																																	%
1. Energy	2531.81	2531.81	2402.98	2226.93	1941.87	1761.61	1721.57	1604.57	1201.03	1072.19	1187.17	1178.42	1184.37	1755.24	1818.41	1963.98	1948.45	1723.95	1523.56	1550.63	1341.76	1147.39	1123.32	1060.18	1100.69	1036.46	944.92	979.33	1118.02	1126.13	1062.38	988.75	1186.37	-53.14
A. Fuel combustion (sectoral approach)	81.48	81.48	68.16	80.41	81.32	41.32	37.42	35.47	34.79	30.14	16.76	17.54	19.41	21.03	24.61	26.93	26.67	26.08	24.94	24.34	31.93	33.55	40.48	37.62	34.25	33.79	35.14	38.15	35.94	29.69	72.21	85.54	79.44	18.46
1. Energy industries	2.26	2.26	2.23	1.61	1.49	1.35	1.44	1.49	1.45	1.55	0.74	0.96	0.96	1.09	1.16	1.23	1.52	1.56	1.46	1.38	1.31	1.46	1.49	1.52	1.63	1.55	1.52	1.54	1.42	1.72	1.46	1.68	1.79	-21.56
2. Manufacturing industries and construction	1.49	1.49	1.45	2.43	1.49	0.39	1.44	0.87	0.93	0.60	1.05	0.57	1.15	1.09	1.04	1.04	1.02	2.25	2.45	2.50	2.45	2.43	2.45	2.51	2.48	2.43	2.33	3.15	3.18	4.23	2.23	2.27	2.24	64.04
3. Transport	6.76	6.76	7.38	5.28	4.06	1.49	2.91	2.43	0.77	2.06	3.15	2.32	3.78	3.39	3.65	5.08	4.62	5.28	6.20	6.36	6.18	6.32	5.98	6.53	6.61	6.69	6.33	6.93	8.44	8.68	9.46	7.11	6.58	41.84
4. Other sectors	69.49	69.49	54.37	71.09	73.73	35.39	31.68	30.93	30.60	26.03	10.09	13.19	12.52	13.22	13.68	15.95	20.04	15.26	14.19	14.44	18.49	19.72	25.93	23.62	19.61	20.22	25.27	41.94	52.58	53.27	56.06	53.70	58.87	-15.19
5. Other	1.02	1.02	0.75	0.15	0.15	0.15	0.14	0.14	0.15	1.03	1.38	2.17	0.83	1.89	2.03	2.19	2.69	3.13	3.20	4.49	3.51	5.54	6.80	3.39	4.33	4.11	4.80	4.75	4.91	5.64	3.03	2.56	2.92	154.71
B. Fugitive emissions from fuels	2470.33	2470.33	2337.49	2146.49	1860.55	1720.27	1684.08	1568.62	2166.23	2249.07	1470.45	1560.94	1164.96	1733.55	1793.78	1935.88	1921.18	1696.98	1498.65	1527.97	1309.88	1113.84	1080.84	1022.77	1066.64	984.79	889.58	920.84	1047.91	1053.49	989.75	912.17	1115.22	-54.87
1. Solid fuels	1355.87	1355.87	1052.98	964.29	836.53	731.37	471.75	439.19	461.21	425.68	360.20	436.42	296.81	384.84	356.98	357.86	327.38	350.51	364.12	360.13	341.41	378.77	417.40	372.10	372.23	373.37	349.34	344.46	347.87	317.13	346.59	330.10	308.06	-75.47
2. Oil and natural gas and other emissions from e	1114.46	1114.46	1284.51	1181.19	1024.03	1010.22	1212.32	1127.43	1705.02	1823.39	1110.25	1124.52	868.15	1348.71	1436.80	1578.02	1593.80	1346.47	1134.53	1167.84	968.47	734.08	663.44	650.66	694.41	611.42	540.24	576.38	699.74	735.36	643.17	582.07	806.87	-31.68
C. CO_2 transport and storage	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Industrial processes	1.29	1.29	1.15	0.98	0.75	0.48	0.49	0.33	0.41	0.39	0.46	0.49	0.51	0.53	0.52	0.52	0.49	0.47	0.50	0.59	0.45	0.37	0.41	0.36	0.32	0.39	0.38	0.41	0.39	0.36	0.46	0.44	0.41	-68.06
A. Mineral industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
B. Chemical industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
C. Metal industry	1.29	1.29	1.15	0.98	0.75	0.48	0.49	0.33	0.41	0.39	0.46	0.49	0.51	0.53	0.52	0.52	0.49	0.47	0.50	0.59	0.45	0.37	0.41	0.36	0.32	0.39	0.38	0.41	0.39	0.36	0.46	0.44	0.41	-68.06
D. Non-energy products from fuels and solvent use	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00
E. Electronic industry																																		
F. Product uses as ODS substitutes																																		
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
3. Agriculture	1121.66	1121.66	1093.85	1072.79	1046.46	826.21	711.68	549.65	452.58	426.38	458.05	458.56	468.63	498.19	533.57	567.31	594.57	623.67	644.79	663.93	675.23	690.37	650.93	667.28	677.91	706.59	731.38	760.12	797.15	839.27	875.67	929.41	973.46	-13.21
A. Enteric fermentation	1069.82	1069.82	1023.75	1006.68	986.54	779.64	664.67	508.76	416.82	393.18	416.66	424.65	434.12	462.33	493.01	526.76	552.47	579.90	600.23	623.32	629.93	643.10	605.86	617.88	633.65	660.59	683.85	712.33	750.68	787.39	821.82	874.17	917.50	-12.22
B. Manure management	45.88	45.88	44.32	41.94	41.24	34.35	29.31	22.05	18.25	17.59	18.48	19.37	19.87	21.33	22.98	23.68	24.27	25.37	26.12	25.75	27.85	27.53	25.48	24.98	25.38	25.99	27.82	28.09	29.13	30.64	32.01	33.81	35.27	-22.39
C. Rice cultivation	26.04	26.04	24.88	24.13	22.68	12.16	17.68	18.39	17.49	15.61	14.91	14.54	14.65	14.89	17.58	16.90	17.83	18.40	18.55	13.86	18.25	19.74	19.59	19.53	18.88	20.00	20.75	19.89	21.65	21.91	21.84	21.48	20.69	-22.06
D. Agricultural soils	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
F. Field burning of agricultural residues	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
G. Liming																																		
H. Urea application																																		
I. Other carbon-containing fertilizers																																		
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
4. Land use, land use change and forestry	6.54	6.54	8.76	4.03	8.52	2.73	8.10	3.43	22.87	4.75	8.14	5.66	7.34	2.77	13.54	6.49	5.65	9.15	6.66	1.84	0.81	1.85	0.97	0.66	8.12	5.46	3.19	9.38	8.44	2.06	2.73	3.05	2.25	67.46
A. Forest land	0.07	0.07	0.38	0.08	0.05	0.16	1.35	0.53	13.55	0.78	1.38	0.83	1.14	0.97	2.22	0.95	0.85	1.44	0.46	0.38	0.14	0.45	0.17	0.28	0.07	0.09	0.48	0.03	0.46	0.38	2.46	2.66	0.71	914.28
B. Cropland	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	0.00
C. Grassland	0.47	0.47	0.47	0.47	0.47	1.41	0.94	2.83	13.22	2.83	6.84	4.24	5.53	4.84	11.32	3.54	4.24	7.71	2.53	1.45	0.77	1.48	0.80	0.28	0.05	1.29	2.74	0.38	0.88	1.74	0.23	1.06	1.54	218.75
D. Wetlands	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	0.00
E. Settlements	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
F. Other land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
G. Harvested wood products																																		
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
5. Waste	142.99	142.99	142.28	137.75	133.49	129.93	127.23	127.75	127.64	128.16	128.43	130.61	133.86	132.37	133.12	136.22	138.77	144.16	146.18	158.74	159.66	166.19	166.16	171.67	175.93	181.74	184.04	188.68	191.91	195.74	201.68	224.23	235.22	64.57
A. Solid waste disposal	60.62	60.62	63.68	64.49	68.79	70.86	72.39	73.86	75.25	76.59	77.89	79.17	80.41	81.65	82.81	84.07	85.21	86.38	87.58	91.61	95.24	99.83	103.08	108.20	111.52	114.61	117.27	119.29	120.35	122.63	125.40	128.01	129.58	112.93
B. Biological treatment of solid waste	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO,NA	NO,NA	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
C. Incineration and open burning of waste	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.03	0.02	0.01	0.01	0.02	0.00	109.00
D. Waste water treatment and discharge	82.37	82.37	78.52	71.25	64.61	58.47	54.84	53.89	52.39	51.57	50.54	51.44	53.45	50.68	50.31	52.15	53.56	57.78	58.60	58.13	64.42	66.36	62.87	63.47	64.40	67.12	66.76	69.36	71.54	73.08	76.19	96.20	106.64	28.58
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Total CH_4 emissions without CH_4 from LULUCF	3797.75	3797.75	3638.46	3458.43	3134.49	2739.44	2560.96	2282.24	2781.68	2827.66	2666.31	2268.13	2287.38	2386.27	2485.62	2667.44	2687.28	2492.26	2330.06	2345.49	2087.18	2004.32	1941.01	1889.61	1955.04	1928.11	1860.54	1928.46	2107.56	2161.47	2130.67	2142.78	2395.16	-36.96
Total CH_4 emissions with CH_4 from LULUCF	3798.29	3798.29	3639.31	3459.94	3135.01	2741.16	2569.13	2285.66	2804.45	2831.85	2674.47	2273.19	2294.72	2392.04	2499.16	2673.93	2687.33	2501.41	2330.65	2347.13	2087.61	2005.17	1941.88	1890.47	1955.16	1928.52	1863.78	1928.84	2116.49	2163.53	2142.38	2145.84	2397.85	-36.87
Memo items:																																		
International bunkers	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-59.09
Aviation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.29
Navigation	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-94.48
Multilateral operations	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-
CO_2 emissions from biomass																																		
CO_2 captured																																		
Long-term storage of C in waste disposal sites																																		
Indirect N_2O																																		
Indirect CO_2 [6]																																		

Note: All footnotes for this table are given at the end of the table on sheet 6.

TABLE 10 EMISSION TRENDS
N_2O
(Sheet 4 of 6)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year(1)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Change from base to latest reported year
													(kt)																					%
1. Energy	5.63	5.60	5.49	3.86	3.87	3.63	2.26	2.30	2.15	2.14	1.73	2.12	2.49	2.54	2.79	2.89	3.09	3.43	3.78	3.98	3.78	4.12	4.03	4.16	4.48	4.79	4.95	4.37	4.03	3.74	4.57	4.15	4.44	-21.04
A. Fuel combustion (sectoral approach)	5.53	5.57	5.25	3.77	3.21	3.61	2.25	2.23	2.13	2.13	1.73	2.07	2.43	2.45	2.71	2.85	3.05	3.33	3.68	3.88	3.67	4.06	3.93	4.15	4.34	4.67	4.83	4.37	4.15	3.65	3.46	4.06	3.95	-21.54
1. Energy industries	1.81	1.81	1.78	1.54	1.43	1.05	1.16	1.13	1.03	0.97	0.69	0.79	0.86	0.88	0.98	1.11	1.19	1.23	1.21	1.15	1.23	1.32	1.35	1.34	1.59	1.66	1.66	1.46	1.55	1.00	1.01	1.09	1.03	-10.04
2. Manufacturing industries and construction	0.23	0.22	0.21	0.17	0.20	0.20	0.07	0.17	0.15	0.15	0.07	0.20	0.21	0.22	0.36	0.34	0.37	0.40	0.45	0.43	0.47	0.52	0.64	0.63	0.36	0.51	0.53	0.54	0.54	0.53	0.37	0.37	0.39	66.24
3. Transport	0.77	0.77	0.75	0.67	0.50	0.63	0.67	0.67	0.71	0.72	0.49	0.60	0.73	0.73	0.82	0.94	0.95	1.23	1.36	1.49	1.40	1.47	1.44	1.56	1.36	1.54	1.56	1.54	1.54	1.80	1.61	2.07	2.10	35.18
4. Other sectors	0.77	0.77	0.75	0.69	0.58	0.43	0.35	0.40	0.34	0.31	0.33	0.14	0.15	0.22	0.24	0.22	0.23	0.23	0.30	0.37	0.37	0.38	0.24	0.34	0.29	0.34	0.36	0.36	0.40	0.31	0.43	0.46	0.54	-29.91
5. Other*	0.19	0.18	0.06	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.24	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-93.75
B. Fugitive emissions from fuels	0.06	0.06	0.06	0.06	0.02	0.02	0.04	0.04	0.02	0.02	0.01	0.06	0.06	0.07	0.08	0.03	0.03	0.03	0.10	0.11	0.11	0.12	0.12	0.12	0.13	0.12	0.12	0.01	0.00	0.09	0.06	0.06	0.06	10.38
1. Solid fuels	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.02	0.02	0.01	0.02	0.03	0.02	0.03	0.02	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.01	0.01	0.01	0.02	0.02	0.02	-8.74
2. Oil and natural gas and other emissions	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.05	0.06	0.01	0.01	0.01	0.07	0.08	0.08	0.09	0.09	0.09	0.09	0.10	0.09	0.07	0.06	0.05	0.04	0.03	0.04	29.09
C. CO2 transport and storage																																		
2. Industrial processes	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	0.07	0.40	0.36	0.29	0.32	0.41	0.31	0.34	0.54	0.60	0.66	0.70	0.68	0.65	0.66	0.77	100.00
A. Mineral industry																																		
B. Chemical industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.07	0.40	0.36	0.29	0.32	0.41	0.31	0.34	0.54	0.60	0.66	0.70	0.68	0.65	0.66	0.77	100.00
C. Metal industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
D. Non-energy products from fuels and solvent use	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00
E. Electronic industry																																		
F. Product uses as ODS substitutes																																		
G. Other product manufacture and use	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	0.00
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
3. Agriculture	57.74	58.74	64.74	81.01	91.46	95.61	108.43	118.01	134.21	147.14	165.10	198.51	170.44	153.18	133.16	108.06	85.48	63.64	61.78	59.88	57.91	54.11	54.49	49.79	45.28	48.46	56.46	57.35	54.69	56.44	57.74	61.06	64.01	17.52
A. Enteric fermentation																																		
B. Manure management	14.10	14.10	13.51	12.71	12.28	9.01	7.94	5.87	4.92	4.72	5.06	5.23	5.18	5.78	6.25	6.47	6.72	6.98	7.26	7.48	7.52	7.64	7.23	7.09	7.16	7.19	7.27	7.77	8.12	8.16	8.67	9.28	9.73	-31.21
C. Rice cultivation																																		
D. Agricultural soils	38.64	38.64	51.22	78.34	80.16	88.11	100.49	111.02	127.23	142.42	160.53	193.28	170.44	147.58	124.69	101.59	78.68	56.06	54.52	52.40	49.84	46.47	45.20	41.76	39.23	41.07	42.85	44.49	46.57	48.06	48.87	51.72	52.48	35.61
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
F. Field burning of agricultural residues	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
G. Liming																																		
H. Urea application																																		
I. Other carbon-containing fertilizers																																		
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
4. Land use, land-use change and forestry	1.19	1.19	1.21	1.19	1.19	1.07	0.65	3.61	4.99	3.73	1.88	1.63	1.81	1.68	2.34	0.06	0.03	0.06	0.06	0.08	0.09	0.16	0.08	0.05	0.01	0.13	0.27	0.01	0.72	0.18	0.16	0.21	0.19	-84.02
A. Forest land	1.15	1.15	1.17	1.15	1.15	1.14	3.40	3.35	3.96	2.36	1.26	1.24	1.26	1.24	1.21	0.14	0.23	0.26	0.43	0.38	0.01	0.03	0.01	0.02	0.00	0.01	0.02	0.00	0.02	0.02	0.14	0.11	0.04	-96.62
B. Cropland	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	0.00
C. Grassland	0.04	0.04	0.04	0.04	0.04	0.13	0.62	0.26	1.03	0.37	0.63	0.39	0.56	0.44	1.03	0.32	0.38	0.70	0.23	0.10	0.07	0.13	0.07	0.03	0.00	0.12	0.25	0.01	0.73	0.16	0.02	0.10	0.14	252.50
D. Wetlands	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	0.00
E. Settlements	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
F. Other land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
G. Harvested wood products																																		
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
5. Waste	0.89	0.89	0.89	0.91	0.91	0.93	0.88	0.88	0.86	0.84	0.83	0.83	0.81	0.83	0.85	0.86	0.87	0.90	0.92	0.95	0.94	1.02	1.02	1.04	1.05	1.07	1.08	1.13	1.15	1.21	1.24	1.30	1.27	42.79
A. Solid waste disposal																																		
B. Biological treatment of solid waste	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
C. Incineration and open burning of waste	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	NO,NE	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.01	100.00
D. Waste water treatment and discharge	0.89	0.89	0.89	0.91	0.91	0.93	0.88	0.88	0.86	0.84	0.83	0.83	0.81	0.83	0.85	0.86	0.87	0.90	0.92	0.95	0.93	1.01	1.01	1.04	1.04	1.06	1.08	1.10	1.13	1.21	1.23	1.28	1.27	42.79
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Total direct N_2O emissions without N_2O from LULUCF	59.26	59.26	70.93	87.78	96.64	104.21	111.86	122.07	137.22	150.68	168.17	201.46	170.93	156.71	134.53	111.03	89.27	67.44	65.88	63.85	62.41	59.56	57.94	54.58	52.27	54.86	56.45	58.38	61.13	63.27	64.11	67.11	68.54	15.69
Total direct N_2O emissions with N_2O from LULUCF	60.45	60.45	72.13	88.97	97.83	104.72	115.48	125.68	140.21	153.41	170.05	203.09	180.75	158.42	136.89	112.47	89.88	68.48	67.53	64.15	62.49	59.72	58.04	54.62	52.28	54.98	56.72	58.43	61.88	63.45	64.31	67.32	68.74	13.71
Memo items:																																		
International bunkers	0.02	0.02	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.00	1.82
Aviation	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.01	15.26
Navigation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	47.67
Multilateral operations	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
CO_2 emissions from biomass																																		
CO_2 captured																																		
Long-term storage of C in waste disposal sites																																		
Indirect N_2O	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NA,NO	NO,NE,NA	NO,NE,NA	NO,NE,NA	NA,NO	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NA	NO,NE,NA	NO,NE,NA	NO,NA	NO,NA	0.00
Indirect CO_2 (3)																																		

Note: All footnotes for this table are given at the end of the table on sheet 6.

TABLE 10 EMISSION TRENDS
HFCs, PFCs, SF_6, and NF_3
(Sheet 5 of 6)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year(1)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Change from base to latest reported year
	(kt)																																	%
Emissions of HFCs and PFCs - (kt CO_2 equivalent)	NO,NA	NO,NA	NO,NA	NO,NA	6.97	1.45	4.45	5.69	9.31	99.47	130.64	273.01	295.75	337.74	462.59	588.06	643.64	889.51	976.41	1468.08	1417.88	1695.50	1674.56	1799.83	1564.67	1819.63	1895.89	1949.38	2052.45	2247.48	2271.83	2548.58	2716.14	100.00
Emissions of HFCs - (kt CO_2 equivalent)	NO,NA	NO,NA	NO,NA	NO,NA	6.97	1.45	4.45	5.69	9.31	99.47	130.64	273.01	295.75	337.74	462.59	588.06	643.64	889.51	946.84	1019.57	1068.08	1072.93	1144.65	1256.57	1328.22	1619.87	1688.54	1746.31	1968.39	2219.50	2258.36	2528.75	2706.49	100.00
HFC-23	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-32	NO	NO	NO	NO	NO	NO	0.00	0.00	0.00	0.01	0.01	0.03	0.03	0.03	0.03	0.04	0.04	0.07	0.08	0.08	0.08	0.07	0.08	0.08	0.09	0.12	0.12	0.13	0.14	0.15	0.16	0.20	0.20	100.00
HFC-41	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-43-10mee	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-125	NO	NO	NO	NO	NO	NO	0.00	0.00	0.00	0.01	0.02	0.04	0.04	0.05	0.07	0.09	0.09	0.13	0.14	0.15	0.15	0.15	0.16	0.18	0.19	0.24	0.25	0.26	0.28	0.32	0.32	0.39	0.41	100.00
HFC-134	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-134a	NO	NO	NO	NO	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.04	0.04	0.04	0.05	0.06	0.10	0.11	0.12	0.13	0.13	0.14	0.16	0.18	0.21	0.23	0.23	0.25	0.28	0.30	0.36	0.38	100.00
HFC-143	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-143a	NO	NO	NO	NO	NO	NO	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.05	0.07	0.08	0.08	0.07	0.07	0.08	0.08	0.09	0.09	0.10	0.10	0.11	0.11	0.13	0.14	100.00
HFC-152	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-152a	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-161	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-227ea	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-236cb	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-236ea	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-236fa	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-245ca	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-245fa	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-365mfc	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Unspecified mix of HFCs(2) - (kt CO_2 equivalent)	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00
Emissions of PFCs - (kt CO_2 equivalent)	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	29.78	448.51	348.04	622.58	529.87	530.26	236.45	199.76	196.66	209.07	84.06	127.78	12.67	10.75	9.65	100.00
CF_4	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.08	0.05	0.04	0.07	0.06	0.06	0.03	0.02	0.02	0.02	0.01	0.01	0.00	0.00	0.00	100.00
C_2F_6	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.08	0.05	0.05	0.05	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
C_3F_8	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
C_4F_{10}	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
$c\text{-}C_4F_8$	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
C_5F_{12}	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
C_6F_{14}	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
$i\text{-}C_6F_{14}$	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
$c\text{-}C_6F_{12}$	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Unspecified mix of PFC_s(2) - (kt CO_2 equivalent)	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00
Unspecified mix of HFCs and PFCs - (kt CO_2 equivalent)	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00
Emissions of SF_6 - (kt CO_2 equivalent)	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	0.01	1.03	1.03	1.73	1.73	1.73	1.73	1.73	1.83	1.93	2.01	2.01	2.08	2.18	2.18	2.31	2.31	2.37	100.00
SF_6	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
Emissions of NF_3 - (kt CO_2 equivalent)	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00
NF_3	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00

Note: All footnotes for this table are given at the end of the table on sheet 6.

TABLE 10 EMISSION TRENDS
SUMMARY
(Sheet 6 of 6)

Inventory 2021
Submission 2023 v1
KAZAKHSTAN

GREENHOUSE GAS EMISSIONS	Base year[1]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Change from base to latest reported year
	CO_2 equivalent (kt)																																	(%)
CO_2 emission without net CO_2 from LULUCF	268184.48	268184.48	261140.71	230247.41	208275.98	174864.17	168509.77	154540.93	146470.61	144588.49	119072.89	143453.45	138849.95	157604.40	173944.21	184477.42	200187.60	230715.37	236939.04	250688.39	224733.93	248988.45	239925.32	246663.76	255488.93	276305.94	276705.46	277749.27	293584.98	307199.95	275341.96	255512.75	238253.17	-3.75
CO_2 emission with net CO_2 from LULUCF	253001.43	253001.43	255548.03	216250.51	212557.33	210017.43	210007.93	210847.70	210004.13	214677.69	165944.01	165767.68	206431.93	220887.85	217314.87	268748.68	287931.34	310985.15	321486.15	360245.49	269161.51	298676.69	293502.71	279595.47	261758.69	290596.57	301194.90	299555.44	314101.14	330388.94	292194.36	270479.13	258259.70	2.12
CH4 emission without CH4 from LULUCF	94943.72	94943.72	90960.05	85968.84	78113.17	68496.11	64924.04	64535.92	60539.55	59676.58	53458.23	56703.35	55184.65	59656.44	63149.56	66686.02	64556.95	62596.58	57848.93	54142.38	51927.51	50188.98	48525.39	47245.14	48876.12	48293.78	46513.51	46111.54	52498.93	54836.91	53491.86	53656.05	53808.92	-36.92
CH4 emission with CH4 from LULUCF	94927.22	94927.22	90979.05	85974.84	78125.17	68529.11	64928.74	64641.42	60611.55	59796.33	53462.73	56826.75	55829.75	59967.93	63278.06	66848.27	64810.95	62536.16	58023.68	54178.28	51956.16	50154.31	48549.53	47494.84	48879.12	48238.03	46592.51	46211.04	52909.93	54908.91	53559.14	53644.69	53847.17	-36.87
N2O emission without N2O from LULUCF	17628.65	17628.65	21135.25	20147.87	20787.91	20173.51	19195.36	20376.83	18296.95	16721.38	16115.58	16606.47	15914.08	16296.78	16896.08	15318.67	20604.86	20008.16	19829.23	19636.85	18599.57	17748.78	17371.68	16243.35	15276.04	16347.38	16852.76	17248.49	16211.85	16854.66	16117.45	16984.17	20963.69	-5.43
N2O emission with N2O from LULUCF	18914.30	18914.30	21492.64	20215.60	20132.41	19206.78	18231.35	17410.53	15750.97	15036.79	14676.34	16520.75	15854.64	17208.33	16794.17	15516.25	16763.73	20166.19	20125.61	19115.78	18622.61	17756.38	17295.23	16277.96	15276.93	16384.63	16863.85	17437.73	16441.78	16906.79	15954.64	20963.69	21473.79	-3.13
HFCs	NA,NO	NA,NO	NA,NO	NA,NO	0.37	1.63	4.45	6.85	8.13	10.43	16.64	27.145	29.13	37.73	49.55	58.05	64.64	88.53	94.84	109.07	104.08	107.38	114.65	119.37	122.63	163.63	188.56	178.93	196.46	209.07	84.96	127.78	12.67	34.7	9.63	100.00
PFCs	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	29.79	448.52	344.14	619.34	539.87	556.26	256.42	199.76	196.46	209.07	84.96	127.78	12.67	34.7	9.63	-100.00
Unspecified mix of HFCs and PFCs	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00
SF6	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	0.00
NF3	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	0.00
Total (without LULUCF)	380796.87	380796.87	373556.01	340163.12	311186.43	273627.68	265005.61	255429.38	235313.13	235398.58	213177.15	243046.37	237524.60	264195.49	278413.30	267019.12	291956.10	294009.25	305005.52	301627.37	296270.69	318125.26	310366.53	311063.93	321410.63	340737.73	343962.37	345110.74	364471.45	382140.51	350500.09	351024.26	361209.59	-5.12
Total (with LULUCF)	365973.61	365973.61	365140.33	346730.60	330194.26	310274.40	303160.68	301688.65	291664.23	293497.65	229614.73	261331.17	317184.66	356334.30	368852.73	369700.03	379611.01	398775.30	406503.58	445603.58	357968.51	369351.35	349419.53	344655.86	317784.51	369055.50	362154.47	360495.67	395056.26	408533.86	367191.36	351193.51	347847.13	-3.35
Total (without LULUCF, with indirect)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
Total (with LULUCF, with indirect)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year[1]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Change from base to latest reported year
	CO_2 equivalent (kt)																																	(%)
A - Energy	310348.64	310348.64	300989.41	273168.06	248336.95	207648.49	198117.16	190568.87	186577.68	185492.78	140919.71	168901.21	164750.73	184488.96	203517.60	215607.98	227956.61	243552.48	243804.59	249133.69	219571.95	240459.96	240119.96	235851.02	242524.10	259573.78	270806.26	268773.13	280511.92	294666.49	270886.41	257324.71	239437.94	-8.16
B - Industrial processes and product use	22737.48	22737.48	25731.60	19795.45	16820.61	15685.27	11990.69	10257.10	11771.48	10108.72	10292.11	17581.35	18159.73	18413.39	20194.51	20326.20	20852.61	20448.79	21834.63	21839.39	21329.51	20434.29	21331.77	21158.11	22314.01	24191.73	25861.09	26079.58	25561.98	26535.75	25762.76	25031.17	27164.60	19.50
C - Agriculture	43868.95	43868.95	46730.63	51605.61	53020.14	49801.66	50145.38	49937.38	50724.01	54506.17	60597.27	70620.38	64111.20	69155.41	52049.91	46285.12	48511.21	46378.88	34527.19	34132.82	33074.55	33385.38	33889.91	30673.61	30773.52	32164.95	33304.86	34584.21	36218.65	37856.18	39491.92	41493.52	43845.43	-5.22
E - Land use, land use change and forestry[2]	-14813.93	-14813.93	-9113.68	-15372.51	-5030.84	-4369.45	-54129.38	-57468.04	-74504.56	-71665.45	-48427.45	-53919.79	-50117.48	-52026.51	-63209.37	-83426.48	-87135.48	-90767.38	-94898.66	-81345.28	-61228.96	-50786.38	-42384.09	-39941.39	-43955.48	-40112.83	-37285.36	-31594.93	-30584.93	-26193.69	-17333.39	-20781.23	-8117.39	-116.18
G - Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Total checksheet 1 (GHG)[3]	365973.61	365973.61	365140.33	346730.60	330194.26	310274.40	303160.68	301688.65	304664.23	293497.65	229614.73	261331.17	317184.66	356334.30	368852.73	369700.03	379611.01	398775.30	406503.58	445603.58	357968.51	369351.35	349419.53	344655.86	317784.51	369055.50	362154.47	360495.67	395056.26	408533.86	367191.36	351193.51	347847.13	-3.35

(1) The column 'Base year' should be filled in only by those Parties with economies in transition that use a base year different from 1990 in accordance with the relevant decisions of the COP. For these Parties, this different base year is used to calculate the percentage change in the final column of this table.
(2) Fill in net emissions/removals as reported in table Summary 1.A. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).
(3) In accordance with the UNFCCC reporting guidelines, for Parties that decide to report indirect CO2 the national totals shall be provided with and without indirect CO_2.
(4) In accordance with the UNFCCC reporting guidelines, HFC and PFC emissions should be reported for each relevant chemical. However, if it is not possible to report values for each chemical (i.e. mixtures, confidential data, lack of disaggregation), this row could be used for reporting aggregate figures for HFCs and PFCs, respectively. Note that the unit used for this row is kt of CO_2 equivalent and that appropriate notation keys should be entered in the cells for the individual chemicals.
(5) Includes net CO_2, CH_4 and N_2O from LULUCF.

Documentation box:

• Parties should provide detailed explanations on emission trends in chapter 2: Trends in Greenhouse Gas Emissions and, as appropriate, in the corresponding Chapter 3 – 9 of the national inventory report (NIR). Use this documentation box to provide references to relevant sections of the NIR if any additional information and further details are needed to understand the content of this table.

Use the documentation box to provide explanations if national emissions are reported.

Documentation box: Calculation will be made in case of data availability on the carbon balance in the period 1990-2013.3.A.1 Dairy Cattle 3.A.1 Non-Dairy Cattle Average annual population of livestock was used, explanation is shown in section 5.5 of the NIR3.A.2 Sheep Average annual population of livestock was used, explanation is shown in section 5.5 of the NIR3.A.3 Swine Average annual population of livestock was used, explanation is shown in section 5.5 of the NIR3.A.4 Goats Goats Average annual population of livestock was used, explanation is shown in section 5.5 of the NIR4. 4.1 – 4.A.1 Carbon stock change 4.B.1 Carbon stock change 4.C.A Solid Wood 4.C.A Paper and Paperboard 4.C.A HWP in SWDS: Carbon stock change are include in CRF tables. Comment is shown in ch. 7 of NIR5.C.1.1.