**ҚАЗАҚСТАН РЕСПУБЛИКАСЫ ЭКОЛОГИЯ, ГЕОЛОГИЯ 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

**Нұр-Сұлтан қ., 2022 жыл**

## КЕЛІСУ ПАРАҒЫ

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

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# 1. 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 2022 жылғы 20 қаңтардағы Қызметтерді мемлекеттік сатып алу туралы №11 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 және SEF) кестелері берілген.

## 2. ЖПЕ (CRF) кестелерінің жалпы сипаттамасы

Қазақстан Республикасының 1990-2020 жылдар кезеңіндегі Парниктік газдарды ұлттық түгендеу бойынша қорытындыларына сәйкес Қазақстан Республикасында базалық 1990 жылы ПГ-дың жиынтық шығарындылары:

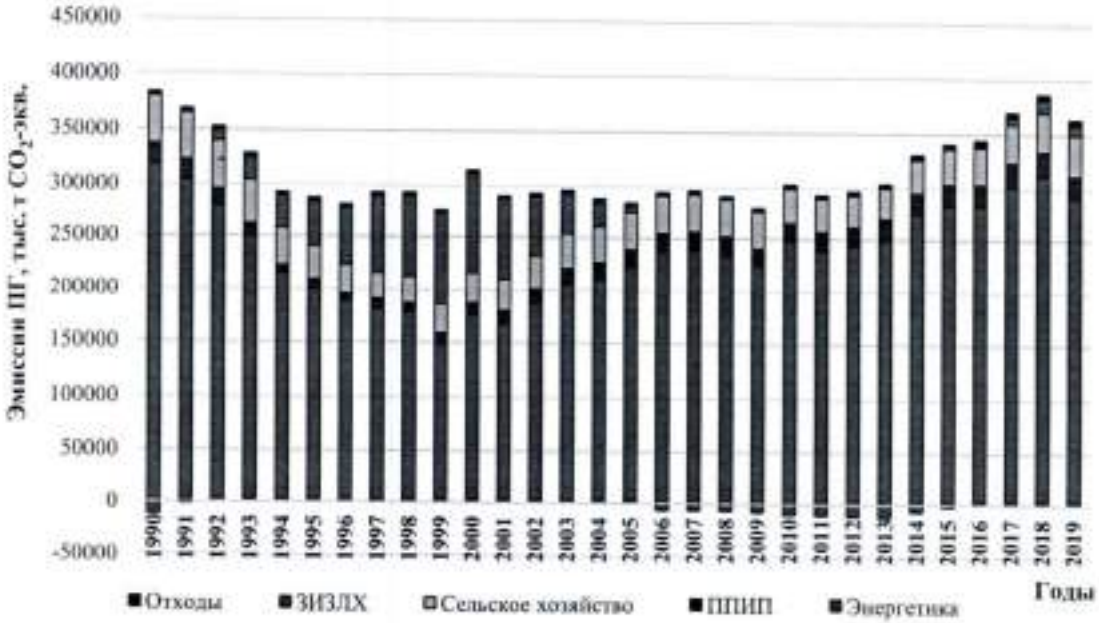
- ЖЖОШӨ секторын есепке алмағанда 387 227,34 мың т $CO_2$-экв.,
- ЖЖОШӨ секторын есепке алғанда 383 286,13 мың т $CO_2$-экв. құрады.

2020 жылы ПГ-ның ұлттық шығарындылары:

- ЖЖОШӨ секторын есепке алмағанда 345 589,56 мың т $CO_2$-экв.,
- ЖЖОШӨ секторын есепке алғанда 353 599, 49 мың т $CO_2$-экв.

1-кесте-Қазақстан Республикасындағы 1990-2020 жылдардағы парниктік газдар шығарындылары, мың т CO2-эквиваленті

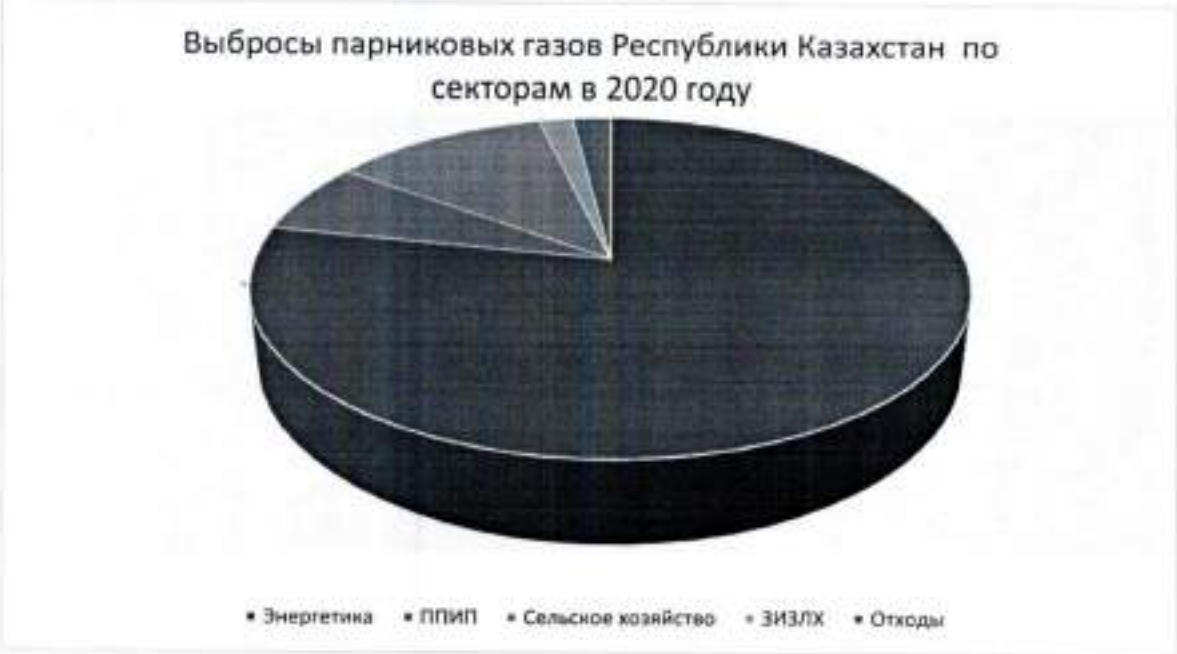
| Сектор | 1990 | 2020 | Өзгеріс, % |
|---|---|---|---|
| **ЖЖОШӨ бар жалпы шығарындылар** | **383 286,13** | **351 798,9** | **-8,3** |
| **ЖЖОШӨ жоқ жалпы шығарындылар** | **387 227,34** | **345 428,0** | **-10,8** |
| **Энергетика** | 318542,9 | 274000,2 | -14,0 |
| **ӨПӨП** | 19290,2 | 23510,1 | 21,9 |
| **Ауыл шаруашылығы** | 44742,1 | 40725,0 | -9,0 |
| **ЖЖОШӨ** | -3856,9 | 6370,9 | 265,2 |
| **Қалдықтар** | 4742,0 | 7192,7 | 51,7 |




1-сурет - Қазақстан Республикасындағы 1990 жылдан 2020 жылға дейінгі секторлар бойынша парниктік газдардың жалпы эмиссиялары

«Энергетика» секторында 2020 ж. базалық тәсіл бойынша парниктік газдар шығарындылары төмендегілерді құрады: 274000,2 мың т $CO_2$-экв. немесе 2020 жылғы шығарындылардың жалпы санынан 77,8%.

1990 жылмен салыстырғанда «Энергетика» секторы бойынша парниктік газдар шығарындылары 14% - ға қысқарды (2-сурет).



Энергетикамен салыстырғанда Өнеркәсіптік процестер және өнімдерді пайдалану (бұдан әрі – ӨПӨП) секторында 1990 жылмен салыстырғанда парниктік газдар шығарындыларының 21,9% - ға ұлғаюы байқалады. 2020 жылы ӨПӨП секторындағы жиынтық шығарындылар 23 510,1 мың тоннаны құрады.

«Ауыл шаруашылығы» секторындағы парниктік газдар шығарындылары 2020 жылы 40 725 мың тонна $CO_2$-экв құрады және 1990 жылмен салыстырғанда 9% - ға қысқарды. «Қалдықтар» секторының парниктік газдар шығарындылары 1990 жылмен салыстырғанда 51,7%-ға өсті және $CO_2$-экв 7 192,7 мың тоннаны құрады.

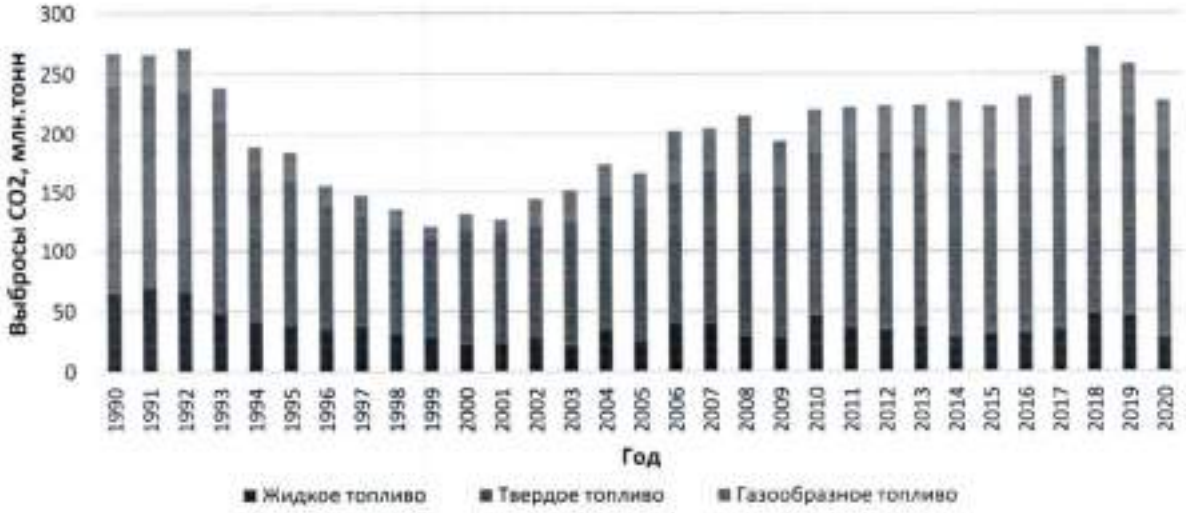
«ЖЖӨОШ» секторы қазіргі уақытта шығарындылары 7 192,7 мың тонна $CO_2$-экв құрайтын парниктік газдардың эмитенті болып табылады.

## 3. «Энергетика» секторының ЖПЕ (CRF) кестелерінің сипаттамасы 1990...2020 жылдардағы секторлық тәсіл бойынша «Энергетика» секторындағы парниктік газдар шығарындылары

«Энергетика» секторында базалық тәсіл бойынша 2020 жылы отынды тұтынудың жалпы көлемі **2946,735 ПДж** құрады. 1990ж. деңгейімен салыстырғанда ол 10,01-ға және 2019 ж. деңгейінен 10,89%-ға төмен (2-кесте).

2020 жылы $CO_2$ шығарындылары «Энергетика» секторында базалық тәсіл бойынша **228,429 млн. тоннаны** құрады, ол 1990 ж деңгейінен 14,75%-ға және 2019 ж. деңгейінен 11,52%-ға аз.

Сұйық отынды тұтынуда, атап айтқанда, өндірілетін шикі мұнай мөлшерінің төмендеуі себебінен шикі мұнайды нақты тұтынудың **396,526 ПДж**-дан **129,065 ПДж**-ға дейін төмендеуінде елеулі өзгерістер байқалады. 2020 жылы сұйық отыннан парниктік газдар шығарындылары **27,738** млн. тонна $CO_2$ экв құрады. Бұл көрсеткіш 1990 жылғы деңгейден 57,38% - ға және 2019 жылғы деңгейден 39,91% - ға аз. Шығарындылардың шамалы төмендеуі қатты отынды тұтынуда байқалады: **1803,658 ПДж** - дан **1697,045 Пж**-ға дейін. 2020 жылы қатты отынды тұтынудан парниктік газдар шығарындыларының төмендеуі энергетикалық және тас көмір экспортының ұлғаюына байланысты болды, бұл өз кезегінде қатты отынды нақты тұтынуға әсер етті.




3-сурет – «Энергетика» секторында базалық тәсіл бойынша 1990...2020 жылдардағы $CO_2$ шығарындыларының динамикасы» млн. тонна.

2019 жылғы парниктік газдар шығарындыларындағыдай, сұйық отынды тұтынудан шығарындылардың азаюы автомобиль бензині мен дизель отынын тұтынудың төмендеуімен де байланысты.

Автомобиль бензині жағдайында елеулі өзгеріс экспорттың өсуімен байланысты, бұл парниктік газдар шығарындыларын есептеу үшін қолданылатын формулаға сүйене отырып, отынның осы түрін нақты тұтынуға тікелей әсер етті.

2-кесте – 1990...2020 жылдарға арналған базалық тәсіл бойынша «Энергетика» секторында отын тұтыну

| Жыл | Барлығы | Отынның түрлері бойынша, ПДж | | | Жалпы $CO_2$, | Отынның түрлері бойынша $CO_2$ шығарындлары, млн тонна | | |
|---|---|---|---|---|---|---|---|---|
| | ПДж | Сұйық отын | Қатты отын | Газ отыны | млн тонна | Сұйық отын | Қатты отын | Газ отыны |
| 1990 | **3274,402** | 926,78 | 1847,903 | 499,719 | **267,943** | 65,089 | 175,081 | 27,773 |
| 1995 | **2225,182** | 533,076 | 1258,262 | 433,844 | **184,122** | 38,426 | 121,358 | 24,339 |
| 2000 | **1597,562** | 322,078 | 1003,175 | 272,309 | **131,626** | 22,81 | 93,632 | 15,184 |
| 2005 | **2114,049** | 357,326 | 1184,806 | 571,917 | **166,506** | 25,007 | 111,465 | 30,034 |
| 2010 | **2807,127** | 647,246 | 1455,721 | 704,159 | **220,271** | 45,942 | 136,168 | 38,161 |
| 2015 | **2973,823** | 494,831 | 1479,412 | 999,58 | **223,653** | 30,829 | 137,789 | 55,036 |
| 2016 | **3102,705** | 520,974 | 1495,956 | 1085,774 | **231,739** | 32,615 | 139,664 | 59,461 |
| 2017 | **3300,067** | 572,258 | 1633,936 | 1093,873 | **247,988** | 35,772 | 152,267 | 59,948 |
| 2018 | **3627,508** | 751,751 | 1727,128 | 1148,629 | **272,878** | 48,567 | 161,174 | 63,136 |
| 2019 | **3306,762** | 709,595 | 1803,658 | 793,509 | **258,162** | 46,158 | 168,577 | 43,427 |
| 2020 | **2946,735** | 459,438 | 1697,045 | 790,252 | **228,429** | 27,738 | 158,155 | 42,536 |

**1990...2020 жылдардағы секторлық тәсіл бойынша «Энергетика» секторында парниктік газдар шығарындылары**

КӨҮСТ 2006 ж. Басшылығына сәйкес секторлық тәсіл бойынша «Энергетика» секторында ПГ шығарындыларын ($CO_2$, $CH_4$, $N_2O$, NOx, CO, NMVOC и $SO_2$) бағалау экономикалық қызметтің келесі санаттары бойынша орындалды: **1.A.1 ЖЭФ Энергетикалық өнеркәсіп, 1.A.2 ЖЭФ Өңдеуші өнеркәсіп және құрылыс, 1.A.3 Транспорт, 1.A.4 Басқа секторлар, 1.A.5 Өзге көздер.**

4-сурет – «Энергетикалық өнеркәсіп» санатында 1990...2020 жылдардағы негізгі көздер бойынша ПГ шығарындылары (секторлық тәсіл, млн. тонна).

«Энергетика» секторында ПГ шығарындыларының негізгі көзі **«Энергетикалық өнеркәсіп»** санаты болып табылады: 2020 жылы осы санатта жалпы отынды тұтыну **1676,567 ПДж** құрады, ол 1990 жылға қатысты 1,04%-ғаартық, 2019 жылға қатысты - 0,7 %-ға артық(2-кесте). «Энергетикалық өнеркәсіп» санатында 2020 жылы жалпы ПГ шығарындылары **144,383 млн. тонна $CO_2$-экв.** (4-сурет) құрады, ол 1990 ж. деңгейінен 0,1%-ға аз және 2019 ж. деңгейінен 0,1%-ға аз.

**«Өңдеуші өнеркәсіп және құрылыс 1.A.2 ЖПЕ»** санаты ҚР аумағында жүзеге асырылатын өнеркәсіп салаларында отынды жағудан ПГ шығарындыларын қамтиды. Бұл санатқа: **1.A.2a «Қара металлургия», 1.A.2b «Түсті металлургия», 1.A.2c «Химиялық өнеркәсіп», 1.A.2d «Целлюлоза-қағаз өнеркәсібі», 1.A.2e «Тамақ өнеркәсібі» және 1.A.2f «Метал емес минералды өнімдер», 1.A.2g «Өнеркәсіптің барлық басқа салалары»** жатады.

Осы санаттағы негізгі тұтынылатын отын – қатты отын, 2020 жылы тұтынылған отынның жалпы санының 72,15%. Осы санатта жалпы отын тұтынуы 2020 ж. **320,268** құрады, ол 1990 ж. деңгейінен 22,85% және 2019 ж. деңгейімен 4,28%-ға артық. «Өңдеуші өнеркәсіп және құрылыс» санатындағы $CO_2$ шығарындылары 2020 ж. **26,631 млн. тонна $CO_2$**-экв. (2-сурет) құрады, ол 1990 ж. деңгейіне қатысты 28, %-ға және 2019 ж. деңгейіне қатысты 2,06%-ға артық құрады.

**«Басқа секторлар1.А.4 ЖПЕ»** санаты келесі санатшаларды қамтиды: **1.А.4а «Коммерциялық/институционалдық сектор», 1.А.4b «Тұрғын үй секторы» және 1.А.4с «Ауыл/Орман/Балық шаруашылығы»**. 2020 жылы «Басқа секторлар» санатында тікелей ПГ жиынтық шығарындылары 1990 жыл деңгейінен 40,67%-ға, 2019 ж. деңгейінен 20,66%-ға кем және **33,429 млн. тонна** $CO_2$**-экв.** құрайды (2-сурет).

Парниктік газдар шығарындыларының көп бөлігін отынның екі түрі шығарады – қатты (45,71%) және газ тәрізді отын (36,33%). «Басқа секторлар» санатындағы шығарындылардың негізгі көзі - 1.А. 4В «Тұрғын үй секторы». 2020 жылы осы санаттағы отынды жалпы тұтыну **327,104 ПДж** немесе осы кіші санаттағы тұтынылған отынның жалпы санының 77,87% - ын құрады.

**«Басқа көздер 1.А.5»** санатындағы тікелей парниктік газдардың жиынтық шығарындылары 2020 жылы $CO_2$-экв 22,279 млн. тоннаны құрады. (3-кесте) бұл 1990 жылы шығарындылар деңгейінен 2,5 есе көп және 2019 жылғы деңгейден 22,89% - ға аз, 2020 жылы «Басқа көздер» кіші санатындағы отынды жалпы тұтыну **255,333 ПДж** құрады, оның көп бөлігі қатты отынға тиесілі (59,58%).

3-кесте –1990...2020 жж. үшін секторлық тәсіл бойынша «Энергетика» секторында отынды тұтыну және $CO_2$ шығарындыларының динамикасы

| Жыл | Барлығы | | Энергетикалық өнеркәсіп | | Өңдеуші өнеркәсіп және құрылыс | | Басқа секторлар | | Өзге көздер | |
|---|---|---|---|---|---|---|---|---|---|---|
| | ПДж | Млн тонна $CO_2$–экв. | ПДж | Млн тонна $CO_2$–экв. | ПДж | Млн тонна $CO_2$–экв. | ПДж | Млн тонна $CO_2$–экв. | ПДж | Млн тонна $CO_2$–экв. |
| 1990 | **2981,109** | **249,017** | 1659,194 | 142,369 | 247,096 | 19,052 | 656,413 | 56,345 | 114,192 | 8,934 |
| 1995 | **1839,026** | **155,082** | 1118,61 | 96,573 | 198,433 | 16,162 | 379,457 | 31,986 | 19,965 | 1,414 |
| 2000 | **1461,061** | **121,725** | 707,431 | 60,805 | 261,819 | 22,285 | 121,887 | 9,522 | 229,874 | 19,522 |
| 2005 | **2098,024** | **172,185** | 1093,513 | 92,263 | 338,512 | 29,223 | 160,802 | 13,072 | 263,091 | 20,979 |
| 2010 | **2732,206** | **220,254** | 1229,647 | 103,753 | 355,08 | 30,052 | 216,238 | 16,533 | 631,735 | 48,549 |
| 2015 | **3345,505** | **270,019** | 1559,165 | 133,166 | 438,602 | 37,601 | 377,137 | 29,041 | 672,405 | 48,466 |
| 2016 | **3387,535** | **253,502** | 1589,076 | 136,033 | 423,725 | 36,629 | 373,584 | 28,941 | 687,567 | 47,462 |
| 2017 | **3619,543** | **287,706** | 1673,408 | 143,423 | 434,615 | 37,093 | 400,547 | 32,357 | 776,302 | 50,481 |
| 2018 | **3814,884** | **301,031** | 1724,332 | 148,184 | 425,082 | 36,108 | 415,631 | 33,378 | 886,989 | 57,21 |
| 2019 | **3328,895** | **268,266** | 1665,331 | 144,532 | 306,556 | 26,082 | 563,588 | 42,134 | 425,208 | 28,896 |

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

Қазақстан Республикасының 1990-2019 жылдарға арналған Монреаль хаттамасымен реттелмейтін көздерден антропогендік шығарындылар кадастры және парниктік газдар сіңіргіштері абсорбциясы туралы ұлттық баяндамасын халықаралық сарапшылар тобының талдауы бойынша ұсынылған құжаттарға сәйкес «Энергетика» секторы үшін ескертулерді үш негізгі санатқа бөлуге болады: CRF жалпы форматындағы кестеге («NO», «NE» және «IE») кілттерін белгісін дұрыс пайдалануға қатысты, кокстелетін көмірді тұтынуға («Өзге де көздер 1.A.5» санаты бойынша ескертулер) 1990-1998 жылдардағы ПГ шығарындыларын қайта есептеуге қатысты ескертулер.

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

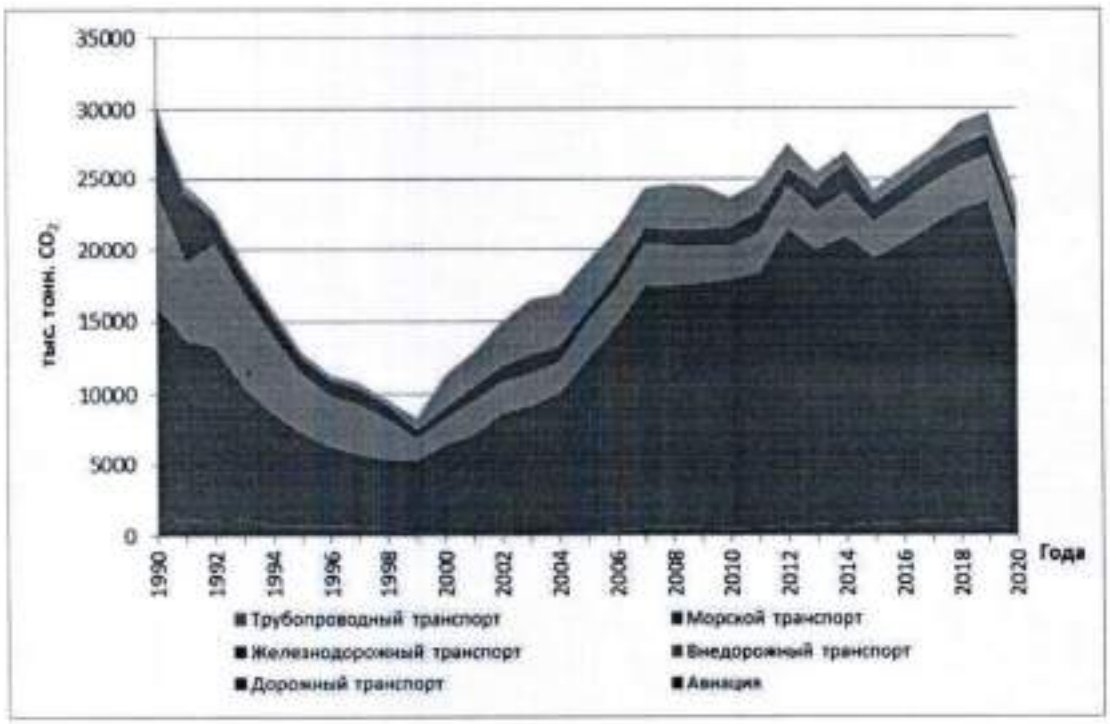
Кокстелетін көмірді пайдалану жөніндегі деректер «АрселорМиталл Теміртау»АҚ кәсіпорындарына ұсынылған деректер негізінде қайта қаралды және қайта есептелді. Бұл кәсіпорын қара металлургия қажеттіліктері үшін кокстелетін көмірдің жалғыз ірі тұтынушысы болып табылады. Осы фактіге сүйене отырып, кейіннен кокс болып қайта қалыптасу үшін «АрселорМиталл Теміртау» АҚ кокстелетін көмірді тұтыну туралы деректерге негізделе отырып, 2014-2019 жылдардағы бірқатар деректерді қайта есептеу туралы шешім қабылданды.

Отынды тұтыну бойынша сенімді статистикалық деректердің болмауына байланысты 1990-1998 жылдар кезеңіндегі деректерді қайта есептеу мүмкін болмады. ҚР ҰЭМ Ұлттық статистика бюросы 1990 жылғы отын-энергетикалық теңгерім құжатын ұсынды, бірақ бұл құжатта «Энергетика» секторында парниктік газдарды ұлттық түгендеу бойынша есептеулер жүргізу үшін талап етілетін Қазақстан Республикасының аумағында отынды тұтыну бойынша толық статистикалық деректер ұсынылған жоқ. Осы фактіні назарға ала отырып, 1990 жылғы ПГ шығарындыларын қайта есептеуді жүргізу 2006 жылғы КӨҮСТ Басшылық қағидаттарына жауап бермейтінін айтамыз.

## 4. «Көлік» санатындағы ЖПЕ (CRF) кестелерінің сипаттамасы

2020 жылға арналған көлік секторындағы эмиссиялардың өзгеру себептерін сипаттау.

2020 жылы көлік санатындағы жалпы эмиссиялар 26620,44 $CO_2$-ден 18725,75 $CO_2$-ге дейін азайды, 5-сурет.




5-сурет – 1990-2020 жж. Көлік секторынан парниктік газдар эмиссиялары (Гг $CO_2$).

Ұлттық статистика бюросының деректеріне сәйкес ҚР-дағы көлік тасымалдарының көлемі соңғы жылдары COVID19 пандемиясына қарамастан тұрақты өсті, мұндай үрдіс жүктер үшін сақталды, алайда жолаушылар тасымалы айтарлықтай қысқарды. Әуе, теміржол және теңіз көліктеріне үлкен қысқартулар әсер етті. Айта кету керек, эмиссиялардың айтарлықтай төмендеуі Қазақстан темір жолы (темір жол тасымалы) Air Kazakhstan (авиатасымалдаушы) және басқа да барлық ұлттық операторлардың жолаушылар тасымалының азаюына байланысты болды. Авиациялық тасымалдар әсіресе айтарлықтай азайды, өйткені бірнеше бағыттарды коспағанда, барлық халықаралық рейстер жарты жылдан астам уақытқа тоқтатылды.

Жүк тасымалы толығымен жүзеге асырылды және әсіресе теміржол байланыстары үшін тіпті біршама өсті. Халықаралық және ішкі рейстерді көлік

авиациясы орындады, автомобиль жүк тасымалдары жүзеге асырылды. Мұнай мен газды құбыр арқылы айдау көлемі айтарлықтай төмендеген жоқ. Су көлігі үшін тасымалдау көлемі де 2019 жылғы айналымның жартысына жуығына қысқарды.

## Халықаралық сарапшылар тобының ұсынымдарына сәйкес «Көлік» санаты бойынша ұлттық түгендеуді жақсарту

«Көлік» санаты біріктірілген, оған эмиссиялар саны бойынша бірнеше маңызды ішкі санаттар кіреді, бірақ санаттардың әрқайсысы үшін байқалатын бірқатар жалпы проблемалар бар.

Атап айтқанда, бұл белгілеу кілттерін пайдалану, сарапшылар анықтаған немесе қосымша тексерулер кезінде анықталған техникалық қателер, сондай-ақ сарапшылардың ұсыныстарымен де, бастапқы ақпаратты жақсарту қажеттілігімен де туындаған қайта есептеулер.

Белгілеу кілттері авиация кіші санатындағы биоотын сарапшыларының ұсынысы бойынша өзгертілді. Техникалық қателік анықталғандықтан, ішкі авиация үшін бүкіл жол қайта есептелді.

Сондай-ақ, жол талғамайтын көлік, теңіз навигациясы және теміржол көлігі ішкі санаттарына да қатысты болды. Қайта есептеу азот оксиді мен метан үшін басқа коэффициенттерді қолдану туралы ұсыныстан туындады.

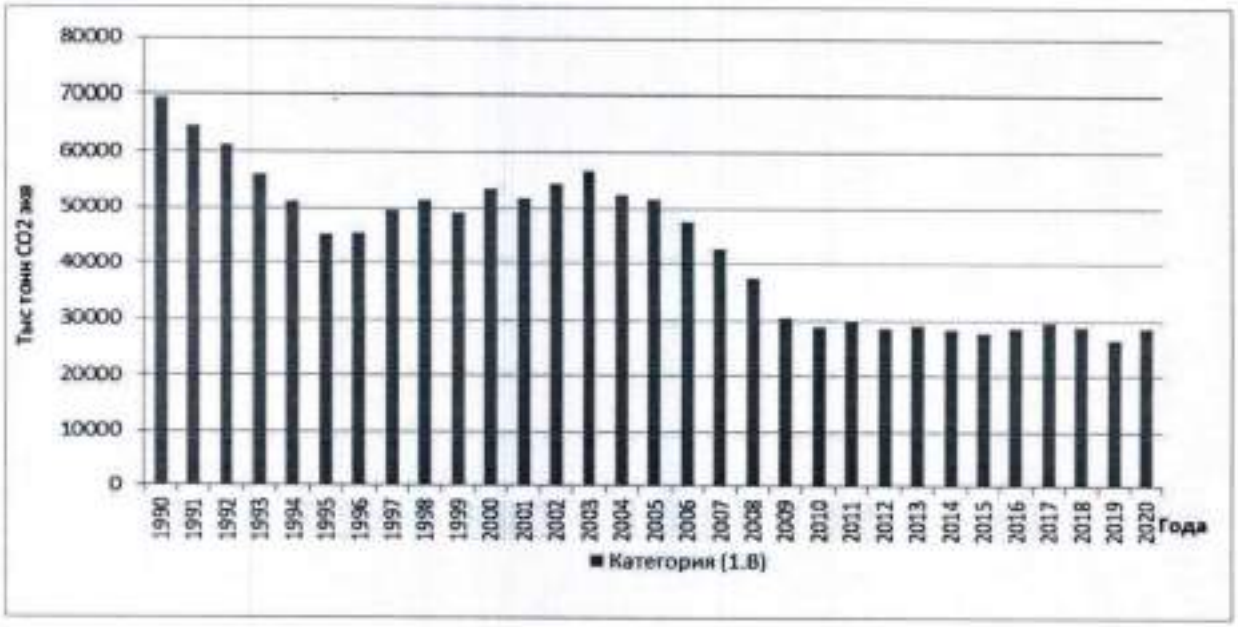
Есептің негізгі бөлігін толық түсіну үшін әдістемелік тәсілдер мен бастапқы деректердің ашықтығы бойынша түсініктемелер кеңейтілді.

## 5. «Ұшпа шығарындылар» санатындағы ЖПЕ (CRF) кестелерінің сипаттамасы

Қазақстан Республикасында «Ұшпа шығарындылар» санатындағы қызметтен парниктік газдар эмиссиялары екі негізгі көзден түзіледі: Көмір кен орындарын игеру (Қатты отын 1.B.1) және Көмірсутек шикізатын өндіру (Сұйық және газ тәрізді отын 1.B. 2). Ұсынылған ішкі санаттардың әркайсысында шикізатты тасымалдауға, оны байытуға, өңдеуге және сақтауға, сондай-ақ соңғы тұтынушыға бөлуге байланысты қосымша эмиссия көздері бар. Ұсынылған ішкі санаттардың әрқайсысында шикізатты тасымалдауға, оны байытуға, өңдеуге және сақтауға, сондай-ақ соңғы тұтынушыға бөлуге байланысты қосымша эмиссия көздері бар. Сонымен қатар, отынның өзгеруіне байланысты (1.B.1.b), алауларда ілеспе газды желдету және жағу (1.B.2.c) [1] көздердің кіші санаттары да бар.

«Ұшпа эмиссия» санатындағы қызмет нәтижесінде пайда болатын негізгі парниктік газ метан ($CH_4$) болып табылады. Сонымен қатар, ұшпа шығарындыларда көмірқышқыл газы ($CO_2$), ал кейбір жағдайларда ұшпа емес органикалық қосылыстар (NLOS) және азот оксиді ($N_2O$) болуы мүмкін. 2020 жылы ұшпа эмиссиялар санатынан жиынтық эмиссиялар $CO_2$экв 28552,7 мың тоннаны құрады. Бұл 2019 жылға қарағанда 1952,1 мың тонна $CO_2$ экв (9.4 %) артық және 1990 жылға қарағанда 143,5% аз (69525,60 мың тонна $CO_2$экв), 2-сурет. Өзгерістердің бірнеше себептері бар, сондықтан жабық тәсілмен өндірілетін көмірдің үлесі 2020 жылы 1990 жылмен салыстырғанда 58,36-дан 10,05 млн тоннаға дейін бес еседен астам төмендеді. Сонымен қатар ашық тәсілмен өндірілетін көмір көлемі ұлғайып, кейбір жылдары 1990 жылы 30 млн тоннаға артты, есепті жылы ашық өндіру 88,78 млн тоннаны құрады. Сала ішінде мұндай қайта бөлу 2020 жылы ПГ эмиссияларының $CO_2$ - экв 6014,57 мың т дейін төмендеуіне алып келді, бұл 2019 жылғы эмиссиядан 2,57% - ға төмен, ал базалық 1990 жылмен салыстырғанда эмиссиялардың азаюы 325,68% - ды құрады.

[1] https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/2_Volume2/19R_V2_4_Ch04_Fugitive_Emissions.pdf




6-сурет - 1.В. «Фугитивті көздер» санатынан $CO_2$ экв. жиынтық эмиссиялар

2020 жылға арналған бағалау бойынша 1.В.2 санаттағы жиынтық эмиссиялар $CO_2$ экв 4845,12 мың тоннаны құрады, бұл базалық 1990 жылға қарағанда 388,4% - ға аз (23665,96 мың тонна $CO_2$ экв). Санат кейбір санаттарды қайта топтастыру немесе деректерді жаңарту арқылы үнемі жаңартылып отырады, сонымен қатар GER (2019 және 2021 жж.) ескертулерін ескере отырып, бүкіл санатты жақсарту бойынша үнемі жұмыс жүргізілуде.

Мұнаймен байланысты жасалатын операциялардан ПГ эмиссиясы 2019 жылы 20%-дан астамға төмендеді. Бұл бірнеше себептерге байланысты. Бірінші кезекте, бастапқы деректердің барлық қатары қайта қаралды және мұнайды автокөлікпен және т/ж көлігімен тасымалдау сияқты кейбір операциялар қосылды (бұған дейін эмиссиялар тек құбыр көлігінің қызметінен есептелген).

Екіншіден, 1998 жылға дейінгі коэффициенттер дамушы елдер үшін, ал 2008 жылдан бастап дамыған елдер үшін қолданылды. Осылайша, салаға жаңа және оңтайлы шешімдерді енгізу, сондай-ақ Қазақстан Үкіметінің инновациялық технологияларды енгізу туралы өкімдерін орындау ескеріледі.

### Халықаралық сарапшылар тобының ұсынымдарына сәйкес «Үшпа 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 санаттарындағыдай мәжбүрлі қайта есептеуге әкеледі.

Бастапқы деректердің, сондай-ақ ұсыныстардың жақсаруымен ПГ шығарындылары алғаш рет ішкі санаттардан есептелді: Тасталған жерасты шахталары, Қатты отынды трансформациялау және Басқа көздер.

Есептеулердің сапасын жақсарту және деректердегі олқылықтарды жою мақсатында МЭТ ұсынымдары бойынша 2019 жылы шағын санаттарға қайта есептеу, мұнай барлау жүргізілді.

Барлық дерлік ішкі санаттардағы кілттер NO-дан NA-ға өзгертілді, ал ішкі санатта мұнай барлау IE кілті есептелген мәліметтермен алмастырылды.

Кейбір ішкі санаттар үшін мұнай мен газ өндірісінің санаттарына өлшем бірліктеріне өзгерістер енгізілді, бұл ескерту: мұнай мен газ өндіру және өңдеу санаттарына қатысты.

## 6. «Өнеркәсіптік процестер мен өнімдерді пайдалану» (ӨПӨП) секторының ЖЭФ (CRF) кестелерінің сипаттамасы

«Өнеркәсіптік процестер мен өнімдерді пайдалану» (ӨПӨП) секторында парниктік газдар шығарындыларын түгендеу минералдық материалдар өндірісінен шығарындыларды (2.A), химия өнеркәсібінен (2.B), металлургия өнеркәсібінен (2.C), еріткіштерді және отыннан энергетикалық емес өнімдерді пайдаланудан (2.D), электрондық өнеркәсіптен (2.E), фторланған ОБЗ-дың алмастырғыштарын пайдаланудан (2.F), басқа өнімдерді өндіру және пайдаланудан (2.G). бағалауды қамтиды.

Парниктік газдарды қазақстандық түгендеу осы тізбедегі алты санатты қамтиды – бұл минералды материалдар өндірісінен шығарындыларды бағалау (2.A), химия өнеркәсібі (2.B), металлургия өнеркәсібі (2.C), еріткіштерді және отыннан энергетикалық емес өнімдерді пайдалану (2.D), фторланған ОБЗ-дың алмастырғыштарын пайдалану (2.F), сондай-ақ күкірт гексафторидін пайдалану (2.G.1). Бұл тарауда Қазақстанда бар ПГ ($CO_2$ және $CH_4$) шығарындыларының барлық өнеркәсіптік көздері ұсынылған.

Айта кету керек, Қазақстан Республикасында КӨҮСТ БҚ, 2006 ж. әдістемесіне сәйкес шығарындылардың маңызды көздері болып табылатын кейбір өндірістік процестер жоқ. Бұл адип қышқылы, табақ шыны өндірісі, күйе өндірісі, металлургиялық емес магнезия өндірісі, капролактам, глиоксил және глиоксил қышқылы өндірісі, титан диоксиді өндірісі және целлюлоза-қағаз өнеркәсібі. Қазақстанда сондай-ақ ГФК, ПФК және $SF_6$ өндірісі жоқ.

«ӨПӨП» бөлімі тоңазытқыш жабдықтарында, кондиционерлерде, көбіктенген материалдарды дайындауда және т.б. пайдаланудан ПФК, ГФК және $SF_6$ эмиссияларын бағалауды қамтиды. Республика аумағында пайдаланылатын осы заттар негізінен еуропалық және қытайлық өндірушілерден импортталады.

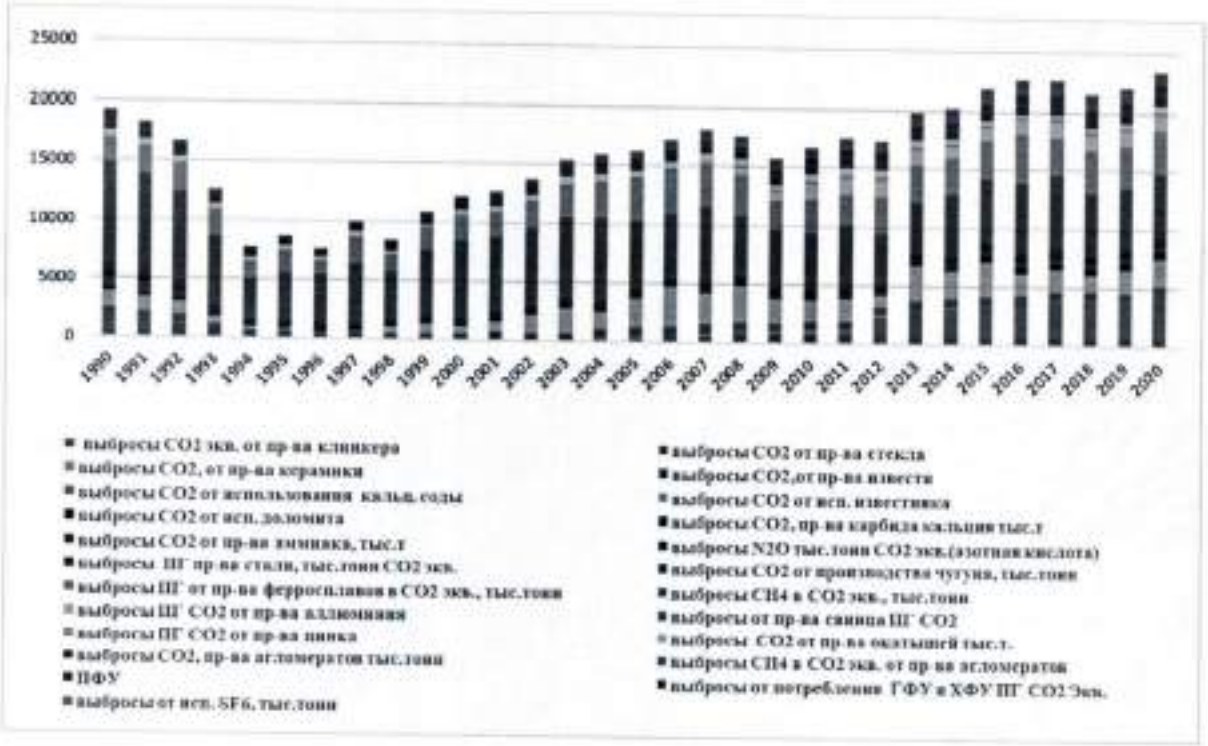
2022 жылғы түгендеу қорытындысы бойынша ӨПӨП секторы бойынша парниктік газдардың жиынтық эмиссиялары 2020 жылы **$CO_2$-экв. 23510,091 мың тоннаны** құрады. Бұл 2019 жылғы эмиссиялардан небәрі 6,5% -ға артық және жалпы ӨПӨП секторы бойынша 1990 жылғы ПГ шығарындыларынан 21,9 %-ға артық (1-кесте және 1-сурет).

ПГ түгендеу қорытындылары бойынша ӨПӨП секторында шығарындылардың негізгі көздері мыналар болып табылады: цемент өндірісі (2a.1), әктас пен доломитті пайдалану (2a.4d), шойын мен болат өндірісі (2c.1), оның ішінде агломерат өндірісі (2c.1D) және шекемтас өндірісі (2c.1e); бұдан

әрі феррокорытпа өндірісі (2c.2), алюминий өндірісі (2c.3), ауаны салқындату және кондиционерлеу (2.F.1).

4-кесте – 1990-2020 жылдар кезеңінде «ӨПӨП» секторынының парниктік газдар шығарындыларының мәні, мың тонна $CO_2$ экв.

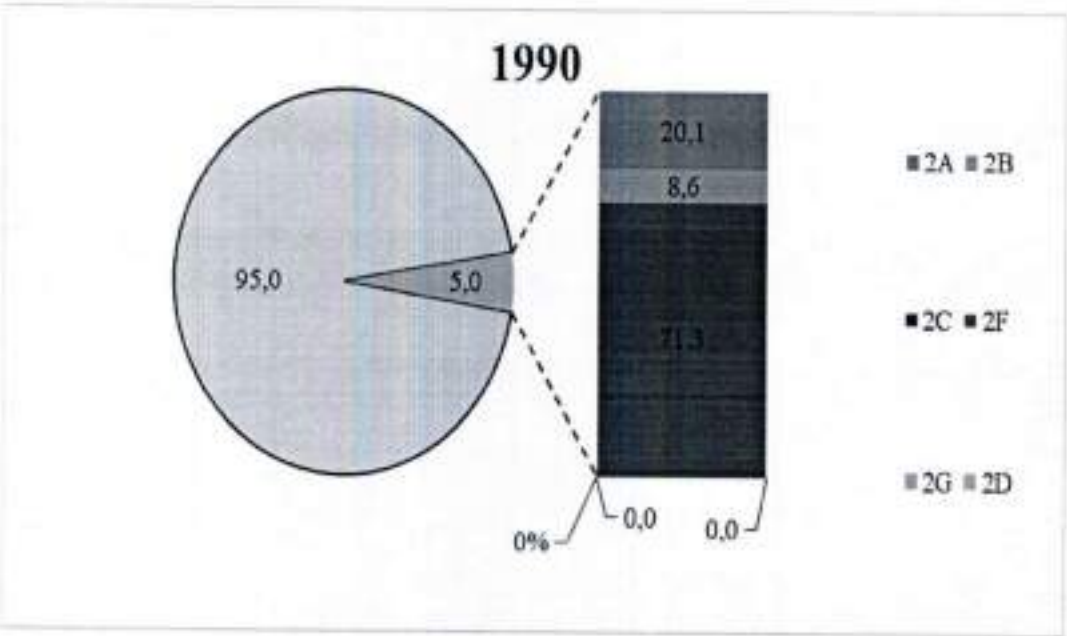
| Жылдар | «ӨПӨП» секторы бойынша парниктік газдар шығарындылары, мың тонна CO2 экв. | | | | | | |
|---|---|---|---|---|---|---|---|
| | **«ӨПӨП» секторы бойынша жалпы шығарындылар** | Минералды материалдар өндірісі (2A) | Химиялық өнеркәсіп (2B) | Металл өндірісі (2C) | ОБЗ тұтыну (2F) | $SF_6$ пайдалану (2G.1) | Отынан энергетикалық емес өнімдер және еріткіштерді пайдалану (2D) |
| *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* |
| 1990 | **19290,169** | 3876,593 | 1656,439 | 13754,78 | 0 | 0 | 2,361 |
| 1991 | **18362,854** | 3470,197 | 1589,629 | 13300,79 | 0 | 0 | 2,242 |
| 1992 | **16725,065** | 3056,001 | 1086,309 | 12580,62 | 0 | 0 | 2,125 |
| 1993 | **12504,281** | 1742,727 | 474,523 | 10284,652 | 0,372 | 0 | 2,007 |
| 1994 | **7737,621** | 1042,781 | 206,741 | 6484,967 | 1,244 | 0 | 1,888 |
| 1995 | **8688,016** | 826,897 | 278,703 | 7577,057 | 3,648 | 0 | 1,711 |
| 1996 | **7641,436** | 575,416 | 352,596 | 6707,337 | 4,494 | 0 | 1,593 |
| 1997 | **9924,297** | 662,709 | 236,058 | 9016,757 | 7,298 | 0 | 1,475 |
| 1998 | **8455,996** | 1182,546 | 34,269 | 7143,022 | 94,802 | 0 | 1,357 |
| 1999 | **10900,968** | 1453,996 | 39,729 | 9284,051 | 121,953 | 0 | 1,239 |
| 2000 | **12326,591** | 1262,886 | 34972 | 10813,828 | 213,786 | 0 | 1,121 |
| 2001 | **12683,212** | 1746,862 | 59,912 | 10640,952 | 235,015 | 0 | 0,472 |
| 2002 | **13772,221** | 2331,416 | 65,314 | 11091,365 | 283,536 | 0 | 0,59 |
| 2003 | **15386,306** | 2944,291 | 141,937 | 11938,539 | 361,126 | 0 | 0,413 |
| 2004 | **15828,081** | 2720,821 | 148,519 | 12506,018 | 452,363 | 0,007 | 0,354 |
| 2005 | **16172,626** | 3879,494 | 59,284 | 11639,634 | 592,265 | 1,653 | 0,295 |
| 2006 | **17199,854** | 4865,741 | 118,994 | 11406,056 | 807,139 | 1,687 | 0,236 |
| 2007 | **18106,194** | 4368,826 | 399,128 | 12480,486 | 855,822 | 1,695 | 0,236 |
| 2008 | **17666,055** | 4960,436 | 416,879 | 11420,032 | 866,815 | 1,715 | 0,177 |
| 2009 | **15766,262** | 3933,755 | 332,79 | 10494,819 | 885,451 | 1,735 | 117,711 |
| 2010 | **16845,189** | 3893,215 | 319,663 | 11636,228 | 877,898 | 1,735 | 116,449 |
| 2011 | **17652,191** | 4028,565 | 430,008 | 12127,404 | 931,662 | 1,749 | 132,803 |
| 2012 | **17462,025** | 4372,826 | 336,545 | 11632,295 | 952,825 | 1,827 | 165,707 |
| 2013 | **19956,275** | 7108,859 | 364,965 | 11378,766 | 961,731 | 1,925 | 140,029 |
| 2014 | **20313,463** | 6623,021 | 542,283 | 11963,348 | 1083,994 | 2,009 | 98,808 |
| 2015 | **21749,704** | 7779,109 | 599,213 | 12213,611 | 1116,835 | 2,013 | 150,752 |
| 2016 | **22702,647** | 6778,693 | 667,283 | 13912,352 | 1156,458 | 2,062 | 185,8 |
| 2017 | **22684,262** | 7121,659 | 688,595 | 13589,128 | 1123,841 | 2,097 | 158,943 |
| 2018 | **21535,079** | 6752,008 | 666,342 | 12822,281 | 1130,606 | 2,152 | 161,689 |
| 2019 | **22071,795** | 7225,453 | 680,579 | 12855,646 | 1140,626 | 2,319 | 167,164 |
| 2020 | **23510,091** | 8273,265 | 679,378 | 13248,661 | 1135,441 | 2,304 | 171,041 |

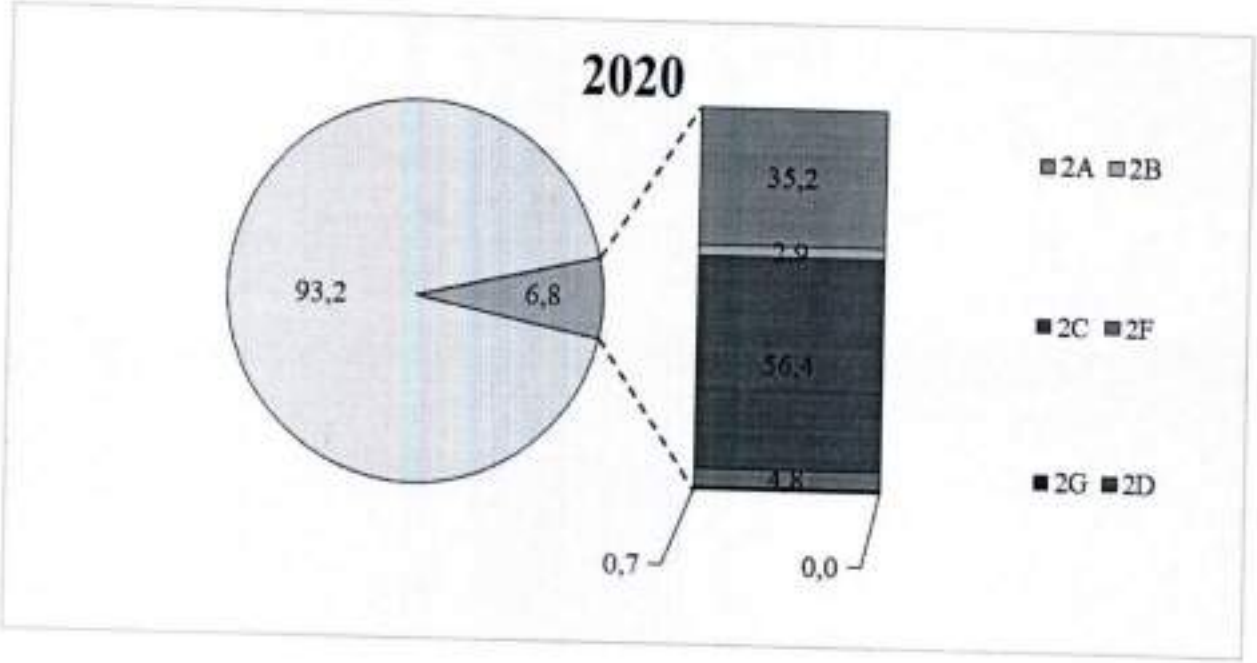



7-сурет – 1990-2020 жылдар кезеңінде CRF кестесінің мәнінде санаттар бойынша «ӨПӨП» секторының парниктік газдар шығарындыларының динамикасы.

1990 ж. және 2020 ж. ПГ жалпы ұлттық шығарындыларына «ӨПӨП» секторының қосқан үлесі (% ЖЖӨОШ секторын есепке алмағанда) 7-суретте көрсетілген.

«ӨПӨП» секторының ОШЖБТ есепке алмағандағы ПГ жалпы ұлттық шығарындыларына үлесі 2020 жылы 6,8%-ды құрады, бұл 1990 жылы шығарындылар үлесінен 36,5 %-ға артық (5,0%).






8-сурет – «ӨПӨП» секторының 1990 ж. (а) және 2020 ж. (б) ПГ жалпы ұлттық шығарындыларына қосқан үлесі, % (ЖЖӨОШ секторын есепке алмағанда)

«Еріткіштер мен басқа да өнімдерді пайдалану» кіші санатындағы парниктік газдардың көздері метан емес ұшпа органикалық қосылыстардың (НМЛОС) және азот шала тотығының ($N_2O$) шығарындылары болып табылады.

Есептеулер келесі кіші санаттар бойынша жүргізілді: бояуларды пайдалану, майсыздандыру және құрғақ тазалау, еріткіштерді басқа пайдалану және аралас қызмет, асфальт өндіру – «жол жабындары» және «асфальтты үрлеу». Осы кіші санаттарда, КӨҮСТ 2006 ж. әдіснамасына сәйкес, жанама парниктік газдарға жататын МЕҰОҚ шығарындылары ғана бағаланды, сондықтан жалпы ұлттық эмиссияларға енгізілмейді.

«Майлау материалдарын пайдалану» ішкі санатында $CH_4$ және $N_2O$ шығарындылары $CO_2$-ге қарағанда өте аз. Сондықтан олар есепке енгізілмеген.

Ел аумағында жағармайлар негізінен өнеркәсіпте және көлікте қолданылады. Майлау материалдары мұнай өңдеу зауыттарында немесе мұнай-химия кәсіпорындарында оларды шикі мұнайдан өңдеу және бөлу арқылы алынады.

Майлау материалдарын пайдаланудан $CO_2$ шығарындылары 2020 жылы 30,486 Гг құрады, 5-кесте.

5-кесте – «Еріткіштерді және басқа да өнімдерді пайдалану» секторындағы МЕҰОҚ жиынтық шығарындылары, мың тонна

| Жылдар | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| МЕҰОҚ | 202,6 | 201,4 | 200,7 | 199,3 | 196,0 | 191,4 | 188,7 | 184,7 | 181,2 | 179,1 | 179,3 | 179,9 | 181,2 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| шығарындылары | 6 | 5 | 2 | 9 | 2 | 5 | 4 | 3 | 3 | 6 | 9 | 7 | 9 |

Кестенің жалғасы

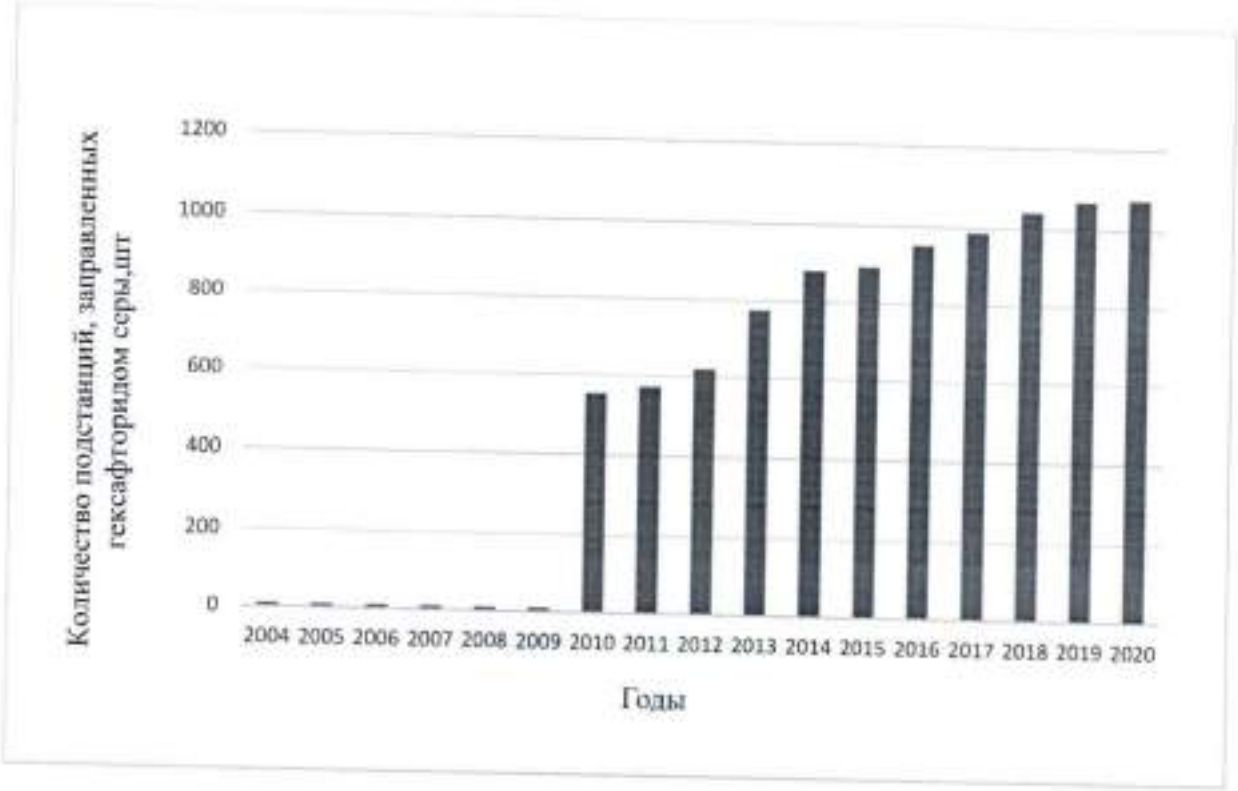
| Жылдар | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| МЕҰОҚ шығарындылары | 183,31 | 184,51 | 185,93 | 187,68 | 190,81 | 194,28 | 198,59 | 202,45 | 208,75 | 212,12 | 216,69 | 228,60 | 231,53 |

Кестенің жалғасы

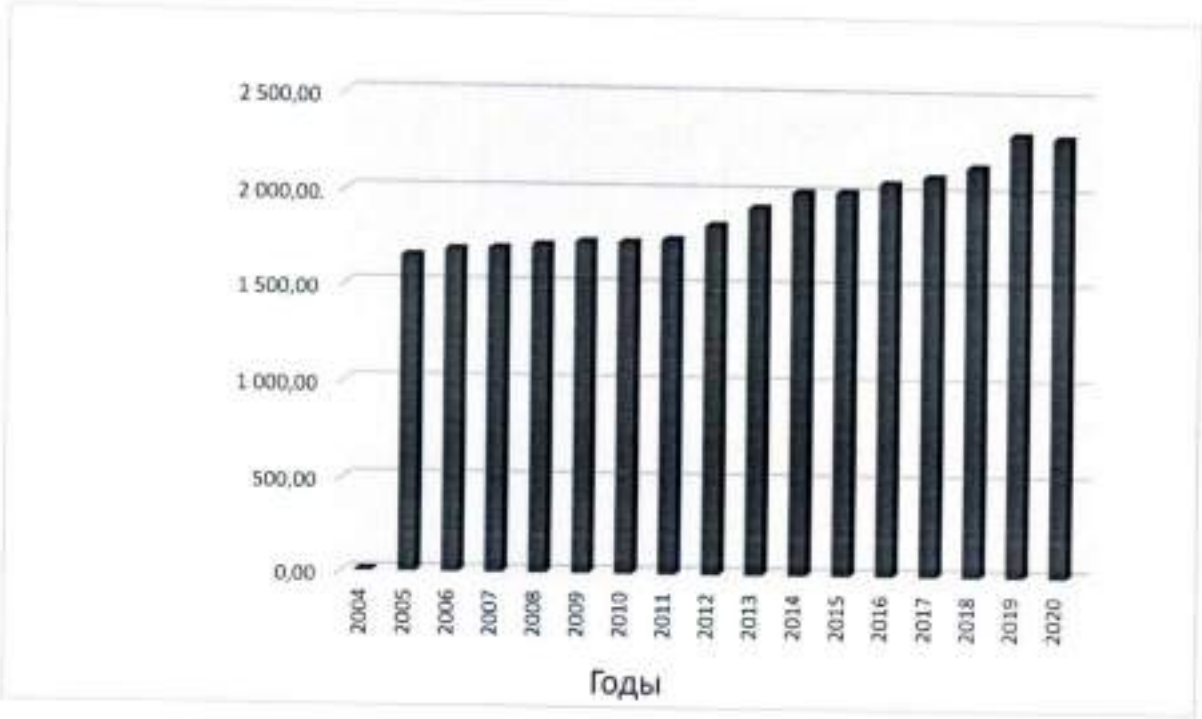
| Жылдар | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|
| МЕҰОҚ шығарындылары | 234,68 | 244,21 | 250,75 | 255,67 | 261,98 |

2016-2020 жылдардағы ЕАЭО елдерімен және басқа елдермен Қазақстан Республикасының сыртқы және өзара сауда, экспорты мен импорты статистикасы бойынша деректерді қоса алғанда, $SF_6$ пайдалану және қолдану түрлері бойынша ұлттық деректерді талдау нәтижесінде ҚР Ұлттық экономика министрлігінің Ұлттық статистика бюросы Қазақстанда $SF_6$ тек электртехникалық жабдықта қолданылатыны анықталды.

Ұлттық электр желісін (жұмыс істеп тұрған қосалқы станцияларды, тарату құрылғыларын, өңіраралық және мемлекетаралық электр беру желілерін) жаңғыртуға және ҚР аумағында жаңа объектілер салуға байланысты 2004 жылдан бастап күкірт гексафторидін қолдана отырып, ескі жабдықты тұмшаланған жабдыққа ауыстыру жүргізілуде. Бұл жабдықтың қызмет ету мерзімі 35 жылдан асады (өндірушінің техникалық төлқұжаты мен кепілдік міндеттемелеріне сәйкес). 9 - суретте 2004-2020 жылдардағы жабдықты пайдалануға беру динамикасы көрсетілген. 2010 жылдан бастап елдегі қолданыстағы және жаңа қосалқы станцияларда герметикалық электр жабдықтарын қолданудың тұрақты өсуі байқалды. 2019 жылдан бастап көрсеткіштер тұрақтанды.




9-сурет - ҚР аумағында күкірт гексафторидін қолданумен электр техникалық жабдықты пайдалануға беру динамикасы




10-сурет – «KEGOC» АҚ электр желілерінде герметикаланған электр техникалық жабдықтан күкірт гексафторидінің эмиссиясы, т $CO_2$-эквивалент

## Халықаралық сарапшылар тобының ұсынымдарына сәйкес «Өндірістік процестер және өнімді пайдалану» секторы бойынша ұлттық түгендеуді жақсарту

КҰБ жыл сайынғы шолуының қорытындысы бойынша (КҰБ 2021ж. шолуы) МЭТ ескертулері мен ұсынымдары бойынша «ӨПӨП секторына қысқаша шолу» бөлімінде жақсартулар орындалды: 1) ҚР целлюлоза-қағаз өнеркәсібі бойынша ақпарат толықтырылды; 2) секторалдық тараулардың құрылымына өзгерістер енгізілді, атап айтқанда 2.E «Электрондық өнеркәсіп» санаттың сипаттамасы енгізілді; 3) 2.F санаттағы өнімдерді пайдалану сипаттамасын қамтиды, ОБЗ және электр жабдықтарын 2.G. 1 алмастырғыштар ретінде, сондай-ақ 2.G.3 өнімді пайдаланудан $N_2O$ шығарындылары металлургиялық процестердің шығарындылары бойынша бөлімнен жеке бөлімдерге ауыстырылды. Сондай-ақ КҰБ бойынша мынадай өзгерістер енгізілді: 1) 2 (I) ЖПЕ кестеге қызметі туралы деректер бойынша ақпарат енгізілді; 2) 2B.2 «Азот қышқылын өндіру»; 2c.1b «Шойын өндірісі»; 2c.1e «Шекемтастар өндірісі» санаттарында; 2.C. 2 «Ферроқорытпалар өндірісі»; 2.C. 6 «Мырыш өндірісі» барлық уақыт қатарына қайта есептелді.

Алғаш рет 2.D.3. «Басқалар» санаттағы ЖПЕ кестелеріне «Непепнәр түрлендіргіштерін пайдалану» ішкі санаты енгізілді, өйткені 2006 ж. КӨҮСТ БҚ сәйкес осы ішкі санаттан эмиссияларды есепке алу «ӨПӨП» секторында жүргізіледі, бірақ сонымен бірге осы ішкі санаттың сипаттамасы «Энергетика» секторының 1.C. санаттағы көлік бөліміне енгізілген.

## 7. «Ауыл шаруашылық» секторының ЖПЕ (CRF) кестелерінің сипаттамасы

«Ауыл шаруашылық» секторында парниктік газдар шығарындыларын түгендеу 1990...2020 жылдардағы парниктік газдар эмиссияларын келесі қызмет санаттары бойынша есептеу нәтижелерін қамтиды:

–ауылшаруашылық жануарлардың ішкі ферменттеуден метан ($CH_4$) шығарындылары (3A санаты CRF);

– көңді жинау, сақтау және пайдалану жүйелерінен метан ($CH_4$) және азот тотығы ($N_2O$) шығарындылары (3B санаты CRF);

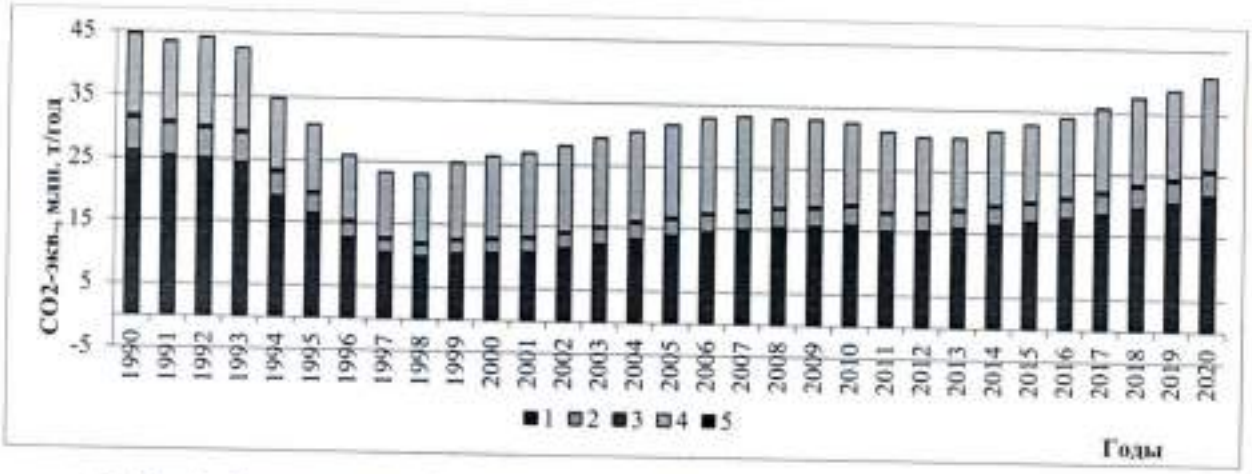
– күріш өсіру кезінде метан ($CH_4$) шығарындылары (3C санаты CRF);

– өңделетін топырақтан азот тотығының шығарындылары (3D санаты CRF);

– несепнәр тыңайтқышымен көміртегі диоксиді ($CO_2$) шығарындылары (3H санаты CRF).

«Ауыл шаруашылығ» секторы «Энергетика» секторынан кейін парниктік газдар шығарыныдылары көздернің мөлшері бойынша екінші болып табылады. Жалпы ұлттық шығарындылардан сектордағы парниктік газдар шығарындыларының үлесі 1990 жылғы 11,5%-дан 2020 жылы 11,8 %-ға азайды. «Ауыл шаруашылығы» секторындағы парниктік газдар эмиссиясының неғұрлым маңызды көздері ауыл шаруашылығы жануарларын ішкі ферменттеу нәтижесінде метан шығарындылары ($CH_4$) (2020 жылы 53,7 %), өңделетін топырақтан азот тотығының шығарындылары ($N_2O$) (2020 жылы 36,2 %) және көңді жинау, сақтау және пайдалану жүйелерінен метан ($CH_4$) және азот тотығының ($N_2O$) шығарындылары (2020 жылы 8,8 %) болып табылады.

11-суретте және 6-кестеде КӨҮСТ жіктемесіне сәйкес қызметтер санаттары бойынша «Ауыл шаруашылығы» секторынан парниктік газдары эмиссияларының есептеулер нәтижелері ұсынылған.




1– ішкі ферменттеу; 2 – көңді басқару; 3 – күріш өсіру; 4 – өңделетін топырақ; 5 – несепнәрді пайдалану.

11-сурет – 1990...2020 жылдардағы «Ауыл шаруашылығы» секторында қызметтен парниктік газдар эмиссиялары

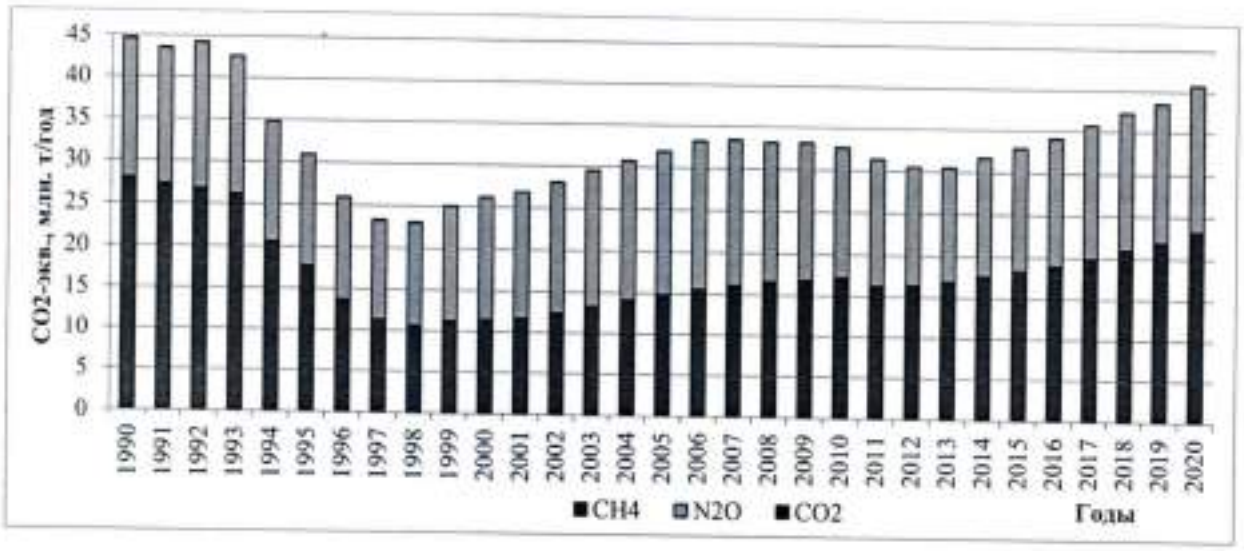
2020 жылы парниктік газдардың жиынтық эмиссиясы 40,725 млн. тонна $CO_2$ экв. құрады және 1990 жылмен салыстырғанда 4,017 млн. тоннаға (9%) азайды. 2019 жылмен салыстырғанда 2020 жылы шығарындылар 2,226 млн. тоннаға (6%) өсті. Эмиссияның ең төменгі мәндері 1998 жылы байқалды (23,067 млн.тонна).

6-кесте – 1990...2020 жылдардағы «Ауыл шаруашылығы» секторында қызметтен парниктік газдар эмиссиялары, мың тонна $CO_2$ экв.

| Жылдар | Ішкі ферменттеу | Көңді басқару | Күріш өсіру | Өңделетін топырақ | Несепнәрді пайдалану | Жиыны |
|---|---|---|---|---|---|---|
| | 3A | 3B | 3C | 3D | 3H | 3 |
| 1990 | 26245,50 | 5278,88 | 651,00 | 12462,36 | 104,40 | 44742,14 |
| 1991 | 25592,75 | 5084,87 | 624,75 | 12173,30 | 91,36 | 43567,03 |
| 1992 | 25167,00 | 4769,37 | 603,75 | 13675,22 | 78,31 | 44293,65 |
| 1993 | 24613,50 | 4655,76 | 567,00 | 12727,58 | 65,27 | 42629,11 |
| 1994 | 19261,00 | 3694,36 | 535,50 | 11312,08 | 52,23 | 34855,17 |
| 1995 | 16616,75 | 3084,72 | 441,50 | 10757,80 | 39,19 | 30939,96 |
| 1996 | 12717,50 | 2293,45 | 472,50 | 10447,88 | 26,14 | 25957,47 |
| 1997 | 10420,50 | 1905,25 | 435,75 | 10564,10 | 13,10 | 23338,70 |
| 1998 | 9834,50 | 1826,72 | 385,25 | 11020,04 | 0,06 | 23066,57 |
| 1999 | 10416,50 | 1932,96 | 372,75 | 12316,34 | 0,17 | 25038,72 |
| 2000 | 10601,25 | 2010,03 | 378,50 | 13171,60 | 0,08 | 26161,46 |
| 2001 | 10853,25 | 2073,80 | 363,25 | 13556,02 | 0,07 | 26846,39 |
| 2002 | 11564,50 | 2222,82 | 357,00 | 13907,66 | 0,06 | 28052,04 |
| 2003 | 12325,75 | 2406,33 | 439,00 | 14312,94 | 0,06 | 29484,08 |
| 2004 | 13169,00 | 2483,44 | 423,75 | 14622,86 | 0,24 | 30699,29 |
| 2005 | 13811,75 | 2580,51 | 445,75 | 15010,26 | 0,25 | 31848,52 |
| 2006 | 14497,50 | 2690,63 | 460,00 | 15466,20 | 0,13 | 33114,46 |
| 2007 | 15005,75 | 2786,68 | 458,75 | 15138,40 | 0,15 | 33389,73 |
| 2008 | 15533,00 | 2840,29 | 396,50 | 14315,92 | 0,56 | 33086,27 |

| Жылдар | Ішкі ферменттеу | Көңді басқару | Күріш өсіру | Өңделетін топырақ | Несепнәрді пайдалану | Жиыны |
|---|---|---|---|---|---|---|
| | 3A | 3B | 3C | 3D | 3H | 3 |
| 2009 | 15748,25 | 2887,05 | 456,25 | 14017,92 | 0,23 | 33109,70 |
| 2010 | 16077,50 | 2937,79 | 493,50 | 13150,74 | 0,68 | 32660,21 |
| 2011 | 15146,50 | 2755,96 | 489,75 | 12903,40 | 2,47 | 31298,08 |
| 2012 | 15322,00 | 2713,39 | 488,25 | 11970,66 | 0,72 | 30495,02 |
| 2013 | 15841,25 | 2750,16 | 472,00 | 11371,68 | 0,20 | 30435,29 |
| 2014 | 16514,75 | 2819,55 | 500,25 | 11842,52 | 0,55 | 31677,62 |
| 2015 | 17085,00 | 2905,32 | 518,75 | 12340,18 | 0,27 | 32849,52 |
| 2016 | 17808,00 | 2986,42 | 495,00 | 12784,20 | 0,59 | 34074,21 |
| 2017 | 18652,50 | 3122,41 | 548,75 | 13368,28 | 1,97 | 35693,91 |
| 2018 | 19683,25 | 3292,39 | 532,75 | 13773,56 | 2,54 | 37284,49 |
| 2019 | 20546,25 | 3418,36 | 546,00 | 13985,14 | 3,11 | 38498,86 |
| 2020 | 21853,50 | 3573,86 | 537,00 | 14756,96 | 3,67 | 40724,99 |

Секторда 2020 жылғы парниктік газдар эмиссияларының негізгі үлесі метанға ($CH_4$) – 23,236 млн. тонна $CO_2$ экв. (57 %). Азот тотығының ($N_2O$) эмиссиясы $CO_2$ экв. 17,487 млн. тоннаны (43%) құрайды, несепнәрды пайдаланудан $CO_2$ эмиссияларының көлемі шамалы (шамамен 0,01%) (12-сурет).




12-сурет – 1990...2020 жылдардағы газдардың түрі бойынша «Ауыл шаруашылығы» секторында қызметтен парниктік газдар эмиссиялары

**Халықаралық сарапшылар тобының ұсынымдарына сәйкес «Ауыл шаруашылығы» секторы бойынша ұлттық түгендеуді жақсарту**

2015-2020 жылдардағы есектер мен буйволдардың саны нақтыланды. FAO мәліметтері бойынша, бірақ бұл нақтылаулар төмен мәндерге байланысты органикалық тыңайтқыштарды қолданған кезде азот оксидінің эмиссиясына әсер етпеді.

1990...2019 жылдардағы органикалық заттардың минералдануы процесінде босатылған азоттың мөлшерін қайта бағалау арқылы қайта есептеу және техникалық қате түзетілді. Бұл мөлшер ЖЖӨОШ секторының «Өсірілетін жерлер» санатындағы топырақ көміртегі мөлшерінің өзгеруіне тікелей байланысты.

Тыңайтқыштар мен басқа да ауылшаруашылық ресурстарынан алынған азот мөлшері түзетілді, ол шаймалау және ағызу нәтижесінде жоғалады.

## 8. «Орман шаруашылығы және жерді пайдаланудың басқа түрлері» секторы ЖПЕ (CRF) кестелерінің сипаттамасы

Қазақстан Республикасының міндеттемелеріне сәйкес БҰҰ КӨНК Конвенциясы бойынша есептілік үшін КҰБ-2022 ЖЖӨОШ бөлімінде 1990...2020 жылдардағы орман шаруашылығындағы қызметке және жер пайдаланудың басқа түрлеріне байланысты парниктік газдардың (ПГ) сіңірілуін / эмиссиясын бағалау нәтижелері ұсынылған.

КӨҮСТ БҚ-ның (2006), 4-том талаптарына сәйкес ПГ түгендеу кезінде жерді пайдаланудың қайта құрылуын бағалау орындалады, олар: Орманды жерлер (FF), Орманды жерлерге қайта салынған жерлер (LF), Өңделетін жерлер (CC), Өңделетін жерлерге қайта салынған жерлер (LC), Жайылымдар болып қалатын жайылымдар (GG), Жайылымдарға қайта салынған жерлер (LG). Жер алқаптарының неғұрлым нақты анықтамалары мен сыныптамасы ұлттық деңгейде белгіленеді.

ЖПЕ (CRF) электрондық кестелерінде 1990-2020 жылдардағы ЖЖӨОШ секторы үшін ПГ түгендеу нәтижелері негізгі кестелерде мыналар ұсынылған:

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 компоненттері бойынша, тірі биомассаны, өлі органикалық заттарды (өлі ағаш және орман қоқысы) және минералды топырақты қоса алғанда, жинақтау резервуарлары бойынша көміртектің қайта бөлінуін ескере отырып ұсынылған.

ЖПЕ (CRF) электрондық кестесінде ұсынылған ЖЖӨОШ секторы бойынша ПГ - ны түгендеу нәтижелері ҰБ -2022 6.1-кестесінде қорытылған, жоғарыда аталған қызмет санаттары бойынша 1990-2020 жылдардағы ПГ-ның жұтылу / эмиссия ағындарын бағалау нәтижелерімен келісіледі.

6.1-кестеден көріп отырғанымыздай, 2020 жылғы есептеулермен Орман жерлерін ( FL), Жайылымдарды (GL), сондай-ақ Қоныстарды (SL) пайдалану санаттары үшін $CO_2$ сіңірілуінің сақталуы расталады. ҚР-да өсірілетін жерлер (АШ) ПГ эмиссиясының көзі болып қалады, бұл нәтижесінде уақытша қатардың барлық жылдары дерлік ЖЖӨОШ секторындағы эмиссия ретінде ҰБ жалпы ағынының сақталуын да айқындайды. 2020 жылға сектор үшін ПГ-ның қорытынды эмиссиялары $CO_2$ баламасында 8009,94 мың тонна деңгейінде есептер бойынша алынды, бұл 2019 жылғы сектор үшін жиынтық эмиссиядан 3658,53 мың тонна $CO_2$ шамасына артық. Базалық жылға қатысты 2020 жылғы

ПГ ағындарының жиынтық шамасы оны сіңіру ретінде сипаттайтын 1990 жылғы $CO_2$ қорытынды ағыны бағытының қарама-қарсы белгісін ескере отырып, 1990 жылғы ұқсас абсолютті шамасы бойынша 11951,14 мың тонна $CO_2$ асып түседі.

ЖЖӨОШ секторы үшін ПГ антропогендік эмиссиялары / сіңірулері ҚР-дағы барлық орман және ауыл шаруашылығы алқаптары, сондай-ақ «Сулы-батпақты алқаптар» санатындағы қоныстар, жасанды су қоймалары астындағы жерлер басқарылатындарға жататындығына жол берілгендіктен, басқарылатын жерлерге арналған ЖПЕ (CRF) электрондық кестесінде келтірілген.

Басқарылмайтын жерлерге көлдер, өзендер, батпақтар және басқа да жерлер кірді. Жерді пайдалану санаттары үшін орман алқаптары (FL) және өңделетін жерлер (CL) 2020 ж. КҰБ-да көміртегі динамикасы мен $CO_2$ сіңіру / эмиссия көлемінің есептері өңірлік деңгейде 1990-2020 жж. орындалды.

Әкімшілік облыстар деңгейінде алынған нәтижелер ұлттық деңгейдегі ЖПЕ (CRF) электрондық кестелері үшін жинақталды.

7-кесте – ҚР-да 1990...2020 ж. орман шаруашылығы және жер пайдаланудың басқа да түрлері үшін есептелген $CO_2$ және ПГ басқа да түрлерінің таза (-)сіңірілуінің/(+)эмиссиясының жылдық шамалары

| Жылдар | Өрттерден эмиссияны ескере отырып, ОШЖБТ секторы үшін сіңіру(-) /эмиссия (+) мың тонна/ $CO_2$экв. жылына | Өрттерден эмиссияны ескере отырып, Орман алаңдары мен ағаш-бұта екпелері, мың тонна/жыл $CO_2$ экв. | Тыңайған жерлерге, жайылымдарға және көпжылдық екпелерге шығарылатын ауыспалы егістегі егістікті қоса алғанда, өңделетін жерлер, $CO_2$ мың тонна /жыл | Өрттерден эмиссияны ескере отырып, табиғи жайылымдар мен шабындықтар, мың тонна/жылына $CO_2$ экв. | Елді мекендер (қосымша жабдықталған жерлер), мың тонна/жылына $CO_2$ экв. | Сулы-батпақты алқаптар (жасанды су айдындары), $CO_2$ мың тонна/жылына |
|---|---|---|---|---|---|---|
| 1990 | -3941,2 | -1478,033 | 5599 | -6911,67 | - 1166,00 | 4,25 |
| 1991 | 1470,04 | -2248,033 | 13566,66 | -8666,90 | -1202,66 | 1,46 |
| 1992 | 7016,13 | -2638,166 | 21307,00 | -10422,13 | - 1241,90 | 0,00 |
| 1993 | 11142,77 | 3823,233 | 28413,00 | -12177,37 | -1281,13 | 1,10 |
| 1994 | 17027,6 | -3509,366 | 35753,66 | -13932,60 | -1321,83 | 0,00 |
| 1995 | 23344,86 | -3194,766 | 43424,33 | -15701,03 | -1362,17 | 0,00 |
| 1996 | 29774,26 | -2613,233 | 51153,66 | -17432,07 | -1401,40 | 0,00 |
| 1997 | 36207,0 | -2567,033 | 58736,33 | -19187,30 | -1441,00 | 0,00 |
| 1998 | 28569,18 | -2957,9 | 53845,0 | -20942,53 | -1481,33 | 0,00 |
| 1999 | 49143,22 | -864,600 | 74048,33 | -22697,78 | -1521,66 | 0,00 |
| 2000 | 56572,04 | 1229,066 | 81246,00 | -24453,00 | -1560,90 | 0,00 |
| 2001 | 53636,35 | 3208,33 | 76277,66 | -24412,67 | -1598,66 | 0,00 |
| 2002 | 52154,35 | 5303,833 | 72735,66 | -24372,33 | -1639,73 | 0,00 |
| 2003 | 48018,53 | 5057,066 | 68680,33 | -24332,00 | -1682,26 | 0,00 |
| 2004 | 43179,44 | 3594,800 | 65420,66 | -24291,67 | -1722,60 | 0,00 |
| 2005 | 37883,98 | 1868,166 | 61926,33 | -24258,67 | -1762,93 | 0,00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2006 | 33682,33 | 369,233 | 59150,66 | -24233,00 | -1802,53 | 0,00 |
| 2007 | 27759,98 | -1129,700 | 54699,33 | -24181,67 | -1842,86 | 0,00 |
| 2008 | 24706,88 | -363 | 51062,00 | -24145 | -1881,00 | 0,00 |
| 2009 | 20910,37 | -1814,63 | 48726,33 | -24099,53 | -1921,33 | 0,00 |
| 2010 | 15251,35 | -3265,533 | 44887,33 | -25527,33 | -1228,33 | 342,79 |
| 2011 | 11593,37 | -4716,433 | 41367,33 | -23184,33 | -2001,26 | 107,47 |
| 2012 | 7244,65 | -6167,333 | 37719,00 | -22311,66 | -2041,60 | 29,19 |
| 2013 | 2321,76 | -8365,866 | 34232,00 | -21431,67 | -2116,03 | 0,00 |
| 2014 | 3427,55 | -7352,03 | 33498,66 | -20555,33 | -2191,56 | 0,00 |
| 2015 | 4434,42 | -6338,566 | 32739,66 | -19682,66 | -2456,66 | 106,37 |
| 2016 | 4972,96 | -5314,1 | 31735,00 | -18810,00 | -2645,50 | 0,18 |
| 2017 | 5487,41 | -4311,633 | 30411,33 | -17941,00 | -2859,27 | 14,89 |
| 2018 | 7961,59 | -3797,200 | 30560,1 | -15775,66 | -3202,83 | 0,00 |
| 2019 | 4351,41 | -7066,033 | 28372,66 | -13768,33 | -3245,27 | 0,00 |
| 2020 | 8009,94 | -10335,60 | 31905,13 | -10120,00 | -3540,90 | 0,00 |

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

2021 жылдың қыркүйек-қазан айларында Ревью –2019 аясында БҰҰ КӨНК Хатшылығының халықаралық топ сарапшылары ҚР-ға парниктік газдарды түгендеудің ұлттық жүйесін, оның ішінде ЖЖӨОШ секторын одан әрі дамытуға бағытталған қызметті жалғастыруды ұсынды, атап айтқанда антропогендік қызметтің негізгі санаттары үшін өнірлік деңгейде есептеулерді қамтамасыз ету мақсатында.

БҰҰ КӨНК Конвенциясы бойынша есептілікке қатысты алынған ұсынымдарға сәйкес, КҰБ - 2020 шеңберінде ЖЖӨОШ секторы ұлттық көміртек эталондарының мұрағатын кеңейтумен, қызмет коэффициенттерін нақтылаумен, ведомстволық мұрағаттардан келісілген ақпаратты алумен Орман алқаптары мен Өңделетін жерлерді жер пайдалану санаттары үшін облыстық деңгейде ПГ есептерін агрегаттау бойынша әдістемелік жұмыстар жалғастырылды. Облыстық деңгейде (барлығы 14 облыс) көміртегі қорларының және қызмет санаттары үшін сіңіру /эмиссия көлемінің жылдық өзгерістері Орман алқаптары мен Өңделетін жерлер КҰБ-2020, ЖЖӨОШ секторында ұсынылған. ЖПЕ (CRF) электрондық кестелерінде нәтижелерді ұсыну мақсатында көрсеткіштер алдын ала ұлттық деңгейде жинақталды.

## 9. БҰҰ КӨНК Хатшылығының халықаралық сарапшылар тобының ұсынымдарын ескере отырып, SEF форматындағы есептік электрондық кестелерге сипаттама

SEF электрондық кестелерінде Киото хаттамасындағы қысқарту және сіңіру бірліктері туралы сипаттама мен ақпарат бар.

Киото Хаттамасының Тарабы ретінде ҚР КХ бойынша міндеттемелердің әрекет етуінің бірінші кезеңінде (2008...2012 жж.) қызметтер нәтижелері бойынша SEF кестелерін ұсынбады, себебі Киото Хаттамасы бойынша мөлшерлік міндеттемелері болмады. Сонымен қатар, КХ бойынша құжаттамаларға (КХ 3 және 8-баптары, 16/CMP.1 шешімі, 2/CMP.7 шешіміне Қосымша және басқалар) сәйкес ҚР міндеттемелердің әрекет етуінің екінші кезеңі үшін қосымша есептілікті (2013...2020 жж.) ерікті түрде ұсына алады.

Халықаралық сарапшылар тобының ұсыныстарына сәйкес, Ел өзінің белгіленген мөлшерін есептеуді жеңілдету үшін және өзінің шығарындылары мен өзінің белгіленген мөлшерін есепке алу қабілетін көрсету үшін хатшылыққа оның стандартты электрондық нысанын қоса алғанда, қосымша ақпарат бере алады.

Сонымен, электрондық форматтағы SEF кестелері парниктік газдар туралы есеп беру үшін міндетті емес, бірақ ұсынуға ұсынылды. Қазақстанда Киото хаттамасының тетіктері бойынша қызмет шеңберінде жобалар болмағандықтан, SEF кестелері NO нотациялық кілттермен толтырылған, яғни мұндай қызмет жүзеге асырылмайды.

SEF кестелері осы есепке Қосымшада ұсынылған.

## 10.«Қалдықтар» секторының ЖПЕ (CRF) кестелерінің жалпы сипаттамасы

Жыл сайын Қазақстанда 5-6 млн.тонна қатты тұрмыстық қалдықтар түзіледі. Таяудағы жылдары азық-түлік және азық-түлік емес тауарлар номенклатурасының, олар үшін орамның түр-түрі мен түрлерінің ұлғаюы, халықтың өмір сүру деңгейінің өсуі есебінен ҚТҚ түзілу көлемінің артуын күту керек.

2020 жылы Қазақстан Республикасында барлығы 4,6 млн.тонна ҚТҚ (Қазақстан Республикасы Экология, геология және табиғи ресурстар министрлігінің деректері бойынша) түзілген, оның 2,8 млн. тоннасын қалдықтарды жинау және тасымалдау жөніндегі мамандандырылған кәсіпорындар мен жеке кәсіпкерлер жинаған коммуналдық қалдықтар құрады, олардың саны 625 бірлікті құрады. Негізгі үлес үй шаруашылықтарының қалдықтарына (71,4%), 14,6% өндіріс қалдықтарына (тұрмыстық қалдықтарға теңестірілген), 9,9% - көше қоқыстарына, 2,2% - базар қалдықтарына тиесілі.

2020 жылы ресми жұмыс істеп тұрған полигондарға (қоқыс тастайтын жерлерге), коммуналдық қалдықтарды сұрыптау және қайта өңдеу объектілеріне 3,7 млн.тонна қалдық келіп түсті. Олардың 61,8%-ы одан әрі депозитке салу үшін түсті, 30,3%-ы сұрыпталды және 30,9%-ы одан әрі өңдеуге жіберілді.

2020 жылдың соңында ресми жұмыс істейтін полигондарда (қоқыс тастайтын жерлерге) 45,7 млн.тоннадан астам қалдық жинақталған.

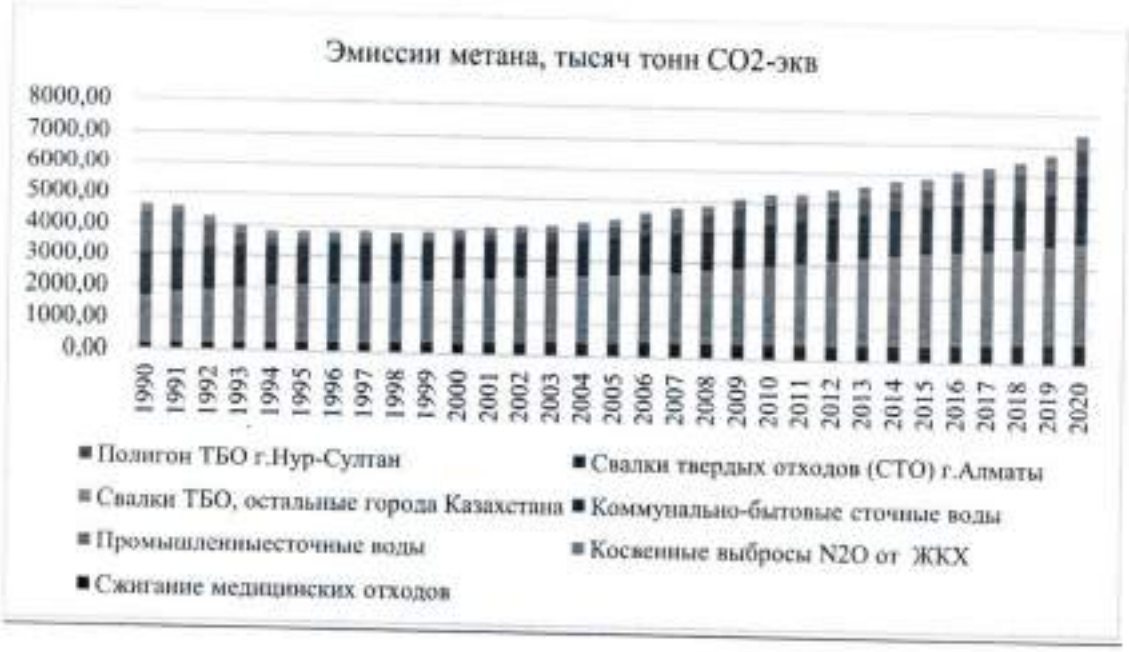
«Қалдықтар» секторында ПГ эмиссиясы қатты тұрмыстық қалдықтарды қоқыс тастайтын жерлерде (ҚҚҚ) көмуден, ағынды суларды (коммуналдық-тұрмыстық және өнеркәсіптік) қайта өңдеуден, адам тіршілік әрекеті өнімдерінен азот тотығының жанама шығарындыларынан, көміртегі диоксидінен (медициналық қалдықтарды жағудан) құралады. «Қалдықтар» секторында қызметтің осы түрлерінен парниктік газдардың жалпы эмиссиясы 2020 жылы есептеулер бойынша 7355,84 Гг. $CO_2$-экв. құрады, бұл өткен 2019 жылдың деңгейінен 10%-ға артық. Айтарлықтай айырмашылық коммуналдық-тұрмыстық ағынды сулардан шығарындылардың едәуір артуымен байланысты.

1990 жылы эмиссия 4648,7 Гг. $CO_2$-экв. құрады. 1990 жылдан бастап 2020 жылға дейінгі барлық кезеңде ҚТҚ түзілуінің өсуі есебінен қызметтің осы түрінен эмиссиялардың өсуі 2 есеге ұлғайды. Қазақстанда экономиканың өсуі және жалғасып жатқан урбандалу ҚТҚ көлемінің жыл сайын артуының себептері болып табылады. Парниктік газдар шығарындыларының трендтері 8-кестеде келтірілген.

8-кесте – 1990…2020 жылдардағы «Қалдықтар» секторында парниктік газдар эмиссиялары, Гг $CO_2$-эквиваленті

| Жылдар | Парниктік газдар эмиссияларының көздері | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | ҚТҚ полигоны Нұр-Сұлтан қ. | Қатты қалдықтар қоқыстары (ҚҚҚ) Алматы қ. | Қазақстанның басқа қалаларындағы ҚТҚ қоқыстары | Коммуналды-тұрмыстық ағынды сулар | Өнеркәсіптік ағындар | Адам өмірінің өнімдері $N_2O$ жанама шығарындылары | Медициналық қалдықтарды жағу | «Қалдықтар» секторына жалпы эмиссиялар |
| 1990 | 45,19 | 144,35 | 1526,56 | 1344,17 | 1323,92 | 264,50 | 0,00 | 4648,70 |
| 1991 | 44,46 | 165,12 | 1604,37 | 1350,89 | 1169,14 | 266,01 | 0,00 | 4600,00 |
| 1992 | 43,74 | 184,41 | 1673,29 | 1346,09 | 758,79 | 271,78 | 0,00 | 4278,11 |
| 1993 | 43,26 | 202,94 | 1733,68 | 1331,01 | 415,24 | 270,27 | 0,00 | 3996,39 |
| 1994 | 42,93 | 220,56 | 1785,78 | 1296,30 | 226,45 | 264,01 | 0,00 | 3836,03 |
| 1995 | 42,79 | 237,18 | 1823,89 | 1273,63 | 188,02 | 262,35 | 0,00 | 3827,86 |
| 1996 | 42,75 | 252,34 | 1860,42 | 1258,57 | 165,28 | 261,96 | 0,00 | 3841,31 |
| 1997 | 42,78 | 266,26 | 1895,02 | 1236,40 | 173,09 | 257,01 | 0,00 | 3870,55 |
| 1998 | 42,94 | 279,38 | 1927,93 | 1220,11 | 105,12 | 250,29 | 0,00 | 3825,76 |
| 1999 | 45,01 | 291,66 | 1959,13 | 1216,52 | 122,42 | 246,55 | 0,00 | 3881,28 |
| 2000 | 48,98 | 303,30 | 1988,80 | 1215,71 | 138,18 | 245,96 | 0,00 | 3940,92 |
| 2001 | 55,44 | 313,96 | 2017,01 | 1215,94 | 214,08 | 245,72 | 0,00 | 4062,15 |
| 2002 | 63,84 | 324,10 | 2044,49 | 1145,20 | 292,57 | 248,81 | 0,00 | 4119,00 |
| 2003 | 71,68 | 334,49 | 2071,22 | 1152,23 | 277,78 | 253,00 | 0,00 | 4160,40 |
| 2004 | 79,04 | 345,75 | 2097,26 | 1178,62 | 327,10 | 255,09 | 0,00 | 4282,84 |
| 2005 | 86,45 | 357,83 | 2122,55 | 1180,06 | 392,87 | 260,43 | 0,00 | 4400,20 |
| 2006 | 94,12 | 371,34 | 2147,11 | 1270,98 | 463,38 | 269,26 | 0,01 | 4616,20 |
| 2007 | 100,25 | 380,41 | 2186,68 | 1251,71 | 578,43 | 275,20 | 0,73 | 4773,41 |
| 2008 | 102,67 | 378,52 | 2277,57 | 1292,37 | 521,85 | 282,47 | 1,07 | 4856,53 |
| 2009 | 104,82 | 378,25 | 2367,98 | 1318,88 | 628,97 | 292,46 | 9,65 | 5101,00 |
| 2010 | 106,93 | 370,60 | 2482,35 | 1365,90 | 631,84 | 299,88 | 10,35 | 5267,85 |
| 2011 | 111,14 | 364,76 | 2582,37 | 1394,18 | 535,45 | 304,14 | 8,21 | 5300,26 |
| 2012 | 116,91 | 360,43 | 2688,24 | 1422,08 | 528,90 | 308,45 | 7,56 | 5432,57 |
| 2013 | 124,20 | 361,41 | 2768,90 | 1450,28 | 540,77 | 311,16 | 9,34 | 5556,71 |
| 2014 | 132,51 | 364,81 | 2843,72 | 1511,10 | 582,69 | 314,89 | 9,07 | 5758,79 |
| 2015 | 142,28 | 376,33 | 2906,59 | 1525,73 | 566,72 | 323,12 | 7,85 | 5848,63 |
| 2016 | 153,19 | 393,65 | 2954,28 | 1551,43 | 722,26 | 328,59 | 7,88 | 6111,28 |
| 2017 | 170,40 | 420,29 | 2976,53 | 1586,52 | 773,63 | 336,71 | 7,27 | 6271,35 |
| 2018 | 184,01 | 435,81 | 3031,01 | 1632,26 | 790,67 | 364,82 | 7,51 | 6446,08 |
| 2019 | 196,40 | 448,44 | 3098,18 | 1673,89 | 871,18 | 393,50 | 7,31 | 6688,89 |
| 2020 | 210,93 | 463,55 | 3161,05 | 2185,37 | 909,17 | 394,84 | 30,92 | 7355,84 |

«Қалдықтар» секторынан 1990...2020 жж. парниктік газдар эмиссияларының жалпы динамикасы 13-суретте ұсынылған.




13-сурет – Қазақстанда 1990…2020 жж. «Қалдықтар» секторынан парниктік газдар эмиссияларының жалпы динамикасы

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

Барлық уақыт қатары бойынша басқарылмайтын қалдықтар полигондарының 5А санатынан эмиссиялар қайта есептелді. Қайта есептеу барысында жаңа есепте көрсетілген шығарындылардың өзге де мәндері алынды. 5.А санаттан шығарындыларды есептеу кезіндегі мәндер DOC мәні әдепкі бойынша - 0,5 қолданылды, осыған байланысты ЖПЕ кестелеріндегі мәндер ауыстырылды.

W. 17 ескертуіне сәйкес ағынды сулардағы жойылған тұнбаның мәні IE-ден NO-ға ауыстырылды, өйткені әдепкі бойынша тұнбаны жою үшін нөлдік мән қолданылды. W. 19 ескертуіне сәйкес өнеркәсіптік сарқынды сулар санаты 5.D.2. целлюлоза-қағаз өндірісінен шығарындылар қосылды. Осыған байланысты барлық уақыт қатары бойынша санаттан шығарындылар қайта есептелді. Сонымен қатар, МЭТ ұсынымдарына сәйкес, қазіргі уақытта өнеркәсіптік қалдықтарды кәдеге жарату жүйесі, полигондарда жиналатын ҚТҚ құрамы, метанды рекуперациялау және қалдықтарды компосттау жөніндегі деректер нақтылануда. Жүргізілген жұмыстың нәтижелері болашақ түгендеу үшін неғұрлым жоғары әдісті пайдалануға бағытталатын болады.

# ЕСЕПКЕ ҚОСЫМША

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

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

Inventory 1990
Submission 2022 v1
KAZAKHSTAN

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | $CO_2$ | $CH_4$ | $N_2O$ | $NO_X$ | CO | NMVOC | $SO_2$ |
|---|---|---|---|---|---|---|---|
| | (kt) | | | | | | |
| **Total Energy** | 261466,16 | 2211,05 | 6,04 | 58241,88 | 461762,12 | 55735,08 | 1083,83 |
| **A. Fuel combustion activities (sectoral approach)** | 245681,14 | 61,64 | 6,02 | 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** | 18950,88 | 1,42 | 0,22 | 57,69 | 20,14 | 2,96 | 106,11 |
| a. Iron and steel | 7939,37 | 0,68 | 0,11 | 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** | 21245,19 | 6,41 | 3,06 | 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 | 0,76 | 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 | 549,74 | 0,08 | 0,42 | NE | NE | NE | NE |

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

Inventory 1990
Submission 2022 v1
KAZAKHSTAN

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | $CO_2$ | $CH_4$ | $N_2O$ | $NO_x$ | CO | NMVOC | $SO_2$ |
|---|---|---|---|---|---|---|---|
| | (kt) | | | | | | |
| **4. Other sectors** | 54835,05 | 50,52 | 0,83 | 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 | 20,42 | 49,72 |
| c. Agriculture/forestry/fishing | 8919,36 | 3,65 | 0,17 | 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** | 15785,02 | 2149,41 | 0,02 | NO,NA | NO,NA | NO,NA | NO,NA |
| **1. Solid fuels** | 15709,91 | 1205,99 | 0,00 | NO,NA | NO,NA | NO,NA | NO,NA |
| a. Coal mining and handling | 277,07 | 1205,99 | NA | NA | NA | NA | |
| b. Solid fuel transformation | 9,93 | 0,00 | 0,00 | NO | NO | NO | NO |
| c. Other *(as specified in table 1.B.1)* | 15422,91 | 0,00 | 0,00 | NA | NA | NA | NA |
| **2. Oil and natural gas and other emissions from energy production** | 75,11 | 943,42 | 0,02 | NA | NA | NA | NA |
| a. Oil | 66,99 | 934,25 | 0,02 | NA | NA | NA | NA |
| b. Natural gas | 1,45 | 9,16 | | | | NA | NA |
| c. Venting and flaring | 6,66 | 0,00 | 0,00 | NA | NA | NA | NA |
| 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 | NE,NA | NE,NA | NE,NA | NE,NA |
| Aviation | 576,45 | 0,00 | 0,02 | NE | NE | NE | NE |
| Navigation | 89,63 | 0,01 | 0,00 | NA | NA | NA | NA |
| **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 | NA | | | | | | |
| For storage in other countries | NA | | | | | | |

[(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 | mous coal. Separate data for this type of coal were not provided by national statistics. 1.1/1990: 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 2022 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** | 18835,55 | 1,29 | 1,43 | NO,NA | NA,NO | NO,NA | NA,NO | NO,NA | 0,46 | 0,05 | 205,92 | 0,00 |
| **A. Mineral industry** | 3876,59 | | | | | | | | 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 | 1372,21 | | | | | | | | | | | |
| **B. Chemical industry** | 1234,17 | NO | 1,43 | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| 1. Ammonia production | 959,21 | NO | NO | | | | | | 0,46 | 0,05 | NO | 0,00 |
| 2. Nitric acid production | | | 1,43 | | | | | | 0,46 | 0,05 | NO | 0,00 |
| 3. Adipic acid production | NO | | NO | | | | | | NO | | | |
| 4. Caprolactam, glyoxal and glyoxylic acid production | NO | | NO | | | | | | NO | NO | NO | |
| 5. Carbide production | 274,96 | NO | | | | | | | | | NO | NO |
| 6. Titanium dioxide production | NO | | | | | | | | NO | NO | NO | NO |
| 7. Soda ash production | NO | | | | | | | | | | | |
| 8. Petrochemical and carbon black production | NO | NO | | | | | | | | | | |
| 9. Fluorochemical production | | | | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| 10. Other *(as specified in table 2(I).A-H)* | NO | NO | NO | NO | NO | NO | NO | NO | | | | |
| **C. Metal industry** | 13722,42 | 1,29 | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| 1. Iron and steel production | 11496,54 | 0,68 | | | | | | | NO,NA | NO,NA | 3,26 | NO,NA |
| 2. Ferroalloys production | 1958,73 | 0,61 | | | | | | | NA | NA | 3,26 | NA |
| 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 2022 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 | 202,66 | 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 | 202,66 | 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(I))* | | | | 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 | 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 3 SECTORAL REPORT FOR AGRICULTURE**
**(Sheet 1 of 2)**

Inventory 1990
Submission 2022 v3
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 | 55,69 | 58,28 | NO | 149,07 |
| **I. Livestock** | | 1095,62 | 13,87 | | | 118,81 |
| **A. Enteric fermentation** | | 1049,82 | | | | |
| 1. Cattle[1] | | 747,75 | | | | |
| *Option A:* | | | | | | |
| Dairy cattle | | 330,74 | | | | |
| Non-dairy cattle | | 416,98 | | | | |
| *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 | | 0,06 | | | | |
| Camels | | 6,58 | | | | |
| Goats | | 5,88 | | | | |
| Horses | | 29,27 | | | | |
| Mules and Asses | | 0,45 | | | | |
| Other (please specify) | | NO | | | | |
| **B. Manure management** | | 45,80 | 13,87 | | | 118,81 |
| 1. Cattle[1] | | 22,90 | 6,19 | | | 92,21 |
| *Option A:* | | | | | | |
| Dairy cattle | | 14,99 | 2,25 | | | 43,76 |
| Non-dairy cattle | | 7,91 | 3,93 | | | 48,45 |
| *Option B:* | | | | | | |
| Mature dairy cattle | | | | | | |
| Other mature cattle | | | | | | |
| Growing cattle | | | | | | |
| *Option C (country-specific):* | | | | | | |
| *Other (as specified in table 3(I).B)* | | | | | | 6,75 |
| 2. Sheep | | 3,99 | 1,72 | | | 2,22 |
| 3. Swine | | 16,12 | 2,30 | | | 17,69 |
| 4. Other livestock | | 2,79 | 1,43 | | | 0,05 |
| Buffalo | | 0,06 | 0,02 | | | 0,04 |
| Camels | | 0,18 | NO | | | 0,64 |
| Goats | | 0,11 | 0,08 | | | 6,95 |
| Horses | | 1,77 | 0,24 | | | 0,07 |
| Mules and Asses | | 0,03 | 0,02 | | | 9,88 |
| Poultry | | 0,68 | 1,02 | | | NE |
| Other (please specify) | | 0,02 | 0,05 | | | NE |
| Rabbit | | 0,02 | 0,05 | | | |
| 3. Indirect $N_2O$ emissions | | | 2,34 | | | |

**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 2022 v1
KAZAKHSTAN

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | $CO_2$ | $CH_4$ | $N_2O$ | $NO_x$ | CO | NMVOC |
|---|---|---|---|---|---|---|
| | (kt) | | | | | |
| C. Rice cultivation | | | | | | |
| D. Agricultural soils (1) (2) (3) (4) | | 36,04 | | | | |
| E. Prescribed burning of savannas | | NO | 41,82 | 38,28 | NO | NO |
| F. Field burning of agricultural residues | | NO | NO | NO | NO | 81,26 |
| G. Liming | | NO | NO | NO | NO | NO |
| H. Urea application | NO | | | | | NO |
| I. Other carbon-containing fertilisers | 104,40 | | | | | |
| J. Other (please specify) | NO | | | | | |
| | 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 disaggregation 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 context of this table. | |
| • If estimates are reported under category 3(B)1H.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 | Note: 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 2022 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** | -3952,45 | 0,23 | 0,02 | 0,32 | 6,17 | 2,90 |
| **A. Forest land** | -1478,03 | 0,06 | 0,00 | 0,04 | 1,42 | 0,43 |
| 1. Forest land remaining forest land | -1478,03 | 0,06 | 0,00 | 0,04 | 1,42 | 0,43 |
| 2. Land converted to forest land | NO,IE | NO,IE | NO,IE | NO | NO | NO |
| **B. Cropland** | 5599,00 | NO,IE | NO,IE | NO | NO | NO |
| 1. Cropland remaining cropland | 5599,00 | NO,IE | NO,IE | NO | NO | NO |
| 2. Land converted to cropland | NO | NO | NO | NO | NO | NO |
| **C. Grassland** | -6911,67 | 0,17 | 0,02 | 0,29 | 4,75 | 2,48 |
| 1. Grassland remaining grassland | -6911,67 | 0,17 | 0,02 | 0,29 | 4,75 | 2,48 |
| 2. Land converted to grassland | NO | 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 | NO,IE | NO,IE | NO | NO | NO |
| 2. Land converted to wetlands | 4,25 | NO | NO | NO | NO | NO |
| **E. Settlements** | -1166,00 | NO | NO | NO | NO | NO |
| 1. Settlements remaining settlements | NO | NO | NO | NO | NO | NO |
| 2. Land converted to settlements | -1166,00 | 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 | per and Paperboard: 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 2022 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 | 175,37 | 0,89 | NO,NE | NO,NE | 0,09 | NO,NE |
| **A. Solid waste disposal** | NO | 68,64 | | NO,NE | NO,NE | NO,NE | |
| 1. Managed waste disposal sites | NO | 7,58 | | NE | NE | NE | |
| 2. Unmanaged waste disposal sites | NO | 61,06 | | 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** | | 106,73 | 0,89 | NO | NO | 0,09 | |
| 1. Domestic wastewater | | 53,77 | 0,89 | NO | NO | 0,09 | |
| 2. Industrial wastewater | | 52,96 | 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 2022 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** | 276453,67 | 3509,60 | 64,07 | NO,NA | NA,NO | NO,NA | NA,NO | NO,NA | 58300,94 | 461768,33 | 56093,06 | 1083,83 |
| **1. Energy** | 261466,16 | 2211,05 | 6,04 | | | | | | 58241,88 | 461762,12 | 55735,08 | 1083,83 |
| A. Fuel combustion Reference approach(2) | 267942,57 | | | | | | | | | | | |
| Sectoral approach(2) | 245681,14 | 61,64 | 6,02 | | | | | | 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 | 18950,88 | 1,42 | 0,22 | | | | | | 57,69 | 20,14 | 2,96 | 106,11 |
| 3. Transport | 21245,19 | 6,41 | 3,06 | | | | | | 57587,13 | 460677,64 | 55610,23 | 39,94 |
| 4. Other sectors | 54835,05 | 50,52 | 0,83 | | | | | | 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 | 15785,02 | 2149,41 | 0,02 | | | | | | NO,NA | NO,NA | NO,NA | NO,NA |
| 1. Solid fuels | 15709,91 | 1205,99 | 0,00 | | | | | | NO,NA | NO,NA | NO,NA | NO,NA |
| 2. Oil and natural gas and other emissions from energy production | 75,11 | 943,42 | 0,02 | | | | | | NA | NA | NA | NA |
| C. $CO_2$ Transport and storage | NO,NA | | | | | | | | | | | |
| **2. Industrial processes and product use** | 18835,55 | 1,29 | 1,43 | NO,NA | NA,NO | NO,NA | NA,NO | NO,NA | 0,46 | 0,05 | 205,92 | 0,00 |
| A. Mineral industry | 3876,59 | | | | | | | | NO | NO | NO | NO |
| B. Chemical industry | 1234,17 | NO | 1,43 | NO | NO | NO | NO | NO | 0,46 | 0,05 | NO | 0,00 |
| C. Metal industry | 13722,42 | 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 | 202,66 | 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 2022 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 | 55,69 | | | | | | 58,28 | NO | 149,07 | NO |
| A. Enteric fermentation | | 1049,82 | | | | | | | | | | |
| B. Manure management | | 45,80 | 13,87 | | | | | | | | 118,81 | |
| C. Rice cultivation | | 26,04 | | | | | | | | | NO | |
| D. Agricultural soils | | NO | 41,82 | | | | | | 58,28 | 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] | -3952,45 | 0,23 | 0,02 | | | | | | 0,32 | 6,17 | 2,90 | NO |
| A. Forest land [4] | -1478,03 | 0,06 | 0,00 | | | | | | 0,04 | 1,42 | 0,43 | |
| B. Cropland [4] | 5599,00 | NO,IE | NO,IE | | | | | | NO | NO | NO | |
| C. Grassland [4] | -6911,67 | 0,17 | 0,02 | | | | | | 0,29 | 4,75 | 2,48 | |
| D. Wetlands [4] | 4,25 | NO,IE,NA | NO,IE,NA | | | | | | NO | NO | NO | |
| E. Settlements [4] | -1166,00 | 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 | 175,37 | 0,89 | | | | | | NO,NE | NO,NE | 0,09 | NO,NE |
| A. Solid waste disposal [5] | NO | 68,64 | | | | | | | 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 | | 106,73 | 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 2022 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 | | | | | | NE,NA | NE,NA | NE,NA | NE,NA |
| Aviation | 576,45 | 0,00 | 0,02 | | | | | | NE | NE | NE | NE |
| Navigation | 89,63 | 0,01 | 0,00 | | | | | | NA | NA | NA | NA |
| **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 $N_2O$** | | | NA,NO | | | | | | | | | |
| **Indirect $CO_2$** | NA,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 ($CO_2$) 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)**



| 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)]** | 276453,67 | 87739,97 | 19092,49 | NO,NA | NA,NO | NA,NO | NO,NA | NO,NA | 383286,13 |
| **1. Energy** | 261466,16 | 55276,20 | 1800,51 | | | | | | 318542,88 |
| A. Fuel combustion (sectoral approach) | 245681,14 | 1541,06 | 1795,07 | | | | | | 249017,28 |
| 1. Energy industries | 141770,89 | 56,93 | 540,80 | | | | | | 142368,62 |
| 2. Manufacturing industries and construction | 18950,88 | 35,42 | 65,66 | | | | | | 19051,95 |
| 3. Transport | 21245,19 | 160,17 | 912,38 | | | | | | 22317,74 |
| 4. Other sectors | 54835,05 | 1262,94 | 247,30 | | | | | | 56345,29 |
| 5. Other | 8879,13 | 25,61 | 28,94 | | | | | | 8933,67 |
| B. Fugitive emissions from fuels | 15785,02 | 53735,14 | 5,44 | | | | | | 69525,60 |
| 1. Solid fuels | 15709,91 | 30149,68 | 0,05 | | | | | | 45859,64 |
| 2. Oil and natural gas | 75,11 | 23585,46 | 5,39 | | | | | | 23665,97 |
| C. $CO_2$ transport and storage | NO,NA | | | | | | | | NO,NA |
| **2. Industrial processes and product use** | 18835,55 | 32,35 | 424,95 | NO,NA | NA,NO | NA,NO | NO,NA | NO,NA | 19292,85 |
| A. Mineral industry | 3876,59 | | | | | | | | 3876,59 |
| B. Chemical industry | 1234,17 | NO | 424,95 | NO | NO | NO | NO | NO | 1659,12 |
| C. Metal industry | 13722,42 | 32,35 | NO | NO | NO | NO | NO | NO | 13754,78 |
| 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 | 16596,33 | | | | | | 44742,14 |
| A. Enteric fermentation | | 26245,50 | | | | | | | 26245,50 |
| B. Manure management | | 1144,91 | 4133,97 | | | | | | 5278,88 |
| C. Rice cultivation | | 651,00 | | | | | | | 651,00 |
| D. Agricultural soils | | NO | 12462,36 | | | | | | 12462,36 |
| 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)]** | -3952,45 | 5,75 | 5,48 | | | | | | -3941,21 |
| A. Forest land | -1478,03 | 1,50 | 1,01 | | | | | | -1475,52 |
| B. Cropland | 5599,00 | NO,IE | NO,IE | | | | | | 5599,00 |
| C. Grassland | -6911,67 | 4,25 | 4,47 | | | | | | -6902,95 |
| D. Wetlands | 4,25 | NO,IE,NA | NO,IE,NA | | | | | | 4,25 |
| E. Settlements | -1166,00 | NO | NO | | | | | | -1166,00 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| F. Other land | NO | NO | NO | | | | | | NO |
| G. Harvested wood products | NO,IE | | | | | | | | NO,IE |
| H. Other | NO | NO | NO | | | | | | NO |
| **5. Waste** | NO | 4384,25 | 265,22 | | | | | | 4649,47 |
| A. Solid waste disposal | NO | 1716,00 | | | | | | | 1716,00 |
| 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 | | 2668,25 | 265,22 | | | | | | 2933,47 |
| 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 $N_2O$** | | | NA,NO | | | | | | |
| **Indirect $CO_2$**[3] | NA,NO | | | | | | | | |
| **Total $CO_2$ equivalent emissions without land use, land-use change and forestry** | | | | | | | | | 387227,34 |
| **Total $CO_2$ equivalent emissions with land use, land-use change and forestry** | | | | | | | | | 383286,13 |
| **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 1990
Submission 2022 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 | CS,D | | | | | | | | | | |
| A. Fuel combustion | T1,T2 | CS,D | T1,T2 | CS,D | T1,T2 | CS,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 | CS,D | T1,T2 | CS,D | T1,T2 | CS,D | | | | | | | | | | |
| 4. Other sectors | T1 | D | T1 | D | T1 | D | | | | | | | | | | |
| 5. Other | T1 | D | T1 | D | T1 | D | | | | | | | | | | |
| B. Fugitive emissions from fuels | T1 | D | T1 | CS,D | T1 | D | | | | | | | | | | |
| 1. Solid fuels | T1 | 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 | T1 | D | | | | | | | | | | |
| A. Mineral industry | T1,T2 | CS,D | | | | | | | | | | | | | | |
| B. Chemical industry | T1,T2 | CS,D | | | T1 | D | | | | | | | | | | |
| 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 2022 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[5] | | | | | 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 | T1 | CS | | | | | | | | | | | | | | |
| F. Other land | | | | | | | | | | | | | | | | |
| G. Harvested wood products | | | | | | | | | | | | | | | | |
| H. Other | | | | | | | | | | | | | | | | |
| **5. Waste** | | | M,T1 | CS,D,M | T1 | D | | | | | | | | | | |
| A. Solid waste disposal | | | M | CS,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)
**RA** (Reference Approach)
**T1** (IPCC Tier 1)
**T1a, T1b, T1c** (IPCC Tier 1a, Tier 1b and Tier 1c, respectively)
**T2** (IPCC Tier 2)
**T3** (IPCC Tier 3)
**CR** (CORINAIR)
**CS** (Country Specific)
**OTH** (Other)
**M** (model)

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)
**CR** (CORINAIR)
**CS** (Country Specific)
**PS** (Plant Specific)
**OTH** (Other)
**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.<br>• 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.<br>• 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 2022 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 | 3509,60 | 461768,33 | 56093,06 | 58300,94 | NO,NA | NA,NO | NA,NO |
| 1. Energy | 2211,05 | 461762,12 | 55735,08 | 58241,88 | NO | NO | NO |
| 2. Industrial processes and product use | 1,29 | 0,05 | 205,92 | 0,46 | NA | NA | NA |
| 3. Agriculture [3] | 1121,66 | NO | 149,07 | 58,28 | | NO | NO |
| 4. LULUCF [3] | 0,23 | 6,17 | 2,90 | 0,32 | | NO | NO |
| 5. Waste | 175,37 | 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 [illegible]
(Sheet 1 of 1)

| KEY CATEGORIES OF EMISSIONS AND REMOVALS | Gas | Criteria used for key source identification | | Net emissions (excluding LULUCF) | Net emissions (including LULUCF) |
|---|---|---|---|---|---|
| | | 1 | 2 | | |
| [illegible] | [illegible] | | | | |
| [illegible] | [illegible] | | | | |
| [illegible] | [illegible] | |

| | | | | | |
|---|---|---|---|---|---|
| [illegible] | [illegible] | | | | |
| [illegible] | [illegible] | | | | |
| [illegible] | [illegible] | | | | |

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

**Recalculated year:** [illegible]
[illegible]
[illegible]

| 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 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 1. Energy | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| A. Fuel combustion activities | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 1. Energy industries | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 2. Manufacturing industries and construction | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 3. Transport | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 4. Other sectors | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 5. Other | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| B. Fugitive emissions from fuels | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 1. Solid fuels | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 2. Oil and natural gas | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| C. $CO_2$ Transport and storage | [illegible] | [illegible] | | | | | | | | | | | | | | | | |
| 2. Industrial processes and product use | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| A. Mineral industry | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | | | | | | | | | | | | |
| B. Chemical industry | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | | | | | | | | | | | | |
| C. Metal industry | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| D. Non-energy products from fuels and solvent use | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| G. Other product manufacture and use | [illegible] | [illegible] | | | | | [illegible] | [illegible] | | | | | [illegible] | [illegible] | | | | |
| H. Other | [illegible] | [illegible] | | | | | [illegible] | [illegible] | | | | | [illegible] | [illegible] | | | | |

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 2022 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[2] | Previous submission | Latest submission | Difference | Difference[1] | Impact of recalculation on total emissions excluding LULUCF[2] | Impact of recalculation on total emissions including LULUCF[2] | Previous submission | Latest submission | Difference | Difference[1] | Impact of recalculation on total emissions excluding LULUCF[2] | Impact of recalculation on total emissions including LULUCF[2] |
| | $CO_2$ equivalent (kt) | | | (%) | | | $CO_2$ equivalent (kt) | | | (%) | | | $CO_2$ equivalent (kt) | | | (%) | | |
| 3. Agriculture | 164.40 | 164.40 | 0.00 | 0.00 | 0.00 | 0.00 | 28041.61 | 28041.61 | 0.00 | 0.00 | 0.00 | 0.00 | 13721.35 | 16796.11 | 873.14 | 5.73 | 0.29 | 0.21 |
| A. Enteric fermentation | | | | | | | 20242.20 | 20242.20 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | |
| B. Manure management | | | | | | | 1144.91 | 1144.91 | 0.00 | 0.00 | 0.00 | 0.00 | 4133.07 | 4133.07 | 0.00 | 0.00 | 0.00 | 0.00 |
| C. Rice cultivation | | | | | | | 651.00 | 651.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | |
| D. Agricultural soils[3] | | | | | | | NO | NO | | | | | 11589.22 | 12462.36 | 873.14 | 7.53 | 0.29 | 0.21 |
| 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 | 164.40 | 164.40 | 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] | -12641.08 | -5572.01 | 7069.07 | -56.07 | | 2.01 | 4.71 | 4.71 | 0.00 | 0.00 | | 0.00 | 5.48 | 5.48 | 0.00 | 0.00 | | 0.00 |
| A. Forest land | -1070.33 | -1478.03 | -408.30 | -38.15 | | 0.13 | 1.30 | 1.30 | 0.00 | 0.00 | | 0.00 | 1.03 | 1.03 | 0.00 | 0.00 | | 0.00 |
| B. Cropland | -3391.93 | 9999.06 | 13390.11 | -457.84 | | 1.86 | NO,IE | NO,IE | | | | | NO,IE | NO,IE | | | | |
| C. Grassland | -6911.07 | -6911.07 | 0.00 | 0.00 | | 0.00 | 4.41 | 4.41 | 0.00 | 0.00 | | 0.00 | 4.47 | 4.47 | 0.00 | 0.00 | | 0.00 |
| D. Wetlands | 4.27 | 4.27 | 0.00 | 0.00 | | 0.00 | NO,IE,NA | NO,IE,NA | | | | | NO,IE,NA | NO,IE,NA | | | | |
| E. Settlements | -1166.00 | -1166.00 | 0.00 | 0.00 | | 0.00 | 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 5 RECALCULATION - RECALCULATED DATA**
**(Sheet 3 of 4)**

**Recalculated year:** [illegible]
[illegible]
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 | | | | | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| A. Solid waste disposal | NO | NO | | | | | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | | | | | | |
| 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. Wastewater treatment and discharge | | | | | | | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| E. Other | NO | NO | | | | | NO | NO | | | | | NO | NO | | | | |
| 6. Other (as specified in summary 1.A) | NO | NO | | | | | NO | NO | | | | | NO | NO | | | | |
| Other items | | | | | | | | | | | | | | | | | | |
| International bunkers | [illegible] | [illegible] | 0.00 | 0.00 | 0.00 | 0.00 | [illegible] | [illegible] | 0.00 | 0.00 | 0.00 | 0.00 | [illegible] | [illegible] | 0.00 | -0.00 | 0.00 | 0.00 |
| Aviation | [illegible] | [illegible] | 0.00 | 0.00 | 0.00 | 0.00 | [illegible] | [illegible] | 0.00 | 0.00 | 0.00 | 0.00 | [illegible] | [illegible] | 0.00 | -0.00 | 0.00 | 0.00 |
| Navigation | [illegible] | [illegible] | 0.00 | 0.00 | 0.00 | 0.00 | [illegible] | [illegible] | 0.00 | 0.00 | 0.00 | 0.00 | [illegible] | [illegible] | 0.00 | -0.00 | 0.00 | 0.00 |
| Multilateral operations | [illegible] | [illegible] | | | | | [illegible] | [illegible] | | | | | [illegible] | [illegible] | | | | |
| $CO_2$ emissions from biomass | [illegible] | [illegible] | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | | | | | | | |
| $CO_2$ captured | [illegible] | [illegible] | | | | | | | | | | | | | | | | |
| Long-term storage of C in waste disposal sites | NO | NO | | | | | | | | | | | | | | | | |
| Indirect $N_2O$ | | | | | | | | | | | | | | | | | | |
| Indirect $CO_2$ | NA,NO | NA,NO | | | | | | | | | | | NA,NO | NA,NO | | | | |

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

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

| Sources and sinks not estimated ("NE")[1] | | | |
|---|---|---|---|
| GHG | Sector[2] | Source/sink category[3] | 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 | via photosynthetic activity, within weeks to few years after burning (IPCC GLS, 2006) |
| CO2 | LULUCF | 4.C Grassland/4.C.1 Grassland Remaining Grassland/4(V) Biomass Burning/Wildfires | via photosynthetic activity, within weeks to few years after burning (IPCC GLS, 2006) |
| 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 |
| so pm | LULUCF | Converted to Settlements | Soil carbon changes were taken as a constant value (Tier 1 method, IPCC GLs, 2006) for the Settlements |

| Sources and sinks reported elsewhere ("IE")[4] | | | | |
|---|---|---|---|---|
| GHG | Source/sink category | Allocation as per IPCC Guidelines | Allocation used by the Party | Explanation |
| CH4 | 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 | The fuel used by mobile transport is included in the category 1.A.3 "Transport" |
| 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 | | 1.1.1.00 | 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 | | 1.AD | |
| CO2 | 1.AD Feedstocks, reductants and other non-energy use of fuels/Solid Fuels/Coking Coal | | 1.AD | 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 | 2.C Metal Industry/2.C.1 Iron and Steel Production/2.C.1.f Other (please specify) | According to IPCC GLs, 2006, volume 3, ch. 4.2, CO2 emission from coke production are presented in the Energy sector | Included in 1.A.2.a | 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.1 Forest Land Remaining Forest Land/4(V) Biomass Burning/Wildfires | | Included in 4.A.1 Carbon stock change | CO2 emissions indirectly accounted in the Carbon stock change |
| 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 | 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 N2O 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) |

(6) 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

(7) Indicate omitted source/sink category

(8) 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 2022 v1
KAZAKHSTAN

| 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]** | 383286,13 | 383286,13 | 0,00 |
| **1. Energy** | 318542,88 | 318542,88 | 0,00 |
| A. Fuel combustion (sectoral approach) | 249017,28 | 249017,28 | 0,00 |
| 1. Energy industries | 142368,62 | 142368,62 | 0,00 |
| 2. Manufacturing industries and construction | 19051,95 | 19051,95 | 0,00 |
| 3. Transport | 22317,74 | 22317,74 | 0,00 |
| 4. Other sectors | 56345,29 | 56345,29 | 0,00 |
| 5. Other | 8933,67 | 8933,67 | 0,00 |
| B. Fugitive emissions from fuels | 69525,60 | 69525,60 | 0,00 |
| 1. Solid fuels | 45859,64 | 45859,64 | 0,00 |
| 2. Oil and natural gas and other emissions from energy production | 23665,97 | 23665,97 | 0,00 |
| C. $CO_2$ transport and storage | NO,NA | NO,NA | 0,00 |
| **2. Industrial Processes** | 19292,85 | 19292,85 | 0,00 |
| A. Mineral industry | 3876,59 | 3876,59 | 0,00 |
| B. Chemical industry | 1659,12 | 1659,12 | 0,00 |
| C. Metal industry | 13754,78 | 13754,78 | 0,00 |
| D. Non-energy products from fuels and solvent use | 2,36 | 2,36 | 0,00 |
| E. Electronic industry | NO | NO | 0,00 |
| F. Product uses as ODS substitutes | NO,NA | NO,NA | 0,00 |
| G. Other product manufacture and use | NO,NE | NO,NE | 0,00 |
| H. Other | NO,NA | NO,NA | 0,00 |
| **3. Agriculture** | 44742,14 | 44742,14 | 0,00 |
| A. Enteric fermentation | 26245,50 | 26245,50 | 0,00 |
| B. Manure management | 5278,88 | 5278,88 | 0,00 |
| C. Rice cultivation | 651,00 | 651,00 | 0,00 |
| D. Agricultural soils | 12462,36 | 12462,36 | 0,00 |
| E. Prescribed burning of savannas | NO | NO | 0,00 |
| F. Field burning of agricultural residues | NO | NO | 0,00 |
| 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[3]** | -3941,21 | -3941,21 | 0,00 |
| A. Forest land | -1475,52 | -1475,52 | 0,00 |
| B. Cropland | 5599,00 | 5599,00 | 0,00 |
| C. Grassland | -6902,95 | -6902,95 | 0,00 |
| D. Wetlands | 4,25 | 4,25 | 0,00 |
| E. Settlements | -1166,00 | -1166,00 | 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** | 4649,47 | 4649,47 | 0,00 |
| A. Solid waste disposal | 1716,00 | 1716,00 | 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 | 2933,47 | 2933,47 | 0,00 |
| E. Other | NO | NO | 0,00 |
| **6. Other** ***(as specified in summary 1.A)*** | NO | NO | 0,00 |
| **Memo items:** | | | |
| **International bunkers** | 671,92 | 671,92 | 0,00 |
| Aviation | 581,36 | 581,36 | 0,00 |
| Navigation | 90,56 | 90,56 | 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 $N_2O$** | NA,NO | NA,NO | 0,00 |
| **Indirect $CO_2$** (3) | NA,NO | NA,NO | 0,00 |
| **Total $CO_2$ equivalent emissions without land use, land-use change and forestry** | 387227,34 | 387227,34 | 0,00 |
| **Total $CO_2$ equivalent emissions with land use, land-use change and forestry** | 383286,13 | 383286,13 | 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**
**$CO_2$**
**(Sheet 2 of 6)**

Inventory 1990
Submission 2022 v1
KAZAKHSTAN

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | Base year[1] | 1990 | Change from base to latest reported year |
|---|---|---|---|
| | (kt) | | % |
| **1. Energy** | 261466,16 | 261466,16 | 0,00 |
| A. Fuel combustion (sectoral approach) | 245681,14 | 245681,14 | 0,00 |
| 1. Energy industries | 141770,89 | 141770,89 | 0,00 |
| 2. Manufacturing industries and construction | 18950,88 | 18950,88 | 0,00 |
| 3. Transport | 21245,19 | 21245,19 | 0,00 |
| 4. Other sectors | 54835,05 | 54835,05 | 0,00 |
| 5. Other | 8879,13 | 8879,13 | 0,00 |
| B. Fugitive emissions from fuels | 15785,02 | 15785,02 | 0,00 |
| 1. Solid fuels | 15709,91 | 15709,91 | 0,00 |
| 2. Oil and natural gas and other emissions from energy production | 75,11 | 75,11 | 0,00 |
| C. $CO_2$ transport and storage | NO,NA | NO,NA | 0,00 |
| **2. Industrial processes** | 18835,55 | 18835,55 | 0,00 |
| A. Mineral industry | 3876,59 | 3876,59 | 0,00 |
| B. Chemical industry | 1234,17 | 1234,17 | 0,00 |
| C. Metal industry | 13722,42 | 13722,42 | 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]** | -3952,45 | -3952,45 | 0,00 |
| A. Forest land | -1478,03 | -1478,03 | 0,00 |
| B. Cropland | 5599,00 | 5599,00 | 0,00 |

| | | | |
|---|---|---|---|
| C. Grassland | -6911,67 | -6911,67 | 0,00 |
| D. Wetlands | 4,25 | 4,25 | 0,00 |
| E. Settlements | -1166,00 | -1166,00 | 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)** | NA,NO | NA,NO | 0,00 |
| **Total $CO_2$ equivalent emissions without land use, land-use change and forestry** | 280406,11 | 280406,11 | 0,00 |
| **Total $CO_2$ equivalent emissions with land use, land-use change and forestry** | 276453,67 | 276453,67 | 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**
**$CH_4$**
**(Sheet 3 of 6)**

Inventory 1990
Submission 2022 v1
KAZAKHSTAN

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | Base year[1] | 1990 | Change from base to latest reported year |
|---|---|---|---|
| | (kt) | | % |
| **1. Energy** | 2211,05 | 2211,05 | 0,00 |
| A. Fuel combustion (sectoral approach) | 61,64 | 61,64 | 0,00 |
| 1. Energy industries | 2,28 | 2,28 | 0,00 |
| 2. Manufacturing industries and construction | 1,42 | 1,42 | 0,00 |
| 3. Transport | 6,41 | 6,41 | 0,00 |
| 4. Other sectors | 50,52 | 50,52 | 0,00 |
| 5. Other | 1,02 | 1,02 | 0,00 |
| B. Fugitive emissions from fuels | 2149,41 | 2149,41 | 0,00 |
| 1. Solid fuels | 1205,99 | 1205,99 | 0,00 |
| 2. Oil and natural gas and other emissions from energy production | 943,42 | 943,42 | 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** | 0,23 | 0,23 | 0,00 |
| A. Forest land | 0,06 | 0,06 | 0,00 |
| B. Cropland | NO,IE | NO,IE | 0,00 |

| | | | |
|---|---|---|---|
| C. Grassland | 0,17 | 0,17 | 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** | 175,37 | 175,37 | 0,00 |
| A. Solid waste disposal | 68,64 | 68,64 | 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 | 106,73 | 106,73 | 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** | 3509,37 | 3509,37 | 0,00 |
| **Total $CH_4$ emissions with $CH_4$ from LULUCF** | 3509,60 | 3509,60 | 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 $CO_2$ (b)** | | | |

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

TABLE 10: ENERGY FACTOR

[illegible]

[illegible]

| [illegible] | [illegible] | [illegible] | [illegible] |
|---|---|---|---|
| [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] |

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

Inventory 1990
Submission 2022 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 2022 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 | 280406,11 | 280406,11 | 0,00 |
| $CO_2$ emissions with net $CO_2$ from LULUCF | 276453,67 | 276453,67 | 0,00 |
| $CH_4$ emissions without $CH_4$ from LULUCF | 87734,22 | 87734,22 | 0,00 |
| $CH_4$ emissions with $CH_4$ from LULUCF | 87739,97 | 87739,97 | 0,00 |
| $N_2O$ emissions without $N_2O$ from LULUCF | 19087,01 | 19087,01 | 0,00 |
| $N_2O$ emissions with $N_2O$ from LULUCF | 19092,49 | 19092,49 | 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)** | 387227,34 | 387227,34 | 0,00 |
| **Total (with LULUCF)** | 383286,13 | 383286,13 | 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 | 318542,88 | 318542,88 | 0,00 |
| 2. Industrial processes and product use | 19292,85 | 19292,85 | 0,00 |
| 3. Agriculture | 44742,14 | 44742,14 | 0,00 |
| 4. Land use, land-use change and forestry[5] | -3941,21 | -3941,21 | 0,00 |
| 5. Waste | 4649,47 | 4649,47 | 0,00 |
| 6. Other | NO | NO | 0,00 |
| **Total (including LULUCF)[6]** | 383286,13 | 383286,13 | 0,00 |

[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
[2] Fill in net emissions/removals as reported in table Summary 1.A. For the purposes of reporting, the signs for removals are always
[3] In accordance with the UNFCCC reporting guidelines, for Parties that decide to report indirect CO2 the national totals shall be
[4] In accordance with the UNFCCC reporting guidelines, HFC and PFC emissions should be reported for each relevant chemical.
[5] Includes net $CO_2$, $CH_4$ and $N_2O$ from LULUCF.

| **Documentation box:**<br>• 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 references to relevant<br>• 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 2020
Submission 2022 v1
KAZAKHSTAN

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | $CO_2$ | $CH_4$ | $N_2O$ | $NO_X$ | CO | NMVOC | $SO_2$ |
|---|---|---|---|---|---|---|---|
| | (kt) | | | | | | |
| **Total Energy** | 259331,29 | 534,91 | 4,35 | 70597,69 | 471815,41 | 51065,41 | 636,22 |
| **A. Fuel combustion activities (sectoral approach)** | 242487,38 | 66,65 | 4,34 | 70597,69 | 471815,41 | 51065,41 | 636,22 |
| **1. Energy industries** | 143762,48 | 1,89 | 1,92 | 427,81 | 32,13 | 8,10 | 416,10 |
| a. Public electricity and heat production | 110429,08 | 1,28 | 1,53 | 338,45 | 24,98 | 6,26 | 357,29 |
| b. Petroleum refining | 3712,42 | 0,15 | 0,03 | | | | |
| c. Manufacture of solid fuels and other energy industries | 29620,98 | 0,46 | 0,36 | 89,36 | 7,15 | 1,84 | 58,81 |
| **2. Manufacturing industries and construction** | 26461,69 | 2,30 | 0,38 | 35,22 | 12,65 | 1,81 | 51,32 |
| a. Iron and steel | 10771,40 | 1,12 | 0,17 | | | | |
| b. Non-ferrous metals | 7744,31 | 0,75 | 0,11 | 23,75 | 10,92 | 1,50 | 41,42 |
| c. Chemicals | 517,30 | 0,01 | 0,00 | 1,39 | 0,28 | 0,05 | |
| d. Pulp, paper and print | 42,88 | 0,00 | 0,00 | | | | |
| e. Food processing, beverages and tobacco | 720,98 | 0,03 | 0,00 | | | | |
| f. Non-metallic minerals | 3282,66 | 0,31 | 0,05 | | | | |
| g. Other (*please specify*) | 3382,17 | 0,09 | 0,04 | 10,08 | 1,45 | 0,27 | 9,90 |
| **3. Transport** | 18164,13 | 7,17 | 1,28 | 70078,80 | 471072,06 | 50985,07 | 41,75 |
| a. Domestic aviation | 111,19 | 0,00 | 0,00 | 0,39 | 0,19 | 0,00 | 0,03 |
| b. Road transportation | 15704,23 | 6,57 | 0,84 | 70078,39 | 471071,83 | 50985,06 | 41,72 |
| c. Railways | 1001,41 | 0,06 | 0,39 | 0,02 | 0,03 | 0,00 | NE |
| d. Domestic navigation | 3,02 | 0,00 | 0,00 | NE | NE | NE | NE |
| e. Other transportation | 1344,28 | 0,53 | 0,06 | NE | NE | NE | NE |

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

Inventory 2020
Submission 2022 v1
KAZAKHSTAN

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | $CO_2$ | $CH_4$ | $N_2O$ | $NO_X$ | CO | NMVOC | $SO_2$ |
|---|---|---|---|---|---|---|---|
| | (kt) | | | | | | |
| **4. Other sectors** | 31970,65 | 52,73 | 0,47 | 30,44 | 391,85 | 39,46 | 73,34 |
| a. Commercial/institutional | 4087,69 | 0,51 | 0,05 | 4,22 | 53,68 | 5,39 | 12,12 |
| b. Residential | 25031,10 | 49,97 | 0,28 | 26,22 | 338,17 | 34,07 | 61,22 |
| c. Agriculture/forestry/fishing | 2851,86 | 2,25 | 0,14 | | | | |
| **5. Other** *(as specified in table 1.A(a) sheet 4)* | 22128,44 | 2,56 | 0,29 | 25,43 | 306,71 | 30,98 | 53,72 |
| a. Stationary | 22128,44 | 2,56 | 0,29 | 25,43 | 306,71 | 30,98 | 53,72 |
| b. Mobile | NO,IE | NO,IE | NO,IE | NO | NO | NO | NO |
| **B. Fugitive emissions from fuels** | 16843,90 | 468,26 | 0,01 | NO,NA | NO,NA | NO,NA | NO,NA |
| **1. Solid fuels** | 16829,18 | 275,13 | 0,00 | NO,NA | NO,NA | NO,NA | NO,NA |
| a. Coal mining and handling | 108,12 | 275,13 | NA | NA | NA | NA | |
| b. Solid fuel transformation | 10,66 | 0,00 | 0,00 | NO | NO | NO | NO |
| c. Other *(as specified in table 1.B.1)* | 16710,40 | 0,00 | 0,00 | NA | NA | NA | NA |
| **2. Oil and natural gas and other emissions from energy production** | 14,73 | 193,12 | 0,01 | NA | NA | NA | NA |
| a. Oil | 11,71 | 160,61 | 0,01 | NA | NA | NA | NA |
| b. Natural gas | 1,33 | 32,51 | | | | NA | NA |
| c. Venting and flaring | 1,69 | 0,00 | 0,00 | NA | NA | NA | NA |
| 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** | 380,63 | 0,00 | 0,01 | NE,NA | NE,NA | NE,NA | NE,NA |
| Aviation | 369,71 | 0,00 | 0,01 | NE | NE | NE | NE |
| Navigation | 10,92 | 0,00 | 0,00 | NA | NA | NA | NA |
| **Multilateral operations** | NA | NA | NA | NA | NA | NA | NA |
| **$CO_2$ emissions from biomass** | 178,92 | | | | | | |
| **$CO_2$ captured** | NO,IE,NA | | | | | | |
| For domestic storage | NA | | | | | | |
| For storage in other countries | NA | | | | | | |

[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 | he, Jet kerosene, Other kerosene, Gas/Diesel Oil, LPG ther Liquid Fuels. in the subcategory 1.A.4c.ii Off road vehicles and other machinery includes Gasoline, Jet kerosene, Other k |

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

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | AGGREGATE ACTIVITY DATA | | IMPLIED EMISSION FACTORS | | | EMISSIONS | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Consumption | | $CO_2$[1] | $CH_4$ | $N_2O$ | $CO_2$[1] | $CH_4$ | $N_2O$ | $CO_2$ Amount captured |
| | (TJ) | NCV/GCV[2] | (t/TJ) | (kg/TJ) | | (kt) | | | |
| 1.A. Fuel combustion | 2502711,55 | NCV | | | | | | | |
| Liquid fuels | 559013,42 | NCV | 70,85 | 17,57 | 2,84 | 242487,38 | 66,65 | 4,34 | NO,NA |
| Solid fuels | 1789669,45 | NCV | 95,79 | 30,65 | 1,50 | 39537,49 | 9,81 | 1,59 | NA |
| Gaseous fuels | 583262,39 | NCV | 55,56 | 2,57 | 0,50 | 170542,64 | 54,85 | 2,69 | NA |
| Other fossil fuels[4] | NO,NA | NCV | NO,NA | NO,NA | NO,NA | 32407,25 | 1,38 | 0,06 | NA |
| Peat[5] | NO,NA | NCV | NO,NA | NO | NO | NO,NA | NO,NA | NO,NA | NA |
| Biomass[6] | 2415,80 | NCV | 24,06 | 252,91 | 4,03 | NO | NO | NO | NO,NA |
| 1.A.1. Energy Industries | 1676567,30 | NCV | | | | | 0,61 | 0,01 | NA |
| Liquid fuels | 102532,85 | NCV | 70,64 | 3,00 | 0,59 | 143762,48 | 1,89 | 1,92 | NO,NA |
| Solid fuels | 1224475,20 | NCV | 95,82 | 1,50 | 1,50 | 7243,34 | 0,31 | 0,06 | NA |
| Gaseous fuels | 359198,02 | NCV | 56,10 | 1,00 | 0,10 | 116368,12 | 1,21 | 1,82 | NA |
| Other fossil fuels[4] | NA | NCV | NA | NA | NA | 20151,01 | 0,36 | 0,04 | NA |
| Peat[5] | NO,NA | NCV | NO,NA | NO | NO | NA | NA | NA | NA |
| Biomass[6] | 360,94 | NCV | 73,33 | 29,92 | 3,88 | NO | NO | NO | NO,NA |
| a. Public electricity and heat production[7] | 1251513,22 | NCV | | | | 26,47 | 0,01 | 0,00 | NA |
| Liquid fuels | 7900,47 | NCV | 76,94 | 3,04 | 0,63 | 110439,08 | 1,29 | 1,53 | NA |
| Solid fuels | 1002517,66 | NCV | 96,07 | 1,00 | 1,50 | 607,88 | 0,02 | 0,01 | NA |
| Gaseous fuels | 240714,15 | NCV | 56,10 | 1,00 | 0,10 | 96317,14 | 1,06 | 1,50 | NA |
| Other fossil fuels[4] | NA | NCV | NA | NA | NA | 13504,06 | 0,24 | 0,02 | NA |
| Peat[5] | NO | NCV | NO,NA | NO | NO | NA | NA | NA | NA |
| Biomass[6] | 360,94 | NCV | 73,33 | 29,92 | 3,88 | NO | NO | NO | NA |
| b. Petroleum refining | 56385,84 | NCV | | | | 26,47 | 0,01 | 0,00 | NA |
| Liquid fuels | 48970,13 | NCV | 67,23 | 3,00 | 0,59 | 3312,40 | 0,15 | 0,03 | NO,NA |
| Solid fuels | 93,96 | NCV | 98,12 | 0,96 | 1,50 | 3292,45 | 0,15 | 0,03 | NA |
| Gaseous fuels | 7321,74 | NCV | 56,10 | 1,00 | 0,10 | 0,22 | 0,00 | 0,00 | NA |
| Other fossil fuels[4] | NA | NCV | NA | NA | NA | 410,75 | 0,01 | 0,00 | NA |
| Peat[5] | NO | NCV | NO | NO | NO | NA | NA | NA | NA |
| Biomass[6] | NA | NCV | NA | NA | NA | NO | NO | NO | NO |
| c. Manufacture of solid fuels and other energy industries[8] | 368668,24 | NCV | | | | NA | NA | NA | NA |
| Liquid fuels | 45962,84 | NCV | 73,21 | 3,00 | 0,59 | 29820,98 | 0,46 | 0,36 | NA |
| Solid fuels | 211844,07 | NCV | 94,61 | 0,99 | 1,51 | 3343,92 | 0,14 | 0,03 | NA |
| Gaseous fuels | 111162,14 | NCV | 56,10 | 1,00 | 0,10 | 20061,76 | 0,21 | 0,32 | NA |
| Other fossil fuels[4] | NA | NCV | NA | NA | NA | 6236,20 | 0,11 | 0,01 | NA |
| Peat[5] | NA | NCV | NO,NA | NO | NO | NA | NA | NA | NA |
| Biomass[6] | NA | NCV | NA | NA | NA | NO | NO | NO | 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 1.111). 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 2020
Submission 2022 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 | 320267,71 | NCV | | | | 26461,69 | 2,30 | 0,38 | NO,NA |
| Liquid fuels | 39539,58 | NCV | 74,94 | 3,00 | 0,59 | 2963,12 | 0,12 | 0,02 | NA |
| Solid fuels | 231062,04 | NCV | 90,93 | 9,23 | 1,50 | 21010,62 | 2,13 | 0,35 | NA |
| Gaseous fuels | 49604,70 | NCV | 50,16 | 1,02 | 0,10 | 2487,95 | 0,05 | 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 | NO,NA |
| Biomass[(6)] | 61,41 | NCV | 73,32 | 30,47 | 3,95 | 4,50 | 0,00 | 0,00 | NA |
| a. Iron and steel | 136692,80 | NCV | | | | 10771,40 | 1,12 | 0,17 | NA |
| Liquid fuels | 21656,33 | NCV | 74,23 | 3,00 | 0,60 | 1607,65 | 0,07 | 0,01 | NA |
| Solid fuels | 104606,06 | NCV | 84,83 | 10,00 | 1,50 | 8873,45 | 1,05 | 0,16 | NA |
| Gaseous fuels | 10430,41 | NCV | 27,83 | 1,00 | 0,10 | 290,30 | 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 | 82703,90 | NCV | | | | 7744,51 | 0,75 | 0,11 | NO,NA |
| Liquid fuels | 10562,97 | NCV | 77,56 | 3,03 | 0,57 | 819,03 | 0,03 | 0,01 | NA |
| Solid fuels | 72091,19 | NCV | 96,02 | 10,00 | 1,50 | 6922,49 | 0,72 | 0,11 | NA |
| Gaseous fuels | 49,74 | NCV | 56,10 | 1,01 | 0,10 | 2,79 | 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 | 9063,56 | NCV | | | | 537,30 | 0,03 | 0,00 | NO,NA |
| Liquid fuels | 225,36 | NCV | 74,28 | 2,97 | 0,60 | 16,74 | 0,00 | 0,00 | NA |
| Solid fuels | 118,46 | NCV | 96,14 | 9,96 | 1,50 | 11,39 | 0,00 | 0,00 | NA |
| Gaseous fuels | 8719,57 | NCV | 56,10 | 1,00 | 0,10 | 489,17 | 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)] | 0,17 | NCV | 73,30 | 28,90 | 4,05 | 0,01 | 0,00 | 0,00 | NA |
| d. Pulp, paper and print | 721,61 | NCV | | | | 42,88 | 0,00 | 0,00 | NO,NA |
| Liquid fuels | 86,63 | NCV | 76,30 | 3,00 | 0,60 | 6,61 | 0,00 | 0,00 | NA |
| Solid fuels | 16,09 | NCV | 96,06 | 10,01 | 1,49 | 1,55 | 0,00 | 0,00 | NA |
| Gaseous fuels | 618,89 | NCV | 56,10 | 1,00 | 0,10 | 34,72 | 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 | NO |
| e. Food processing, beverages and tobacco | 11374,38 | NCV | | | | 720,98 | 0,03 | 0,00 | NO,NA |
| Liquid fuels | 2333,63 | NCV | 70,98 | 3,00 | 0,60 | 165,63 | 0,01 | 0,00 | NA |
| Solid fuels | 1377,55 | NCV | 97,02 | 9,94 | 1,50 | 114,25 | 0,01 | 0,00 | NA |
| Gaseous fuels | 7662,73 | NCV | 56,10 | 1,00 | 0,10 | 441,10 | 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)] | 0,47 | NCV | 73,22 | 30,06 | 4,05 | 0,03 | 0,00 | 0,00 | NA |
| f. Non-metallic minerals | 57121,61 | NCV | | | | 3282,66 | 0,31 | 0,05 | NO,NA |
| Liquid fuels | 968,49 | NCV | 70,34 | 3,10 | 0,60 | 68,13 | 0,00 | 0,00 | NA |
| Solid fuels | 29628,54 | NCV | 96,15 | 10,00 | 1,50 | 2848,78 | 0,30 | 0,04 | NA |
| Gaseous fuels | 6519,59 | NCV | 56,10 | 1,00 | 0,10 | 365,75 | 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)] | 4,98 | NCV | 73,33 | 30,00 | 4,01 | 0,37 | 0,00 | 0,00 | NA |
| g. Other (please specify)[(7)] | 42589,88 | NCV | | | | 3182,17 | 0,09 | 0,04 | 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 2020

Submission 2022 v1

KAZAKHSTAN

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | AGGREGATE ACTIVITY DATA | | IMPLIED EMISSION FACTORS | | | EMISSIONS | | |
|---|---|---|---|---|---|---|---|---|
| | Consumption | | $CO_2$ [1] | $CH_4$ | $N_2O$ | $CO_2$ [1] | $CH_4$ | $N_2O$ |
| | (TJ) | NCV/GCV [2] | (t/TJ) | (kg/TJ) | | (kt) | | |
| **1.A.3 Transport** | 260467,52 | NCV | | | | 18164,13 | 7,17 | 1,28 |
| Liquid fuels | 241301,10 | NCV | 70,75 | 28,88 | 5,31 | 17071,35 | 6,97 | 1,28 |
| Solid fuels | NO,NA | NCV | NO,NA | NO,NA | NO,NA | NO,NA | NO,NA | NO,NA |
| Gaseous fuels | 19815,92 | NCV | 55,15 | 10,00 | 0,10 | 1092,78 | 0,20 | 0,00 |
| Other fossil fuels [4] | NO,NA | NCV | NO,NA | NO,NA | NO,NA | NO,NA | NO,NA | NO,NA |
| Biomass [5] | NO,NA | NCV | NO,NA | NO,NA | NO,NA | NO,NA | NO,NA | NO,NA |
| a. Domestic aviation [10] | 1576,32 | NCV | | | | 111,19 | 0,00 | 0,00 |
| Aviation gasoline | 688,31 | NCV | 69,30 | 0,50 | 2,00 | 47,70 | 0,00 | 0,00 |
| Jet kerosene | 888,01 | NCV | 71,50 | 0,50 | 2,00 | 63,49 | 0,00 | 0,00 |
| Biomass | NO | | NO | NO | NO | NO | NO | NO |
| b. Road transportation [11] | 223818,31 | NCV | | | | 15704,23 | 6,57 | 0,84 |
| Gasoline | 134802,98 | NCV | 69,30 | 33,00 | 3,20 | 9341,84 | 4,45 | 0,43 |
| Diesel oil | 67571,63 | NCV | 74,13 | 3,90 | 5,20 | 5009,29 | 0,26 | 0,35 |
| Liquefied petroleum gases (LPG) | 21443,71 | NCV | 63,10 | 86,84 | 2,52 | 1353,10 | 1,86 | 0,05 |
| 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 [5] | 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 | 149051,25 | NCV | | | | 10309,97 | 5,42 | 0,49 |
| Gasoline | 112373,13 | NCV | 69,30 | 33,00 | 3,20 | 7787,46 | 3,71 | 0,36 |
| Diesel oil | 18920,05 | NCV | 74,10 | 3,90 | 3,90 | 1401,98 | 0,07 | 0,07 |
| Liquefied petroleum gases (LPG) | 17758,07 | NCV | 63,10 | 92,00 | 3,00 | 1120,53 | 1,63 | 0,05 |
| Other liquid fuels (*please specify*) | NA | | | | | NA | NA | NA |
| Gaseous fuels | NA | | NA | NA | NA | NA | NA | NA |
| Biomass [5] | NA | | NA | NA | NA | NA | NA | NA |
| Other fossil fuels (*please specify*) [4] | NA | | | | | NA | NA | NA |
| ii. Light duty trucks | 25891,22 | NCV | | | | 1834,31 | 0,61 | 0,10 |
| Gasoline | 14940,80 | NCV | 69,30 | 33,00 | 3,20 | 1035,39 | 0,49 | 0,05 |
| Diesel oil | 9610,19 | NCV | 74,33 | 3,90 | 5,70 | 714,34 | 0,04 | 0,05 |
| Liquefied petroleum gases (LPG) | 1340,23 | NCV | 63,10 | 62,00 | 0,20 | 84,57 | 0,08 | 0,00 |
| Other liquid fuels (*please specify*) | NA | | | | | NA | NA | NA |
| Gaseous fuels | NA | | NA | NA | NA | NA | NA | NA |
| Biomass [5] | NA | | NA | NA | NA | NA | NA | NA |
| Other fossil fuels (*please specify*) [4] | NA | | | | | NA | NA | NA |
| iii. Heavy duty trucks and buses | 48483,68 | NCV | | | | 3532,77 | 0,53 | 0,25 |
| Gasoline | 7096,86 | NCV | 69,30 | 33,00 | 3,20 | 491,81 | 0,23 | 0,02 |
| Diesel oil | 39041,38 | NCV | 74,10 | 3,90 | 5,70 | 2892,97 | 0,15 | 0,22 |
| Liquefied petroleum gases (LPG) | 2345,41 | NCV | 63,10 | 62,00 | 0,20 | 148,00 | 0,15 | 0,00 |
| Other liquid fuels (*please specify*) | NA | | | | | NA | NA | NA |
| Gaseous fuels | NA | | NA | NA | NA | NA | NA | NA |
| Biomass [5] | NA | | NA | NA | NA | NA | NA | NA |
| Other fossil fuels (*please specify*) [4] | NA | | | | | NA | NA | NA |
| iv. Motorcycles | 392,20 | NCV | | | | 27,18 | 0,01 | 0,00 |
| Gasoline | 392,20 | NCV | 69,30 | 33,00 | 3,20 | 27,18 | 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[8] | NA | | NA | NA | NA | NA | NA | NA |
| Other fossil fuels *(please specify)*[9] | NA | | | | | NA | NA | NA |
| v. Other (please specify) | NO | NCV | | | | NO | NO | NO |
| c. Railways | 13514,32 | NCV | | | | 1001,41 | 0,06 | 0,39 |
| Liquid fuels | 13514,32 | NCV | 74,10 | 4,15 | 28,60 | 1001,41 | 0,06 | 0,39 |
| Solid fuels | NO | | NO | NO | NO | NO | NO | NO |
| Gaseous fuels | NO | | NO | NO | NO | NO | NO | NO |
| Biomass[8] | NO | | NO | NO | NO | NO | NO | NO |
| Other fossil fuels *(please specify)* | NO | | | | | NO | NO | NO |
| d. Domestic Navigation[10] | 40,97 | NCV | | | | 3,02 | 0,00 | 0,00 |
| Residual fuel oil | NO | | NO | NO | NO | NO | NO | NO |
| Gas/diesel oil | 37,99 | NCV | 74,10 | 7,00 | 2,00 | 2,81 | 0,00 | 0,00 |
| Gasoline | 2,99 | NCV | 69,30 | 33,00 | 32,00 | 0,21 | 0,00 | 0,00 |
| Other liquid fuels *(please specify)* | NO | | | | | NO | NO | NO |
| Gaseous fuels | NO | | NO | NO | NO | NO | NO | NO |
| Biomass[8] | NO | | NO | NO | NO | NO | NO | NO |
| Other fossil fuels *(please specify)*[9] | NO | | | | | NO | NO | NO |
| e. Other transportation *(please specify)* | 21517,59 | NCV | | | | 1344,28 | 0,53 | 0,06 |
| Liquid fuels | 2351,17 | NCV | 106,97 | 143,05 | 23,47 | 251,49 | 0,34 | 0,06 |
| Solid fuels | NO,NA | NCV | NO,NA | NO,NA | NO,NA | NO,NA | NO,NA | NO,NA |
| Gaseous fuels | 19815,92 | NCV | 55,15 | 10,00 | 0,10 | 1092,78 | 0,20 | 0,00 |
| Other fossil fuels[9] | NO,NA | NCV | NO,NA | NO,NA | NO,NA | NO,NA | NO,NA | NO,NA |
| Biomass[8] | NO,NA | NCV | NO,NA | NO,NA | NO,NA | NO,NA | NO,NA | NO,NA |
| i. Pipeline transport | 21517,59 | NCV | | | | 1219,25 | 0,29 | 0,06 |
| Liquid fuels | 1701,68 | NCV | 74,32 | 56,69 | 0,65 | 126,47 | 0,10 | 0,00 |
| Solid fuels | NO | NCV | NO | NO | NO | NO | NO | NO |
| Gaseous fuels | 19815,92 | NCV | 55,15 | 10,00 | 0,10 | 1092,78 | 0,20 | 0,00 |
| Other fossil fuels[9] | NO | | NO | NO | NO | NO | NO | NO |
| Biomass[8] | NO | | NO | NO | NO | NO | NO | NO |
| ii. Other *(please specify)* | NO | NCV | | | | 125,02 | 0,24 | 0,05 |

**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 2020
Submission 2022 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 | 420075,89 | NCV | | | | | | | |
| Liquid fuels | 73539,99 | NCV | 66,56 | 19,83 | 2,17 | 3197,65 | 52,73 | 0,47 | NO,NA |
| Solid fuels | 192014,82 | NCV | 86,39 | 268,32 | 1,50 | 8962,47 | 1,40 | 0,18 | NA |
| Gaseous fuels | 152948,99 | NCV | 56,10 | 5,00 | 0,10 | 18507,40 | 49,99 | 0,29 | NA |
| Other fossil fuels [4] | NO,NA | NCV | NO,NA | NO,NA | NO,NA | 8560,78 | 0,76 | 0,02 | NA |
| Peat [5] | NO | NCV | NO,NA | NO | NO | NO,NA | NO,NA | NO,NA | NA |
| Biomass [6] | 1922,49 | NCV | 74,25 | 300,13 | 4,86 | NO | NO | NO | NO,NA |
| a. Commercial/institutional [7] | 52677,66 | NCV | | | | 142,75 | 0,58 | 0,01 | NA |
| Liquid fuels | 5644,32 | NCV | 72,81 | 9,82 | 0,55 | 4087,69 | 0,51 | 0,05 | NA |
| Solid fuels | 26771,84 | NCV | 96,22 | 10,01 | 1,50 | 4103,95 | 0,06 | 0,00 | NA |
| Gaseous fuels | 20478,02 | NCV | 56,10 | 4,98 | 0,10 | 2527,93 | 0,26 | 0,04 | NA |
| Other fossil fuels [4] | NA | NCV | NA | NA | NA | 1148,82 | 0,10 | 0,00 | NA |
| Peat [5] | NO | NCV | NO,NA | NO | NO | NA | NA | NA | NA |
| Biomass [6] | 278,48 | NCV | 78,39 | 301,63 | 3,95 | NO | NO | NO | NA |
| b. Residential [7] | 127103,85 | NCV | | | | 23,28 | 0,08 | 0,00 | NA |
| Liquid fuels | 34109,63 | NCV | 85,16 | 39,90 | 0,59 | 29031,10 | 49,97 | 0,78 | NA |
| Solid fuels | 161800,27 | NCV | 96,41 | 300,08 | 1,50 | 2154,32 | 0,24 | 0,02 | NA |
| Gaseous fuels | 129713,11 | NCV | 56,10 | 5,00 | 0,10 | 15599,83 | 48,54 | 0,24 | NA |
| Other fossil fuels [4] | NA | NCV | NA | NA | NA | 7276,91 | 0,65 | 0,01 | NA |
| Peat [5] | NO | NCV | NO,NA | NO | NO | NA | NA | NA | NA |
| Biomass [6] | 1480,82 | NCV | 73,61 | 299,83 | 4,05 | NO | NO | NO | NA |
| 1.A.4 b.ii. Other (please specify) | 227103,85 | NCV | | | | 109,01 | 0,44 | 0,01 | NA |
| c. Agriculture/forestry/fishing | 40598,60 | NCV | | | | 29331,18 | 49,33 | 0,28 | NA |
| Liquid fuels | 15786,04 | NCV | 69,19 | 29,61 | 4,84 | 2951,86 | 2,25 | 0,14 | NO,NA |
| Solid fuels | 394,171 | NCV | 96,30 | 300,12 | 1,50 | 2337,29 | 1,20 | 0,14 | NA |
| Gaseous fuels | 2407,47 | NCV | 56,10 | 4,98 | 0,10 | 379,60 | 1,18 | 0,01 | NA |
| Other fossil fuels [4] | NO,NA | NCV | NO,NA | NO,NA | NO,NA | 135,06 | 0,01 | 0,00 | NA |
| Peat [5] | NO | NCV | NO | NO | NO | NO,NA | NO,NA | NO,NA | NA |
| Biomass [6] | 163,18 | NCV | 73,34 | 300,28 | 4,29 | NO | NO | NO | NO |
| i. Stationary | 6701,26 | NCV | | | | 11,97 | 0,05 | 0,00 | NA |
| Liquid fuels | 189,00 | NCV | 73,54 | 10,05 | 0,60 | 538,58 | 1,75 | 0,01 | NO,NA |
| Solid fuels | 394,171 | NCV | 96,30 | 300,12 | 1,50 | 13,90 | 0,00 | 0,00 | NA |
| Gaseous fuels | 2407,47 | NCV | 56,10 | 4,98 | 0,10 | 379,60 | 1,18 | 0,01 | NA |
| Other fossil fuels [4] | NA | NCV | NA | NA | NA | 135,06 | 0,01 | 0,00 | NA |
| Peat [5] | NO | NCV | NO | NO | NO | NA | NA | NA | NA |
| Biomass [6] | 163,18 | NCV | 73,34 | 300,28 | 4,29 | NO | NO | NO | NO |
| ii. Off-road vehicles and other machinery | 26609,41 | NCV | | | | 11,97 | 0,05 | 0,00 | NA |
| Gasoline | 8026,72 | NCV | 69,10 | 80,00 | 2,00 | 1824,36 | 0,63 | 0,04 | |
| Diesel oil | 6126,49 | NCV | 74,10 | 4,15 | 2,86 | 556,25 | 0,64 | 0,02 | |
| Liquefied petroleum gases (LPG) | NO | NCV | NO | NO | NO | 455,97 | 0,03 | 0,02 | |
| Other liquid fuels (please specify) | 12456,20 | NCV | | | | NO | NO | NO | |
| Gaseous fuels | NA | NCV | NA | NA | NA | 816,13 | 0,01 | 0,01 | |
| Biomass [6] | NA | | NA | NA | NA | NA | NA | NA | |
| Other fossil fuels (please specify) [4] | NA | | | | | NA | NA | NA | |
| iii. Fishing | 6987,62 | NCV | | | | 498,95 | 0,33 | 0,01 | |
| Residual fuel oil | NO | | NO | NO | NO | NO | NO | NO | |
| Gas/diesel oil | 3063,75 | NCV | 74,10 | 4,15 | 28,60 | 226,99 | 0,01 | 0,09 | |
| Gasoline | 3924,18 | NCV | 69,20 | 80,00 | 2,00 | 271,96 | 0,31 | 0,01 | |
| Other liquid fuels (please specify) | NO | NCV | | | | 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) [8] | 255313,11 | NCV | | | | 22128,44 | 2,56 | 0,29 | NA |
| a. Stationary (please specify) | 255313,11 | NCV | | | | 22128,44 | 2,56 | 0,29 | NA |
| b. Mobile (please specify) | NO,IE | NCV | | | | NO,IE | NO,IE | NO,IE | |
| Information item [10] | | | | | | | | | |
| Waste incineration with energy recovery included as: | | | | | | | | | |
| Biomass [6] | NO | | NO | NO | NO | NO | NO | NO | NO |
| Fossil fuels [4] | NO | | NO | NO | NO | NO | NO | NO | NO |

[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] Total 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.

**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)**

Submission 2020

Submission 2022 v1

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| FUEL TYPES | | | Units | Production | Imports | Exports | International bunkers | Stock change | Apparent consumption | Conversion factor (TJ/Unit) | NCV/GCV [a] | 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 | Primary fuels | Crude oil | kt | 7906.71 | 11.42 | 7620.46 | | -315.13 | 661.95 | 42.6 | NCV | 28163.34 | 20.00 | 563.27 | NE | 563.27 | 1.00 | 2066.79 |
| | | Natural gas liquids | kt | NO | NO | NO | | NO | NO | NA | NCV | NO,NA | NA | NO,NA | NE | NO,NA | NA | NO,NA |
| | | Other oil and gas liquids | kt | 12649.96 | 0.72 | 231.08 | | 34.64 | 12453.01 | 44.20 | NCV | 550663.81 | 17.50 | 9636.09 | NA | 9636.09 | 1.00 | 35332.31 |
| | Secondary fuels | Gasoline | kt | | 2.76 | 566.83 | NO | 266.72 | 466.79 | 44.30 | NCV | 20675.03 | 18.90 | 390.82 | 0.25 | 390.57 | 1.00 | 1431.77 |
| | | Jet kerosene | kt | | 20.04 | 6.39 | NO | -8.41 | 22.05 | 44.10 | NCV | 972.40 | 19.50 | 18.97 | NA | 18.97 | 1.00 | 69.56 |
| | | Other kerosene | kt | | 0.87 | NO | NO | -1.42 | 2.29 | 43.80 | NCV | 100.31 | 19.60 | 1.94 | 0.00 | 1.94 | 1.00 | 7.11 |
| | | Diesel oil | kt | | NO | NO | | NO | NO | NA | NCV | NO,NA | 19.60 | NO,NA | NE | NO,NA | NA | NO,NA |
| | | Residual fuel oil | kt | | 666.11 | 130.48 | NO | 91.42 | 476.16 | 41.60 | NCV | 19810.56 | 21.10 | 418.00 | 0.00 | 418.00 | 1.00 | 1532.33 |
| | | Liquefied petroleum gases (LPG) | kt | | 7.30 | 1551.09 | NO | -8.19 | 1567.01 | 46.40 | NCV | 72695.83 | 17.20 | 1250.00 | 14.61 | 1235.39 | 1.00 | 4529.77 |
| | | Ethane | kt | | 0.04 | 2895.46 | | 25.41 | 2870.49 | 47.50 | NCV | 136293.83 | 20.00 | 2725.87 | 2.29 | 2723.58 | 1.00 | 9986.81 |
| | | Naphtha | kt | | NO | NO | | NO | NO | NA | NCV | NO,NA | NA | NO,NA | NE | NO,NA | NA | NO,NA |
| | | Bitumen | kt | | NO | NO | | NO | NO | NA | NCV | NO,NA | NA | NO,NA | NE | NO,NA | NA | NO,NA |
| | | Lubricants | kt | | 67.29 | 56.26 | | 3.23 | 47.77 | 40.20 | NCV | 1920.77 | 20.00 | 38.42 | 18.40 | 20.02 | 1.00 | 73.41 |
| | | Petroleum coke | kt | | 167.11 | 2.30 | NO | -3.78 | 165.11 | 40.20 | NCV | 6636.67 | 27.50 | 182.52 | 2.20 | 180.32 | 1.00 | 661.17 |
| | | Refinery feedstocks | kt | | 180.11 | 44.59 | | -0.98 | 136.50 | 40.20 | NCV | 5488.50 | 20.00 | 109.77 | 32.14 | 77.63 | 1.00 | 284.79 |
| | | Other oil | kt | | NA | NA | | NA | NO | 35.00 | NCV | NO | 20.00 | NO,NA | NE | NO,NA | 1.00 | NO,NA |
| | | | kt | | 91.54 | 6.11 | | 0.01 | 91.23 | 40.20 | NCV | 3666.95 | 19.70 | 72.23 | NA | 72.23 | 1.00 | 264.83 |
| Other liquid fossil | | | | | | | | | | | | | 20.00 | -73.33 | NA | -73.33 | 1.00 | -268.89 |
| | | Tar | kt | NO | NO | NO | NO | NO | NO | NA | NCV | NO,NA | | NO,NA | NA | NO,NA | | NO,NA |
| | | Other | kt | NO | NO | NO | NO | NO | NO | NA | NCV | NO,NA | NA | NO,NA | NA | NO,NA | NA | NO,NA |
| Liquid fossil totals | | | | | | | | | | | | NO,NA | NA | NO,NA | NA | NO,NA | NA | NO,NA |
| Solid fossil | Primary fuels | Anthracite[b] | kt | NO | NO | NO | | | | | | 419410.83 | | 8032.90 | 465.58 | 7567.32 | | 27758.96 |
| | | Coking coal | kt | 10072.40 | NA | NA | | NO | NO | NA | NCV | NO,NA | NA | NO,NA | NA | NO,NA | NA | NO,NA |
| | | Other bituminous coal | kt | 340 | 0.0 | NO | NO | -277.26 | 6116.35 | 28.20 | NCV | 251126.50 | 25.80 | 7112.81 | 85.98 | 7026.83 | 1.00 | 25762.72 |
| | | Sub-bituminous coal | kt | NO | NO | NO | NO | NO | NO | NA | NCV | NO,NA | NA | NO,NA | NA | NO,NA | NA | NO,NA |
| | | Lignite | kt | 9422.10 | NO | 3564.07 | NO | NO | NO | NA | NCV | NO | NA | NO,NA | NA | NO,NA | NA | NO,NA |
| | | Oil shale and tar sand | kt | NA | NA | NA | | 3564.07 | 2786.04 | 31.90 | NCV | 88910.88 | 27.00 | 2400.57 | 1.29 | 2400.28 | 1.00 | 8798.14 |
| | Secondary fuels | BKB[c] and patent fuel | kt | | NA | NA | | NA | NA | 8.90 | NCV | NA | 25.80 | NA | NA | NA | 1.00 | NA |
| | | Other manufactured fuels | kt | | 0.04 | 0.0 | | 0.04 | 0.04 | 20.70 | NCV | 0.83 | 20.00 | 0.02 | NA | 0.02 | 1.00 | 0.06 |
| | | Coal tar | kt | | 994.44 | 9.93 | | -44.49 | 1028.92 | 28.70 | NCV | 29605.90 | 20.20 | 598.03 | 92.42 | 505.61 | 1.00 | 1854.56 |
| | | | kt | | 0.00 | 28.26 | | 3.31 | 40.78 | 28.00 | NCV | 1142.17 | 22.00 | 25.13 | 0.00 | 25.13 | 1.00 | 92.15 |
| Other solid fossil | | | | | | | | | | | | 1997867.18 | | 36595.72 | 238.85 | 36356.87 | | 133320.79 |
| | | Energy coal | kt | 13611.80 | 3.12 | 4516.95 | NO | 84.04 | 9910.42 | 35.90 | NCV | 356081.66 | 26.20 | 9404.26 | 207.93 | 9232.29 | 1.00 | 33849.84 |
| | | High ash coal | kt | 7277.96 | NA | 14993.77 | NO | 22.67 | 16255.86 | 35.90 | NCV | 583900.93 | 26.20 | 15974.40 | 27.36 | 15947.04 | 1.00 | 58505.85 |
| | | Other coal | kt | 9143.30 | 15.75 | 4423.04 | NO | -28.36 | 4765.57 | 35.90 | NCV | 171128.57 | 26.20 | 4682.57 | 0.00 | 4682.57 | 1.00 | 17167.77 |
| | | Coal concentrate | kt | 1842.90 | 278.00 | 1627.58 | NO | -64.77 | 569.04 | 28.20 | NCV | 16044.20 | 25.80 | 439.00 | NA | 439.00 | 1.00 | 1609.67 |
| Solid fossil totals | | | | | | | | | | | | 1997867.18 | | 36595.72 | 238.85 | 36356.87 | | 133320.79 |
| Gaseous fossil | | Natural gas (dry) | $10^6 m^3$ | 29862.71 | 12032.11 | 19984.77 | | -990.04 | 22721.05 | 34.70 | NCV | 788232.03 | 15.30 | 12060.86 | 499.11 | 11561.75 | 1.00 | 42386.07 |
| Other gaseous fossil | | | | | | | | | | | | 788232.03 | | 12060.86 | 499.11 | 11561.75 | | 42386.07 |
| Gaseous fossil totals | | | | | | | | | | | | NO | | NO | NO | NO | | NO |
| Peat (sup-bituminous) | | | | | | | | | | | | 788232.03 | | 12060.86 | 499.11 | 11561.75 | | 42386.07 |
| Other fossil fuels | | | kt | NO | NO | NO | NO | NO | NO | NA | NCV | NO,NA | NA | NO,NA | NE | NO,NA | NA | NO,NA |
| Waste | | | | | | | | | | | | NO | | NO | NO | NO | | NO |
| | | | kt | NO | NO | NO | NO | NO | NO | NA | NCV | NO,NA | NA | NO,NA | NE | NO,NA | NA | NO,NA |
| Total | | | | | | | | | | | | NO,NA | NA | NO,NA | NE | NO,NA | NA | NO,NA |
| Biomass total | | | | | | | | | | | | 2946715.47 | | 64502.10 | 2261.28 | 62208.84 | | 229429.31 |
| | | Solid biomass | TJ | 55.19 | 403.41 | 2.41 | | -4.36 | 472.14 | 1.00 | NCV | 472.14 | | 34.40 | 0.01 | 34.39 | | 32.76 |
| | | Liquid biomass | TJ | 0 | 0 | 0 | | 0 | 0 | NA | NCV | 472.14 | 30.30 | 34.40 | 0.01 | 34.39 | 1.00 | 32.76 |
| | | Gas biomass | TJ | 0 | 0 | 0 | | 0 | 0 | NA | NCV | 0 NA | NA | 0 NA | 0 | 0 NA | NA | 0 NA |
| | | Other non-fossil fuels (biogenic waste) | TJ | NO | NO | NO | | 0 | 0 | NA | NCV | 0 NA | NA | 0 NA | 0 | 0 NA | NA | 0 NA |
| | | | | | | | | NO | NO | NA | NCV | NO,NA | NA | NO,NA | NO | NO,NA | NA | NO,NA |

[a] 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.

[b] In correct quantities in previous columns in 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.

[c] If data for anthracite are not available separately, include with Other Bituminous Coal.

[d] BKB: Brown coal briquettes.

[e] 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 1.11.

[f] Include peat briquettes here.

**Documentation Box:**

Parties should provide detailed explanation in 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 information to national experts of the NIR. If any additional information and/or further details are needed to understand the content of this table.

| Documentation box | Fuel consumption of the Territory include the total of liquid, solid and gaseous biomass 1.A(b)(iii). Made oil not used in Kazakhstan 1.A(b)(iii). Tar is not used in Kazakhstan 1.A(b)(iii). Oil Tar is not used in Kazakhstan 1.A(b)(iii). CO2 emissions and consumption include |
|---|---|

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

**Comparison of $CO_2$ emissions from fuel combustion**

**(Sheet 1 of 1)**

Inventory 2020

Submission 2022 v1

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) | 459,44 | 459,44 | 27738,06 | 558,01 | 39537,49 | -16,62 | -29,84 |
| Solid fuels (excluding international bunkers) | 1697,04 | 1631,20 | 158155,18 | 1789,67 | 170542,64 | -8,85 | -7,26 |
| Gaseous fuels | 790,25 | 790,26 | 42536,07 | 583,26 | 32407,25 | 35,49 | 31,25 |
| Other fossil fuels | NO,NA | NO | NO,NA | NO,NA | NO,NA | NO,NA | NO,NA |
| Peat | NO,NA | NO | NO,NA | NO,NA | NO | NO,NA | NO,NA |
| *Total*[5] | 2946,74 | 2880,89 | 228429,31 | 2930,95 | 242487,38 | -1,71 | -5,80 |

(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 | 13,62 | 18,86 | 0,26 | 0,94 | -0,04 | 0,94 | roducts from Fuels and Solvent Use |
| | | Jet kerosene | NA | NA | NA | NA | NA | NA | roducts from Fuels and Solvent Use |
| | | Other kerosene[4] | 430,87 | 19,59 | 8,44 | 30,95 | 156,26 | 30,95 | roducts from Fuels and Solvent Use |
| | | Shale oil | NO | NO | NO | NO | NO,NA | NO | |
| | | Gas/diesel oil[5] | 1407,51 | 20,20 | 28,43 | 104,24 | -8,70 | 104,24 | roducts from Fuels and Solvent Use |
| | | Residual fuel oil | 664,72 | 21,09 | 14,02 | 51,41 | -1,04 | 51,41 | roducts from Fuels and Solvent Use |
| | | Liquefied petroleum gases (LPG)[6] | 179,42 | 17,18 | 3,08 | 11,29 | -0,18 | 11,29 | roducts from Fuels and Solvent Use |
| | | Ethane[7] | NO | NO | NO | NO | NO,NA | NO | |
| | | Naphtha[8] | NO | NO | NO | NO | NO,NA | NO | |
| | | Bitumen | 14472,96 | 22,00 | 318,41 | 1167,50 | -873,45 | 1167,50 | roducts from Fuels and Solvent Use |
| | | Lubricants[9] | 119,91 | 20,02 | 2,40 | 8,80 | 1,85 | 8,80 | roducts from Fuels and Solvent Use |
| | | Petroleum coke[10] | 3479,28 | 26,60 | 92,55 | 339,35 | -68,38 | 339,35 | al Industry - Other (please specify) |
| | | Refinery feedstocks | 11,93 | 15,55 | NO | NO | NO,NA | 0,68 | Petrochemical Production - Other |
| | | Other oil[11] | 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 | | | 20780,22 | 22,51 | 467,59 | 1714,49 | 5,82 | 1715,16 | |
| Solid fossil | Primary fuels | Anthracite | NO | NO | NO | NO | NO,NA | NO | |
| | | Coking coal | 3332,43 | 25,86 | 85,98 | 315,26 | 1,14 | 315,26 | Ferroalloys Production |
| | | Other bituminous coal | NO | NO | NO | NO | NO,NA | NO | |
| | | Sub-bituminous Coal | NO | NO | NO | NO | NO,NA | NO | |
| | | Lignite | 45,76 | 27,54 | 1,26 | 4,62 | -0,22 | 4,62 | al 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 | NA | NA | |
| | | Coke oven/gas coke | 31625,44 | 29,20 | 923,46 | 3386,03 | 109,04 | 3386,03 | Ferroalloys Production |
| | | Coal tar[7] | 0,06 | 21,43 | 0,00 | 0,00 | -0,01 | 0,00 | y Products - Other (please specify) |
| Other solid fossil | | | 8965,26 | 26,20 | 234,88 | 861,23 | 0,64 | 861,23 | |
| | | Energy coal | 7901,77 | 26,20 | 207,02 | 759,07 | 4,64 | 759,07 | y Products - Other (please specify) |
| | | High ash coal | 1044,40 | 26,20 | 27,36 | 100,32 | 0,10 | 100,32 | roducts from Fuels and Solvent Use |
| | | Other coal | 19,09 | 26,14 | 0,50 | 1,83 | 0,02 | 1,83 | roducts from Fuels and Solvent Use |
| | | Coal concentrate | NA | NA | NA | NA | NA | NA | |
| Solid fossil totals | | | 41968,94 | 28,33 | 1245,58 | 4567,14 | 2,81 | 4567,13 | |
| Gaseous fossil | | Natural gas (dry)[12] | 32033,26 | 15,30 | 490,11 | 1797,07 | 4,05 | 1797,07 | Chemical Industry |
| Other gaseous fossil | | | NO | NO | NO | NO | NO | NO | |
| Gaseous fossil totals | | | 32033,26 | 15,30 | 490,11 | 1797,07 | 4,05 | 1797,07 | |
| 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 | |

[12] 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.

[13] The fraction of carbon excluded from reference approach relates $CO_2$ from carbon excluded to $CO_2$ reported in the reference approach.

[14] 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.A, page 1.26, chapter 1, volume 3 of the 2006 IPCC

[15] Enter data for those fuels that are used as feedstocks (fuel used as raw materials for manufacture of products such as plastics or fertilisers), 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).

[16] Total deliveries.

[a] Refinery gas, paraffin waxes and white spirit are included under "other oil" in table 1A(b).

[b] Deliveries to petrochemical feedstock and blast furnaces.

[c] 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 | Sur 2, p 6-9). 1.AD/2020: 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/2020: Anthracite is not used in Kazakhstan. |

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

Inventory 2020
Submission 2022 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** | 98,83 | | | NO,NE | 275,13 | 108,12 |
| i. Underground mines[4] | 10,05 | 19,68 | 3,60 | NO,NE | 197,81 | 36,19 |
| Mining activities | | 16,75 | 3,56 | NE | 168,39 | 35,83 |
| Post-mining activities | | 2,68 | 0,04 | NO | 26,94 | 0,36 |
| Abandoned underground mines | | 0,25 | NA | NO | 2,48 | NA |
| ii. Surface mines[4] | 88,78 | 0,87 | 0,81 | NO | 77,33 | 71,93 |
| Mining activities | | 0,80 | 0,81 | NO | 71,38 | 71,91 |
| Post-mining activities | | 0,07 | 0,00 | NO | 5,95 | 0,02 |
| **1. B. 1. b. Solid fuel transformation**[5] | 4,00 | 0,00 | 2,67 | NO | 0,00 | 10,66 |
| **1. B. 1. c. Other** *(please specify)*[6] | | | | NO | 0,00 | 16710,40 |
| Flaring of coke oven gas | 2528,95 | 0,00 | 6,61 | NO | 0,00 | 16710,40 |

(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 2020
Submission 2022 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]** | | | | | | | | | | |
| 1. Exploration | Oil produced | t | 73006,20 | 0,11 | 0,23 | 0,00 | 11,71 | NA | 160,61 | 0,00 |
| 2. Production[7] | Oil produced | t | 73006,20 | 156,69 | 2169,58 | | 0,01 | NA | 0,02 | 0,01 |
| 3. Transport | Oil produced | t | 173200,00 | 0,83 | 9,08 | | 11,44 | NA | 158,59 | |
| 4. Refining/storage | (Oil produced) | t | 16812,20 | 7,05 | 36,15 | 0,11 | 0,15 | NA | 1,59 | |
| 5. Distribution of oil products | (Oil produced) | t | NA | NA | NA | | 0,12 | NA | 0,61 | 0,00 |
| 6. Other | (Oil produced) | NA | NA | NA | NA | | NA | NA | NA | |
| **1. B. 2. b. Natural gas** | | | | | | | NA | NA | NA | |
| 1. Exploration | (Gas produced) | 10^6M^3 | 11438,00 | 9,10 | 19,41 | | 1,33 | NA | 22,21 | |
| 2. Production[7] | (Gas produce | 10^6m^3 | 11438,00 | 48,00 | 134,00 | | 0,10 | NA | 0,22 | |
| 3. Processing | (Gas produced) | 10^6 m^3 | 31542,00 | 0,17 | 0,39 | | 0,55 | NA | 1,53 | |
| 4. Transmission and storage | (Gas produced) | bln m3 | 102745,10 | 0,99 | 297,96 | | 0,01 | NA | 0,02 | |
| 5. Distribution | (Gas produced) | Bln m3 | 11111,02 | 51,00 | 11,00 | | 0,10 | NA | 30,62 | |
| 6. Other | (Gas produced) | | NA | NA | NA | | 0,57 | NA | 0,12 | |
| **1. B. 2. c. Venting and flaring** | | | | | | | NA | NA | NA | |
| **Venting** | | | | | | | 1,69 | IE,NA | 0,00 | 0,00 |
| i. Oil | (Gas produced) | NA | NA | NA | NA | | NA | NA | NA | |
| ii. Gas | (Gas produced) | NA | NA | NA | NA | | NA | NA | NA | |
| iii. Combined | | NA | NA | NA | NA | | NA | NA | NA | |
| **Flaring[8]** | | | | | | | NA | NA | NA | |
| i. Oil | | IE | IE | IE | IE | IE | 1,69 | IE,NA | 0,00 | 0,00 |
| ii. Gas | (Gas produced) | IE | IE | IE | IE | IE | IE | IE | IE | IE |
| iii. Combined | (Gas produced) | mln m^3 | 786,00 | 2148,85 | 1,14 | 0,03 | IE | IE | IE | IE |
| **1.B.2.d. Other (please specify)[9]** | | | | | | | 1,69 | NA | 0,00 | 0,00 |
| | | | | | | | 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 | pipeline and railway transport 1.B.2/2020. Emissions are accounted for in category 1?2?2 III to avoid double counting. See the explanations in the report 1.B.2/2020. Amount captured for ?2 is taken into account when calculating ?2 emissions in this category. |
|---|---|

## TABLE 1.C SECTORAL BACKGROUND DATA FOR ENERGY
## $CO_2$ Transport and storage
## (Sheet 1 of 1)

Inventory 2020

Submission 2022 v1

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 $CO_2$ | | | |
| a. Pipelines | NO | NO | NO |
| b. Ships | NO | NO | NO |
| c. Other | NO | NO | NO |
| 2. Injection and storage[3] | NO | NO | NO |
| a. Injection | NA | NA | NA |
| b. Storage | NA | NA | NA |
| 3. Other | NA | NA | NA |
| Information item[4, 5] | NO | NO | NO |
| Total amount captured for storage | | | |
| Total amount of imports for storage | | | NA |
| *Total A* | | | NA |
| Total amount of exports for storage | | | NA |
| Total amount of $CO_2$ injected at storage sites | | | NA |
| Total leakage from transport, injection and storage | | | NA |
| *Total B* | | | NA |
| *Difference (A-B)*[6] | | | NA |
| | | | NA |

[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/2020: This process is not carried out. Extended comment in chapter 3.5.4.1 |

## TABLE 1.D SECTORAL BACKGROUND DATA FOR ENERGY

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

**(Sheet 1 of 1)**

Inventory 2020
Submission 2022 v1
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)** | 5170,71 | | | | 369,71 | 0,00 | 0,01 |
| Jet kerosene | 5170,71 | 71,50 | 0,50 | 2,00 | 369,71 | 0,00 | 0,01 |
| Aviation gasoline | NO | NO | NO | NO | NO | NO | NO |
| Biomass | NO | NO | NO | NO | NO | NO | NO |
| **International navigation (marine bunkers)** | 144,01 | | | | 10,92 | 0,00 | 0,00 |
| Residual fuel oil | 75,59 | 77,40 | 7,00 | 7,00 | 5,85 | 0,00 | 0,00 |
| Gas/diesel oil | 68,42 | 74,10 | 6,99 | 2,00 | 5,07 | 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] | NA | NA | NA | NA | NA | NA | NA |

[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 | 23,36 | 76,64 |
| Marine | 22,15 | 77,85 |

[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<br>• 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 | |
| Documentation box | |
| Documentation box | |

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

Inventory 2020
Submission 2022 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** | 21499,55 | 0,46 | 0,66 | 1135,44 | 665,50 | NO,NA | 0,00 | NO,NA | 0,48 | 31,83 | 263,05 | 0,00 |
| **A. Mineral industry** | 8273,27 | | | | | | | | NO | NO | NO | NO |
| 1. Cement production | 4448,14 | | | | | | | | | | | NO |
| 2. Lime production | 636,89 | | | | | | | | | | | |
| 3. Glass production | 11,70 | | | | | | | | | | | |
| 4. Other process uses of carbonates | 3176,54 | | | | | | | | NO | NO | NO | NO |
| **B. Chemical industry** | 483,50 | NO | 0,66 | NO | NO | NO | NO | NO | 0,22 | 0,02 | NO | 0,00 |
| 1. Ammonia production | 458,57 | NO | NO | | | | | | 0,22 | 0,02 | NO | 0,00 |
| 2. Nitric acid production | | | 0,66 | | | | | | NO | | | |
| 3. Adipic acid production | NO | | NO | | | | | | NO | NO | NO | |
| 4. Caprolactam, glyoxal and glyoxylic acid production | NO | | NO | | | | | | | | | |
| 5. Carbide production | 24,93 | 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** | 12571,74 | 0,46 | NO | NO | 665,50 | NO | NO | NO | 0,27 | 31,81 | 1,07 | NO,NA |
| 1. Iron and steel production | 7070,25 | 0,40 | | | | | | | NA | NA | 1,07 | NA |
| 2. Ferroalloys production | 3794,98 | 0,05 | | | | | | | NO | NO | NO | NO |
| 3. Aluminium production | 1362,45 | | | | 665,50 | | NO | | 0,27 | 31,81 | NO | NO |
| 4. Magnesium production | NO | | | NO | NO | NO | NO | | NO | NO | NO | NO |
| 5. Lead production | 66,57 | | | | | | | | NO | NO | NO | NO |
| 6. Zinc production | 277,49 | | | | | | | | 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 2020
Submission 2022 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** | 171,04 | NO,NA | NO,NA | | | | | | NO,NA | NO,NA | 261,98 | NO,NA |
| 1. Lubricant use | 30,49 | NA | NA | | | | | | NA | NA | NA | NA |
| 2. Paraffin wax use | NA | NA | NA | | | | | | NA | NA | NA | NA |
| 3. Other | 140,56 | NO | NO | | | | | | NO | NO | 261,98 | 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]** | | | | 1135,44 | NO,NA | NO,NA | NO,NA | NO,NA | | | | |
| 1. Refrigeration and air conditioning | | | | 1130,52 | | | | | | | | |
| 2. Foam blowing agents | | | | NO | NO | NO | NO | NO | | | | |
| 3. Fire protection | | | | NO | NO | NO | NO | NO | | | | |
| 4. Aerosols | | | | 4,92 | 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 | artas" 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 2020
Submission 2022 v1
KAZAKHSTAN

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | ACTIVITY DATA | | IMPLIED EMISSION FACTORS[2] | | | EMISSIONS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Production/Consumption quantity | | $CO_2$ | $CH_4$ | $N_2O$ | $CO_2$ | | $CH_4$ | | $N_2O$ | |
| | Description[1] | (kt) | (kt) | | | Emission[3] | Recovery[4] | Emission[3] | Recovery[4] | Emission[3] | Recovery[4] |
| **A. Mineral industry** | | | | | | (kt) | | | | | |
| 1. Cement production | clinker production | 8453,00 | 0,53 | | | 4473,27 | NO | | | | |
| 2. Lime production | (lime production) | 860,90 | 0,74 | | | 4448,14 | NO | | | | |
| 3. Glass production | glass production | 117,00 | 0,10 | | | 636,89 | NO | | | | |
| 4. Other process uses of carbonates | | | | | | 11,70 | NO | | | | |
| a. Ceramics | production of ceramics and ceramic products | 593,47 | 0,11 | | | 3176,54 | NO | | | | |
| b. Other uses of soda ash | using soda ash | 147,74 | 0,44 | | | 65,28 | NO | | | | |
| c. Non-metallurgical magnesium production | | NO | NO | | | 61,31 | NO | | | | |
| d. Other | limestone and dolomite production | 6819,46 | 0,45 | | | NO | NO | | | | |
| **B. Chemical industry** | | | | | | 3049,95 | NO | | | | |
| 1. Ammonia production[5] | ammonia production | 217,95 | 2,10 | NO | NO | 488,50 | NO | NO | NO | 0,66 | NO |
| 2. Nitric acid production | nitric acid production | 285,78 | | | 0,00 | 458,57 | NO | NO | NO | NO | NO |
| 3. Adipic acid production | | NO | NO | | NO | | | | | 0,66 | NO |
| 4. Caprolactam, glyoxal and glyoxylic acid production | | | | | | NO | NO | | | NO | NO |
| a. Caprolactam | | NO | NO | | NO | NO | NO | | | NO | NO |
| b. Glyoxal | | NO | NO | | NO | NO | NO | | | NO | NO |
| c. Glyoxylic acid | | NO | NO | | NO | NO | NO | | | NO | NO |
| 5. Carbide production | | 26,08 | 0,96 | NO | | 24,93 | NO | NO | NO | | |
| a. Silicon carbide | | NO | NO | NO | | NO | NO | NO | NO | | |
| b. Calcium carbide | production of calcium carbide | 26,08 | 0,96 | NO | | 24,93 | NO | NO | NO | | |
| 6. Titanium dioxide production | | NO | NO | | | NO | NO | | | | |
| 7. Soda ash production | | NO | NO | | | NO | NO | | | | |
| 8. Petrochemical and carbon black production | | | | | | NO | NO | NO | NO | | |
| a. Methanol | | NO | NO | NO | | NO | NO | NO | NO | | |
| b. Ethylene | | NO | NO | NO | | NO | NO | NO | NO | | |
| c. Ethylene dichloride and vinyl chloride monomer | | NO | NO | NO | | NO | NO | NO | NO | | |
| d. Ethylene oxide | | NO | NO | NO | | NO | NO | NO | NO | | |
| e. Acrylonitrile | | NO | NO | NO | | NO | NO | NO | NO | | |
| f. 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 2020
Submission 2022 v1
KAZAKHSTAN

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | ACTIVITY DATA | | IMPLIED EMISSION FACTORS [1] | | | EMISSIONS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Production/Consumption quantity | | $CO_2$ | $CH_4$ | $N_2O$ | $CO_2$ | | $CH_4$ | | $N_2O$ | |
| | Description [1] | (kt) | (kt) | | | Emissions [2] | Recovery [3] | Emissions [2] | Recovery [3] | Emissions [2] | Recovery [3] |
| **C. Metal industry** | | | | | | (kt) | | | | | |
| 1. Iron and steel production | | | | | | 12571,24 | NO | 0,46 | NO | NO | NO |
| a. Steel | steel production | 4009,40 | 0,12 | NO | | 7070,23 | NO | 0,40 | NO | | |
| b. Pig iron | pig iron production | 1101,63 | 1,72 | NO,NE | | 481,83 | NO | NO | NO | | |
| c. Direct reduced iron | | NO | NO | NO | | 5332,07 | NO | NE | NO | | |
| d. Sinter | production of agglomerates | 5391,10 | 0,17 | 0,00 | | NO | NO | NO | NO | | |
| e. Pellet | pellet production | 4748,32 | 0,06 | NO | | 901,48 | NO | 0,40 | NO | | |
| f. Other *(please specify)* | | | | | | 294,85 | NO | NO | NO | | |
| 2. Ferroalloys production | production of ferroalloys | 2214,65 | 1,71 | 0,00 | | IE | NO | NA | NO | | |
| 3. Aluminium production | aluminum production | 265,10 | 5,14 | | | 3794,08 | NO | 0,05 | NO | | |
| 4. Magnesium production | | NO | NO | | | 1362,45 | NO | | | | |
| 5. Lead production | lead production | 128,01 | 0,52 | | | NO | NO | | | | |
| 6. Zinc production | duction of zinc from wetle calcin | 75,83 | 3,66 | | | 66,57 | NO | | | | |
| 7. Other *(please specify)* | | | | | | 277,49 | NO | | | | |
| **D. Non-energy products from fuels and solvent use** | | | | | | NO | NO | NO | NO | NO | NO |
| 1. Lubricant use | | 51,80 | 6,59 | NA | NA | 171,04 | NO,NA | NO,NA | NO,NA | NO,NA | NO,NA |
| 2. Paraffin wax use | | NA | NA | NA | NA | 30,49 | NA | NA | NA | NA | NA |
| 3. Other *(please specify)* [Text] | | | | | | NA | NA | NA | NA | NA | NA |
| **G. Other product manufacture and use** | | | | | | 140,36 | NO | NO | NO | NO | NO |
| 1. $N_2O$ from product uses | | | | | | NO | NO | NO | NO | NO,NE | NO,NE |
| a. Medical applications | | NE | | | NE | | | | | NO,NE | NO,NE |
| b. Other [5] | | | | | | | | | | NE | NE |
| 4. Other | | | | | | | | | | NO | NO |
| **H. Other** *(please specify)* [6] | | | | | | NO | NO | NO | NO | NO | NO |
| 2.H.2 Food and beverages industry | | NA | NA | NA | NA | NA | NA | 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 and to

[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 the 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 | the company of JSC "ArcelorMittal 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 1990-2011 |
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**TABLE 3(II) SECTORAL REPORT FOR INDUSTRIAL PROCESSES AND PRODUCT USE – EMISSIONS OF HFCs, PFCs, $SF_6$ AND NF3**
**(Sheet 1 of 1)**

[illegible]

| GHG SOURCE AND SINK CATEGORIES | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (t) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total actual emissions of halocarbons (by chemical) and $SF_6$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A. Chemical industry | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Manufacture of production | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. Product processing | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fugitive emissions | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. Other | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C. Metal industry | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Aluminum production | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. Magnesium production | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. Other | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| D. Electronics industry | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Integrated circuit or semiconductor | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. TFT flat panel display | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. Photovoltaics | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. Heat transfer fluid | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. Other (as specified in table 2(II)) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| E. Product uses as substitutes for ODS[a] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Refrigeration and air conditioning | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. Foam blowing agents | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. Fire protection | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. Aerosols | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. Solvents | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6. Other applications | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| G. Other product manufacture and use | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Electrical equipment | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. $SF_6$ and PFCs from other product use | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. Other | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| H. Other (please specify) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.H.1. Food and beverage industry | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total emissions[b] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

[illegible]

Documentation box:
Parties should provide detailed explanations on the industrial processes sector in chapter 4, industrial processes, CRF sector 2 of the NIR. Use the documentation box to provide references to relevant sections of the NIR if no additional information and/or further details are needed to understand the content of the table.
If estimates are reported under 2.H.1 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.

| Documentation box | |
|---|---|
| Documentation box | |
| Documentation box | |
| Documentation box | |

| | |
|---|---|
| [illegible] | |
| [illegible] | |
| [illegible] | |

**TABLE 2(II).B-H SECTORAL BACKGROUND DATA FOR INDUSTRIAL PROCESSES AND PRODUCT USE**

**Sources of fluorinated substances**

**(Sheet 1 of 2)**

Inventory 2020

Submission 2022 v1

KAZAKHSTAN

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | Gas (please specify) One row per substance | ACTIVITY DATA | | IMPLIED EMISSION FACTORS[1] | EMISSIONS | |
|---|---|---|---|---|---|---|
| | | Description | (t) | (kg/t) | Emissions[2] (t) | Recovery[3] (t) |
| **B. Chemical industry** | | | | | | |
| 9. Fluorochemical production | | | | | | |
| *By-product emissions* | | | | | | |
| Production of HCFC-22 | | | | | | |
| HFC-23 | HFC-23 | Production of HCFC-22 | | | | |
| 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 | 265103,00 | 0,28 | 75,06 | NO |
| C2F6 | C2F6 | Production of primary aluminium | 265103,00 | 0,03 | 9,08 | 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(II).B-H SECTORAL BACKGROUND DATA FOR INDUSTRIAL PROCESSES AND PRODUCT USE**
**Sources of fluorinated substances**
**(Sheet 2 of 2)**

Inventory 2020
Submission 2022 v1
KAZAKHSTAN

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | Gas (please specify) | ACTIVITY DATA | | | IMPLIED EMISSION FACTORS[1] | | | EMISSIONS[2] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Amount | | | | | | | | | |
| | 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 airconditioning | | | | | | | | | | | |
| Commercial refrigeration | | | | | | | | | | | |
| HFC-125 | HFC-125 | NO | NO | NO | NO | NO | NO | NO | 6,57 | NO | NO |
| HFC-134a | HFC-134a | NO | NO | NO | NO | NO | NO | NO | 28,30 | NO | NO |
| HFC-143a | HFC-143a | NO | NO | NO | NO | NO | NO | NO | 7,53 | NO | NO |
| Domestic refrigeration | | | | | | | | | | | |
| HFC-32 | HFC-32 | NO | NO | NO | NO | NO | NO | NO | 32,62 | NO | NO |
| HFC-125 | HFC-125 | NO | NO | NO | NO | NO | NO | NO | 36,85 | NO | NO |
| HFC-134a | HFC-134a | NO | NO | NO | NO | NO | NO | NO | 21,18 | NO | NO |
| HFC-143a | HFC-143a | NO | NO | NO | NO | NO | NO | NO | 5,02 | NO | NO |
| Industrial refrigeration | | | | | | | | | | | |
| HFC-32 | HFC-32 | NO | NO | NO | NO | NO | NO | NO | 24,45 | NO | NO |
| HFC-125 | HFC-125 | NO | NO | NO | NO | NO | NO | NO | 60,56 | NO | NO |
| HFC-134a | HFC-134a | NO | NO | NO | NO | NO | NO | NO | 3,28 | NO | NO |
| HFC-143a | HFC-143a | NO | NO | NO | NO | NO | NO | NO | 42,68 | NO | NO |
| Transport refrigeration | | | | | | | | | | | |
| HFC-125 | HFC-125 | NO | NO | NO | NO | NO | NO | NO | 1,55 | NO | NO |
| HFC-134a | HFC-134a | NO | NO | NO | NO | NO | NO | NO | 1,49 | NO | NO |
| HFC-143a | HFC-143a | NO | NO | NO | NO | NO | NO | NO | 1,83 | NO | NO |
| Mobile air-conditioning | | | | | | | | | | | |
| HFC-134a | HFC-134a | NO | NO | NO | NO | NO | NO | NO | 12,31 | NO | NO |
| Stationary air-conditioning | | | | | | | | | | | |
| HFC-32 | HFC-32 | NO | NO | NO | NO | NO | NO | NO | 36,68 | NO | NO |
| HFC-125 | HFC-125 | NO | NO | NO | NO | NO | NO | NO | 81,17 | NO | NO |
| HFC-134a | HFC-134a | NO | NO | NO | NO | NO | NO | NO | 21,37 | NO | NO |
| HFC-143a | HFC-143a | NO | NO | NO | NO | NO | NO | NO | 7,53 | NO | 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 | fied 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 | fied 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 | fied 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 | 3,44 | | 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 | fied 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 (please specify - 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 | fied 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[19] | | | | | | | | | | | |
| Emissive | | | | | | | | | | | |
| 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 | fied 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 | fied 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[20] | | | | | | | | | | | |
| 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 | fied mix of HFCs and PFCs | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| SF6 | SF6 | NO | 50,54 | NO | NO | 0,20 | NO | NO | 0,10 | NO | NO |
| NF3 | NF3 | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| 2. $SF_6$ and PFCs from other product use[21] | | | | | | | | | | | |
| Military applications | | | | | | | | | | | |
| 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-C3F6 | c-C3F6 | 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 |
| SF6 | SF6 | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| Soundproof windows | | | | | | | | | | | |
| Adiabatic properties, shoes and tyres | | | | | | | | | | | |
| Other (please specify - one row per substance) | | | | | | | | | | | |
| 4. Other | | | | | | | | | | | |
| **H. Other** *(please specify) (one row per activity/substance)* | | | | | | | | | | | |
| 2.H.2 Food and beverages industry | | | | | | | | | | | |
| HFC-23 | HFC-23 | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| HFC-32 | HFC-32 | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| HFC-41 | HFC-41 | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| HFC-43-10mee | HFC-43-10mee | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| HFC-125 | HFC-125 | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| HFC-134 | HFC-134 | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| HFC-134a | HFC-134a | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| HFC-143 | HFC-143 | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| HFC-143a | HFC-143a | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| HFC-152 | HFC-152 | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| HFC-152a | HFC-152a | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| HFC-161 | HFC-161 | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| HFC-227ea | HFC-227ea | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| HFC-236cb | HFC-236cb | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| HFC-236ea | HFC-236ea | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| HFC-236fa | HFC-236fa | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| HFC-245ca | HFC-245ca | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| HFC-245fa | HFC-245fa | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| HFC-365mfc | HFC-365mfc | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| Unspecified mix of HFCs | Unspecified mix of HFCs | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 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-C3F6 | c-C3F6 | 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 | fied 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.

(i) The implied emission factors (IEFs) are estimated on the basis of gross emissions as follows: IEF = emissions / activity data (AD).

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

(iii) Amounts of emission recovery, oxidation, destruction or transformation, including from disposal emissions, where applicable.

(iv) 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 ($SF_6$) production, halogen exchange processes to make low-boiling PFCs like $C_3F_8$ and $CF_4$, HFC 134a and 245fa, $NF_3$ manufacturing, and production of uranium hexafluoride, of fluorinated monomers (e.g. tetrafluoroethylene and hexafluoropropylene), and of fluorochemical agrochemicals and/or anesthetics. Both

(v) 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.

(vi) Include emissions from cover gases and generated secondary compounds in the Mg foundries.

(vii) 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 of

(viii) Could include emissions from micro-electromechanical systems, hard disk drive manufacturing, device testing, and vapour phase reflow soldering.

(ix) Emissions may include HFCs and PFCs used in sterilization equipment, for tobacco expansion applications, as solvents in the manufacture of adhesives, coating and inks.

(x) 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 onsite should be reported under manufacturing for equipment installed within the country (also if

(xi) 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 medical

| **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.<br>• Where only aggregate figures for activity data are provided, e.g. due to reasons of confidentiality (see footnote 1 to table 2(II)), a note indicating this should be provided in this documentation box.<br>• 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.<br>• 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. | |
| Documentation box | |
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**TABLE 3 SECTORAL REPORT FOR AGRICULTURE**
**(Sheet 1 of 2)**

Inventory 2020
Submission 2022 v1
KAZAKHSTAN

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | $CO_2$ | $CH_4$ | $N_2O$ | $NO_x$ | CO | NMVOC |
|---|---|---|---|---|---|---|
| | (kt) | | | | | |
| **3. Total agriculture** | 3,67 | 929,85 | 58,68 | 14,39 | NO | 126,85 |
| **I. Livestock** | | 907,95 | 9,16 | | | 107,43 |
| **A. Enteric fermentation** | | 874,14 | | | | |
| 1. Cattle[1] | | 652,65 | | | | |
| *Option A:* | | | | | | |
| Dairy cattle | | 409,44 | | | | |
| Non-dairy cattle | | 243,21 | | | | |
| *Option B:* | | | | | | |
| Mature dairy cattle | | | | | | |
| Other mature cattle | | | | | | |
| Growing cattle | | | | | | |
| *Option C (country-specific):* | | | | | | |
| *Other (as specified in table 3(I).A)* | | | | | | |
| 2. Sheep | | 138,84 | | | | |
| 3. Swine | | 1,02 | | | | |
| 4. Other livestock | | 81,63 | | | | |
| Buffalo | | 0,57 | | | | |
| Camels | | 10,47 | | | | |
| Goats | | 13,77 | | | | |
| Horses | | 56,52 | | | | |
| Mules and Asses | | 0,30 | | | | |
| Other (please specify) | | NO | | | | |
| **B. Manure management** | | 33,81 | 9,16 | | | 107,43 |
| 1. Cattle[1] | | 23,17 | 4,89 | | | 85,21 |
| *Option A:* | | | | | | |
| Dairy cattle | | 18,56 | 2,64 | | | 52,08 |
| Non-dairy cattle | | 4,61 | 2,21 | | | 29,13 |
| *Option B:* | | | | | | |
| Mature dairy cattle | | | | | | |
| Other mature cattle | | | | | | |
| Growing cattle | | | | | | |
| *Option C (country-specific):* | | | | | | |
| *Other (as specified in table 3(I).B)* | | | | | | |
| 2. Sheep | | 2,04 | 0,88 | | | 3,46 |
| 3. Swine | | 4,08 | 0,58 | | | 0,56 |
| 4. Other livestock | | 4,52 | 1,43 | | | 22,20 |
| Buffalo | | 0,05 | 0,01 | | | 0,04 |
| Camels | | 0,29 | NO | | | 0,06 |
| Goats | | 0,30 | 0,18 | | | 1,49 |
| Horses | | 3,42 | 0,46 | | | 13,42 |
| Mules and Asses | | 0,02 | 0,01 | | | 0,04 |
| Poultry | | 0,43 | 0,74 | | | 7,15 |
| Other (please specify) | | 0,01 | 0,03 | | | NE |
| Rabbit | | 0,01 | 0,03 | | | NE |
| 5. Indirect $N_2O$ emissions | | | 1,38 | | | |

**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)**

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | $CO_2$ | $CH_4$ | $N_2O$ | $NO_x$ | CO | NMVOC |
|---|---|---|---|---|---|---|
| | (kt) | | | | | |
| C. Rice cultivation | | | | | | |
| D. Agricultural soils[(2)(3)(4)] | | 71,49 | | | | |
| E. Prescribed burning of savannas | | NO | 49,52 | 34,39 | NO | NO |
| F. Field burning of agricultural residues | | NO | NO | NO | NO | 19,42 |
| G. Liming | | NO | NO | NO | NO | NO |
| H. Urea application | NO | | | | | NO |
| I. Other carbon-containing fertilizers | 1,63 | | | | | |
| J. Other (please specify) | NO | | | | | |
| | 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 disaggregation 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 emissions are reported under category 3.H) 6 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 | ***: 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 | 8668,34 | | | 75,29 | 652,65 |
| *Option A:* | | | | | |
| Dairy cattle[3] | 4008,27 | 239,62 | 6,50 | 102,15 | 409,44 |
| Non-dairy cattle | 4660,07 | 122,42 | 6,50 | 52,19 | 243,21 |
| *Option B:* | | | | | |
| Mature dairy cattle | | | | | |
| Other mature cattle | | | | | |
| Growing cattle | | | | | |
| *Option C (country-specific[4]):* | | | | | |
| Other *(please specify)* | | | | | |
| 2. Sheep | 20447,54 | | | 6,79 | 138,84 |
| Other *(please specify)* | 20447,54 | | | 6,79 | 138,84 |
| Sheep | 20447,54 | 23,01 | 6,50 | 6,79 | 138,84 |
| 3. Swine | 1020,92 | | | 1,00 | 1,02 |
| Other *(please specify)* | 1020,92 | | | 1,00 | 1,02 |
| Swine | 1020,92 | NE | NE | 1,00 | 1,02 |
| 4. Other livestock[5] | 6160,90 | | | 13,25 | 81,63 |
| Buffalo | 10,39 | NE | NE | 54,85 | 0,57 |
| Camels | 227,70 | NE | NE | 45,98 | 10,47 |
| Goats | 2753,41 | NE | NE | 5,00 | 13,77 |
| Horses | 3139,83 | NE | NE | 18,00 | 56,52 |
| Mules and Asses | 29,56 | NE | NE | 10,15 | 0,30 |
| 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 2010
Submission 2012 v1
Kazakhstan

Additional information - units for those livestock types for which tier 2 was used: **

| Disaggregation for of indicator * / Indicators | | Dairy Cattle | Non-Dairy Cattle | Growing Cattle | Mature Dairy Cattle | Other Mature Cattle | Other Cattle | Other Sheep | Camels | Other Camels | Mules | Other Mules | Buffalo | Llamas | Goats | Horses | Mules and Asses | Other (please specify) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Weight | kg | [illegible] | [illegible] | | | | | | [illegible] | | [illegible] | | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | |
| Growing Duration ** | | [illegible] | [illegible] | | | | | | [illegible] | | [illegible] | | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | |
| Milk yield | kg/head | [illegible] | [illegible] | | | | | | [illegible] | | [illegible] | | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | |
| Work | h/day | [illegible] | [illegible] | | | | | | [illegible] | | [illegible] | | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | |
| Pregnant | % | [illegible] | [illegible] | | | | | | [illegible] | | [illegible] | | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | |
| Organic excretion of dung | kg | [illegible] | [illegible] | | | | | | [illegible] | | [illegible] | | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | |
| Dung energy | GJ/head | [illegible] | [illegible] | | | | | | [illegible] | | [illegible] | | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | |

* See the tables 3.4.1, 3.4.2 and 3.4.3 of volume 4 of the 2006 IPCC Guidelines. These data are relevant if Tiers do not have data on average feed intake.
** Disaggregate to the split actually used. Add columns to the table if necessary.
*** 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)**

| 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 | 8668,54 | | | | | | | 2,67 | 23,17 |
| *Option A:* | | | | | | | | | |
| Dairy cattle[3] | 4008,27 | 100,00 | NO | NO | 475,00 | 5,26 | 0,24 | 4,63 | 18,56 |
| Non-dairy cattle | 4660,07 | 100,00 | NO | NO | 338,00 | 2,69 | 0,10 | 0,99 | 4,61 |
| *Option B:* | | | | | | | | | |
| Mature dairy cattle | | | | | | | | | |
| Other mature cattle | | | | | | | | | |
| Growing cattle | | | | | | | | | |
| *Option C (country-specific)*[4]: | | | | | | | | | |
| Other (please specify) | | | | | | | | | |
| 2. Sheep | 20447,54 | | | | | | | 0,10 | 2,04 |
| Other (please specify) | 20447,54 | | | | | | | 0,10 | 2,04 |
| Sheep | 20447,54 | 100,00 | NO | NO | 38,00 | NE | NE | 0,10 | 2,04 |
| 3. Swine | 1020,92 | | | | | | | 4,00 | 4,08 |
| Other (please specify) | 1020,92 | | | | | | | 4,00 | 4,08 |
| Swine | 1020,92 | 100,00 | NO | NO | 96,00 | NE | NE | 4,00 | 4,08 |
| 4. Other livestock[5] | 49599,50 | | | | | | | 0,09 | 4,52 |
| Buffalo | 10,39 | 100,00 | NO | NO | 380,00 | NE | NE | 5,00 | 0,05 |
| Camels | 227,30 | 100,00 | NO | NO | 217,00 | NE | NE | 1,27 | 0,29 |
| Goats | 2753,41 | 100,00 | NO | NO | 38,00 | NE | NE | 0,11 | 0,30 |
| Horses | 3139,83 | 100,00 | NO | NO | 238,00 | NE | NE | 1,09 | 3,42 |
| Mules and Asses | 29,56 | 100,00 | NO | NO | 130,00 | NE | NE | 0,68 | 0,02 |
| Poultry | 43335,00 | 100,00 | NO | NO | 1,80 | NE | NE | 0,01 | 0,43 |
| Other (please specify) | NO | | | | | | | 0,08 | 0,01 |
| Rabbit | 103,61 | 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 (see 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 (UNF sector 4) of the national inventory report (NIR). Use the 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.<br>• Provide a reference to the relevant section in the NIR, in particular with regard to:<br>(a) Disaggregation of livestock population (e.g. according to the classification recommended in the 2006 IPCC Guidelines);<br>(b) Parameters relevant to the application of the 2006 IPCC Guidelines;<br>(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)

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 | | | | | | | | | |
| | | | Sheep - Sh | NO | NO | NO | 11,00 | 89,00 | NO | NO | NO | NO |
| | | | Sheep - Sh | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| | | | Sheep - Sh | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| | | | Sheep - Sh | NO | NO | NO | NE | NE | NO | NO | NO | NO |
| | | | Sheep - Sh | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| | | | Sheep - Sh | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| | | | Swine - Sw | NO | 30,00 | NO | 70,00 | NO | NO | NO | NO | NO |
| | | | Swine - Sw | NO | NO | NO | NO | NO | NO | NO | NO | NO |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Swine - Sv | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| Swine - Sv | NO | NE | NO | NE | NO | NO | NO | NO | NO |
| Swine - Sv | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| Swine - Sv | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| Rabbit - A | NO | NO | NO | 100,00 | NO | NO | NO | NO | NO |
| Rabbit - A | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| Rabbit - A | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| Rabbit - M | NO | NO | NO | NE | | NO | NO | NO | NO |
| Rabbit - M | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| Rabbit - M | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| Buffalo - A | NA | NA | NA | 100,00 | NA | NA | NA | NA | NA |
| Buffalo - A | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Buffalo - A | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Buffalo - N | NA | NA | NA | NE | NA | NA | NA | NA | NA |
| Buffalo - N | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Buffalo - N | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Camels - A | NA | NA | NA | NA | 100,00 | NA | NA | NA | NA |
| Camels - A | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Camels - A | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Camels - N | NA | NA | NA | NA | NE | NA | NA | NA | NA |
| Camels - N | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Camels - N | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Goats - All | NA | NA | NA | 12,00 | 88,00 | NA | NA | NA | NA |
| Goats - All | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Goats - All | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Goats - Mi | NA | NA | NA | NE | NE | NA | NA | NA | NA |
| Goats - Mi | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Goats - Mi | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Horses - A | NA | NA | NA | 18,00 | 82,00 | NA | NA | NA | NA |
| Horses - A | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Horses - A | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Horses - M | NA | NA | NA | NE | NE | NA | NA | NA | NA |
| Horses - M | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Horses - M | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Mules and | NO | NA | NA | 100,00 | NA | NA | NA | NA | NA |
| Mules and | NO | NA | NA | NA | NA | NA | NA | NA | NA |
| Mules and | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Mules and | NA | NA | NA | NE | NA | NA | NA | NA | NA |
| Mules and | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Mules and | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Poultry - A | NA | NA | NA | 100,00 | NA | NA | NA | NA | NA |
| Poultry - A | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Poultry - A | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Poultry - N | NA | NA | NA | NE | NA | NA | NA | | NA |
| Poultry - N | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Poultry - N | NA | NA | NA | NA | NA | NA | NA | NA | NA |

[10] 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)**

| 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 volatilized as $NH_3$ and $NO_x$[1,2] | 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[3] | Composting | Digesters | Burned for fuel or as waste[4] | Other[5] | (kg N/yr) | (kg N/yr) | (kg N/yr) | (kg $N_2O$/ head/yr) | (kg $N_2O$-N/kg N) | | (kt) | | |
| 1. Cattle | 8668.34 | | | NO | NO | NO | ######## | ######## | NO | NO | NO | NO | 444443775.00 | | | 0.56 | | | 4.89 | | |
| Option A: | | | | | | | | | | | | | | | | | | | | | |
| Dairy cattle[6] | 4008.27 | 60.60 | 479.00 | NO | NO | NO | ######## | ######## | NO | NO | NO | NO | 243321825.00 | | | 0.67 | | | 2.68 | | |
| Non-dairy cattle | 4660.07 | 47.10 | 338.00 | NO | NO | NO | ######## | ######## | NO | NO | NO | NO | 201221951.00 | | | 0.47 | | | 2.21 | | |
| Option B: | | | | | | | | | | | | | | | | | | | | | |
| Mature dairy cattle | | | | | | | | | | | | | | | | | | | | | |
| Other mature cattle | | | | | | | | | | | | | | | | | | | | | |
| Growing cattle | | | | | | | | | | | | | | | | | | | | | |
| Option C (country-specific)[7]: | | | | | | | | | | | | | | | | | | | | | |
| Other (please specify) | | | | | | | | | | | | | | | | | | | | | |
| 2. Sheep | 20447.54 | | | NO | NO | NO | ######## | ######## | NO | NO | NO | NO | 2551852620.00 | | | 0.04 | | | 0.88 | | |
| Other (please specify) | 20447.54 | | | NO | NO | NO | ######## | ######## | NO | NO | NO | NO | 2551852620.00 | | | 0.04 | | | 0.88 | | |
| Sheep | 20447.54 | 17.48 | 38.00 | NO | NO | NO | ######## | ######## | NO | NO | NO | NO | 2551852620.00 | | | 0.04 | | | 0.88 | | |
| 3. Swine | 1020.92 | | | NO | ######## | NO | ######## | NO | NO | NO | NO | NO | 264724560.00 | | | 0.57 | | | 0.58 | | |
| Other (please specify) | 1020.92 | | | NO | ######## | NO | ######## | NO | NO | NO | NO | NO | 264724560.00 | | | 0.57 | | | 0.58 | | |
| Swine | 1020.92 | 25.97 | 96.00 | NO | ######## | NO | ######## | NO | NO | NO | NO | NO | 264724560.00 | | | 0.57 | | | 0.58 | | |
| 4. Other livestock[8] | ######## | | | NO | NO | NO | ######## | ######## | NO | NO | NO | NO | 1626731115.00 | | | 0.01 | | | 1.61 | | |
| Buffalo | 10.39 | 44.70 | 300.00 | NO | NO | NO | 461197.00 | NO | NO | NO | NO | NO | 461197.00 | | | 0.96 | | | 0.01 | | |
| Camels | 227.70 | 36.20 | 217.00 | NO | NO | NO | NO | ######## | NO | NO | NO | NO | 6851860.00 | | | NO | | | NO | | |
| Goats | 2753.41 | 17.75 | 38.00 | NO | NO | NO | ######## | ######## | NO | NO | NO | NO | 48872974.00 | | | 0.07 | | | 0.18 | | |
| Horses | 3138.81 | 26.06 | 238.00 | NO | NO | NO | ######## | ######## | NO | NO | NO | NO | 81817996.00 | | | 0.13 | | | 0.46 | | |
| Mules and Asses | 29.56 | 14.24 | 150.00 | NO | NO | NO | 62096.00 | NO | NO | NO | NO | NO | 62096.00 | | | 0.34 | | | 0.01 | | |
| Poultry | 43519.00 | 0.54 | 1.80 | NO | NO | NO | ######## | NO | NO | NO | NO | NO | 23460900.00 | | | 0.00 | | | 0.74 | | |
| Other (please specify) | NO | | | NO | NO | NO | 839225.00 | NO | NO | NO | NO | NO | 839225.00 | | | 0.25 | | | 0.03 | | |
| Rabbit | 185.61 | 8.10 | 5.00 | NO | NO | NO | 839225.00 | NO | NO | NO | NO | NO | 839225.00 | | | 0.25 | | | 0.03 | | |
| 5. Indirect $N_2O$ emissions | | | | | | | | | | | | | | | | | | | | | |
| Total N handled per MMS (kg N/year) | | | | NO | ######## | NO | ######## | | NO | NO | | NO | | 88187575.00 | NE | | 0.02 | NE | | 1.18 | NE |
| IEF direct $N_2O$ (kg $N_2O$-N/kg N handled) | | | | NO | 0.05 | NO | 0.02 | | NO | NO | | NO | | | | | | | | | |
| Direct $N_2O$ emissions per MMS (Gg/kt) $N_2O$ | | | | NO | 0.38 | NO | 7.30 | | NO | NO | | NO | | | | 0.01 | | | 7.78 | | |

[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.(B).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, anaerobic 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 populations (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 2020
Submission 2022 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** | | | | | 21,48 |
| Continuously flooded | NO | NO | NO | NO | NO |
| Intermittently flooded Single aeration | NO | NO | NO | NO | NO |
| Intermittently flooded Multiple aeration | 1,02 | NO | NO | 21,00 | 21,48 |
| **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) | 1,02 | | | | |

[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<br>kg N/yr | kg $N_2O$-N/kg N[1,2,3] | $N_2O$<br>(kt) |
| **a. Direct $N_2O$ emissions from managed soils** | | | | 43,99 |
| 1. Inorganic N fertilizers[3] | N input from application of inorganic fertilizers to cropland and grassland | 56798510,00 | 0,01 | 1,04 |
| 2. Organic N fertilizers[3] | N input from organic N fertilizers to cropland and grassland | 152329665,00 | 0,01 | 2,39 |
| a. Animal manure applied to soils | N input from manure applied to soils | 152329665,00 | 0,01 | 2,39 |
| 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 | 632961091,00 | 0,01 | 14,49 |
| 4. Crop residues | N in crop residues returned to soils | 210250000,00 | 0,01 | 3,26 |
| 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 | 1452800000,00 | 0,01 | 22,81 |
| 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** | | | | 5,53 |
| 1. Atmospheric deposition[6] | Volatilized N from agricultural inputs of N | 162738002,20 | 0,01 | 2,58 |
| 2. Nitrogen leaching and run-off | N from fertilizers and other agricultural inputs that is lost through leaching and run-off | 250037210,00 | 0,01 | 2,95 |

(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[10] | 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.<br>• Provide a reference to the relevant section in the NIR, in particular with regard to<br>(a) Background information on methane ($CH_4$) emissions from agricultural soils, if accounted for under the agriculture sector;<br>(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 2020
Submission 2022 v1
KAZAKHSTAN

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | ACTIVITY DATA AND OTHER RELATED INFORMATION | | | | | IMPLIED EMISSION FACTORS | | EMISSIONS [2] | |
|---|---|---|---|---|---|---|---|---|---|
| | Area of savanna burned (k ha/yr) | Average above-ground biomass density (t dm/ha) | Fraction of savanna burned | Biomass burned (kt dm) | Nitrogen fraction in biomass | $CH_4$ (kg/t dm) | $N_2O$ (kg/t dm) | $CH_4$ (kt) | $N_2O$ (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

**Field burning of agricultural residues**[1]

**(Sheet 1 of 1)**

Inventory 2020

Submission 2022 v1

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) | $CH_4$ | $N_2O$ | $CH_4$ | $N_2O$ |
| | | | | | (kg/t dm) | | (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 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 3.G-I SECTORAL BACKGROUND DATA FOR AGRICULTURE
## $CO_2$ emissions from liming, urea application and other carbon-containing fertilizers
## (Sheet 1 of 1)

Inventory 2020
Submission 2022 v1
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** | 5005,52 | 0,20 | 3,67 |
| **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 2020
Submission 2022 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** | 7908,63 | 2,29 | 0,15 | NO | NO | NO |
| **A. Forest land** | -10335,60 | 1,66 | 0,09 | NO | NO | NO |
| 1. Forest land remaining forest land | -10335,60 | 1,66 | 0,09 | | | |
| 2. Land converted to forest land | NO,IE | NO,IE | NO,IE | NO | NO | NO |
| **B. Cropland** | 31905,13 | NO,IE | NO,IE | NO | NO | NO |
| 1. Cropland remaining cropland | 31905,13 | NO,IE | NO,IE | NO | NO | NO |
| 2. Land converted to cropland | NO | NO | NO | NO | NO | NO |
| **C. Grassland** | -10120,00 | 0,63 | 0,06 | | | |
| 1. Grassland remaining grassland | -10120,00 | 0,63 | 0,06 | | | |
| 2. Land converted to grassland | NO | NO | NO | | | |
| **D. Wetlands**[3] | NO,NE,NA | NO,IE,NA | NO,IE,NA | NO | NO | NO |
| 1. Wetlands remaining wetlands | NO,NE | NO,IE | NO,IE | NO | NO | NO |
| 2. Land converted to wetlands | NO | NO | NO | NO | NO | NO |
| **E. Settlements** | -3540,90 | NO | NO | NO | NO | NO |
| 1. Settlements remaining settlements | NO | NO | NO | NO | NO | NO |
| 2. Land converted to settlements | -3540,90 | 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 | ber and Paperboard: 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]**

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (kha) | | | | | | | | | | |
| Forest land (managed)[2] | 19086,90 | NO | NO | NO | NO | NO | NO | NO | NO | NO | 19086,90 |
| Forest land (unmanaged)[2] | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| Cropland[2] | NO | NO | 35943,00 | NO | NO | NO | NO | NO | NO | NO | 35943,00 |
| Grassland (managed)[2] | NO | NO | NO | 183425,00 | NO | NO | NO | 332,70 | NO | NO | 183757,70 |
| Grassland (unmanaged)[2] | NO | | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| Wetlands (managed)[2] | NO | NO | NO | NO | NO | 800,90 | NO | NO | NO | NO | 800,90 |
| Wetlands (unmanaged)[2] | NO | NO | NO | NO | NO | NO | 7990,20 | NO | NO | NO | 7990,20 |
| 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 | 22937,50 | NO | 22937,50 |
| Total unmanaged land [3] | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| **Final area** | 19086,90 | NO | 35943,00 | 183425,00 | NO | 800,90 | 7990,20 | 2306,70 | 22937,50 | NO | 272490,20 |
| **Net change[4]** | 0,00 | NO | 0,00 | -332,70 | NO | 0,00 | 0,00 | 332,70 | 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)**

| 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[(2)] | 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)(6)] | | Net $CO_2$ emissions/ removals[(7)] |
| | | | | | 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 | | 19086,90 | 19086,90 | NO | 0,11 | NO | 0,11 | 0,01 | 0,01 | 0,01 | NO | 2192,00 | NO | 2192,00 | 233,30 | 214,30 | 179,20 | NO | -10335,60 |
| 1. Forest land remaining forest land | | 19086,90 | 19086,90 | NO | 0,11 | NO | 0,11 | 0,01 | 0,01 | 0,01 | NO | 2192,00 | NO | 2192,00 | 233,30 | 214,30 | 179,20 | NO | -10335,60 |
| 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 sign 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 | |
| Documentation box | |

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

| 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] (t) | | | Net carbon stock change in dead organic matter per area[4] | Net carbon stock change in soils per area[5] | | Carbon stock change in living biomass[6] (t C/ ha) | | | Net carbon stock change in dead organic matter[7] (t C) | Net carbon stock change in soils[8] (t C) | | Net $CO_2$ emissions/ removals[9] (t) |
| | | | | | 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** | | 33943.00 | 33943.00 | NO | 0.11 | NO | 0.11 | NO,D | 42.36 | NO | 4004.00 | NO | 4004.00 | NO,D | -1282.40 | NO | 11903.13 |
| 1. Cropland remaining cropland | | 33943.00 | 33943.00 | NO | 0.11 | NO | 0.11 | D | 42.36 | NO | 4004.00 | NO | 4004.00 | D | -1282.40 | NO | 11903.13 |
| 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 classifications. When Parties estimate emissions
[2] The total area of the subcategories, in accordance with the subdivisions used, should be entered here. For lands converted to cropland report the cumulative area remaining in the category on 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 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 conversions 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 the 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 | 4.D.1 Carbon stock change |

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

| 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[11] | Total area[12] (kha) | Area of mineral soil (kha) | Area of organic soil (kha) | Carbon stock change in living biomass per area[13] [14] | | | Net carbon stock change in dead organic matter per area[15] | Net carbon stock change in soils per area[16] | | Carbon stock change in living biomass[15] [16] | | | Net carbon stock change in dead organic matter[15] [16] | Net carbon stock change in soils[16] [18] [19] | | Net $CO_2$ emissions/ removals[16] [19] |
| | | | | | 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 | | 1834231.00 | 1834231.00 | NO | 0.0 | 0.00 | 0.00 | 0.58 | 0.02 | NO | NO | -110.00 | -110.00 | -40.00 | 2990.00 | NO | -3920.00 |
| 1. Grassland remaining grassland | | 1834231.00 | 1834231.00 | NO | NO | 0.00 | 0.00 | 0.58 | 0.02 | NO | NO | -110.00 | -110.00 | -40.00 | 2990.00 | NO | -3920.00 |
| 2. Land converted to grassland[17] | | 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 |
| 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 |
| 2.4 Settlements converted to grassland | | 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 |

[11] Land categories may be further divided according to climate zone, management system, soil type, including whether the soil is drained, aerated 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

[12] 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.

[13] 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.

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

[15] 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.

[16] No reporting on dead organic matter pools is required for category 4.C.1 Grassland remaining grassland.

[17] When Parties cannot estimate carbon stock changes for organic and mineral soil separately, these should be reported under mineral soils.

[18] 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.

[19] 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 conversions 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 (LULF sector 6) 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 contents 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 2020
Submission 2022 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 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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[3,4,5] | | | Net carbon stock change in dead organic matter per area[6] | Net carbon stock change in soils per area[6] | | Carbon stock change in living biomass[3,4,5] | | | Net carbon stock change in dead organic matter[6] | Net carbon stock change in soils[6] | | Net $CO_2$ emissions/removals[7,8,9,10] |
| | | | | | Gains | Losses | Net change | | Mineral soils | Organic soils | Gains | Losses | Net change | | Mineral soils | Organic soils | |
| | | | | | t C/ha/a | | | | | | Gg C | | | | | | Gg |
| **D. Total wetlands** | | 8791.10 | 8791.10 | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| 1. Wetlands remaining wetlands | | 8791.10 | 8791.10 | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| 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 | | 800.90 | 800.90 | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| 1.3 Other wetlands remaining other wetlands[11] | | 7990.20 | 7990.20 | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| 2. Land converted to wetlands[12] | | 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 climatic 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 conversions 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 added | |
| Documentation box | |
| Documentation box | |

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

**Settlements**

**(Sheet 1 of 1)**

| GRANTHAM GAS SINKS AND GHG CATEGORIES | | ACTIVITY DATA | | | IMPLIED CARBON STOCK CHANGE FACTORS | | | | | | STOCKS IN CARBON STOCK AND NET CO2 EMISSIONS/REMOVALS FROM SOILS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Land use category | Subdivisions[1] | Total area[2] (kha) | Area of observed land (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[5] | Net carbon stock change in soils per area[6] | | Carbon stock change in living biomass[3,4] | | | Net carbon stock change in dead organic matter[5] | Net carbon stock change in soils[6] | | Net $CO_2$ emissions/removals[7,8,9] |
| | | | | | Fodder | Leaves | Net change | | Mineral soils | Organic soils | Fodder | Leaves | Net change | | Mineral soils | Organic soils | |
| | | | | | t C/ha | | | | | | (kt C) | | | | | | (Gg) |
| 1. Settlements | | 174.76 | 174.76 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1.1 Settlements remaining settlements | | 174.76 | 174.76 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1.1.1 Land converted to settlements | | 12.76 | 12.76 | 0.0 | 1.46 | 0.0 | 1.46 | 0.0 | 0.0 | 0.0 | 18.6 | 0.0 | 18.6 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1.1.1.1 Forest land converted to settlements | | | | | | | | | | | | | | | | | |
| 1.1.1.2 Cropland converted to settlements | | 10.0 | 10.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1.1.1.3 Grassland converted to settlements | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1.1.1.4 Wetlands converted to settlements | | 12.76 | 12.76 | 0.0 | 1.46 | 0.0 | 1.46 | 0.0 | 0.0 | 0.0 | 18.6 | 0.0 | 18.6 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1.1.1.5 Other land converted to settlements | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1.2 Other land converted to settlements | | 162 | 162 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

[1] Land categories may be further divided according to climate zone, management system, ecotype, including whether the soil is drained, irrigated or unmanaged, or other management zone, tree species, ecoregion zone or national land classification. When Parties estimate emissions and removals or carbon stock change in dead wood or litter separately, they are encouraged to use this column to provide the 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 from these areas included or excluded from the total land area of the country.

[2] The total area of the subcategories in accordance with the subdivisions used, should be stated here. For lands converted to settlements report the cumulative area existing in the category or the reporting year. The total area should equal the area of remaining and 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 sign for emissions of gases or carbon dioxide are positive (+) and of losses or carbon dioxide are negative (-).

[5] When Parties choose to estimate emissions and removals other than carbon stock changes, they may report emissions/removals directly in this column and use comment lines in the stock change columns.

**Documentation Box**

Parties should provide detailed explanations in the land use, land-use change and forestry sector in chapter 3 Land Use Land Use Change and Forestry (LULUCF) sector 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 the table.

| | |
|---|---|
| Documentation Box | |
| Documentation Box | |

**TABLE 4.F SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY**
**Other land**
**(Sheet 1 of 1)**

Inventory 2020
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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 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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[5] | | Carbon stock change in living biomass[3][4] | | | Net carbon stock change in dead organic matter[4] | Net carbon stock change in soils[5] | | Net $CO_2$ emissions/ removals[6][7] |
| | | | | | 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** | | 22937,50 | 22937,50 | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| 1. Other land remaining other land[8] | | 22937,50 | 22937,50 | 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 of

[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. | |
| Documentation box | |
| Documentation box | |

## TABLE 4(I) SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTR

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

Inventory 2020
Submission 2022 v1
KAZAKHSTAN

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | ACTIVITY DATA AND OTHER RELATED INFORMATION | IMPLIED EMISSION FACTORS | EMISSIONS[4] |
|---|---|---|---|
| Land-use category[2] | Value<br>kg N/yr | $N_2O$–N emissions per unit of N input<br>kg $N_2O$–N/kg N[3] | $N_2O$<br>(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 |
| **B. 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 | | |
| **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 in

[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 managed

| 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 2020
Submission 2022 v1
KAZAKHSTAN

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | Subdivision[2] | ACTIVITY DATA | IMPLIED EMISSION FACTORS | | | EMISSIONS | | |
|---|---|---|---|---|---|---|---|---|
| Land-use category[1] | | 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] | $N_2O$ (kt) | $CH_4$ |
| **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**[6,8] | | | | | | 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**[6] | | | | | | NO | NO | NO |
| **Total organic soils** | | NO | NO | | NO | NO | | NO |
| Drained organic soils | | | | | | 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 |
| Other *(please specify)* | | NO | NO | NO | NO | NO | NO | NO |
| **D. Wetlands**[6] | | | | | | 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,NA | NO | NO | NO,NA | NO |
| Drained organic soils | | NO | NO | NA | NO | NO | NA | 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 |
| **E. Other** *(please specify)* [9] | | | | | | 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

[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

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

[6] On-site $CH_4$ emission /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

**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)**

Inventory 2020
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| 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** | NO | NO | NO |
| **A. Forest land** | NO | NO | NO |
| 1. Forest land remaining forest land | NO | NO | NO |
| 2. Lands converted to forest land[5] | NO | NO | NO |
| **B. Cropland[2]** | NO | NO | NO |
| 2. Lands converted to cropland[5] | NO | NO | NO |
| **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 2020
Submission 2022 v1
KAZAKHSTAN

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | ACTIVITY DATA AND OTHER RELATED INFORMATION | | IMPLIED EMISSION FACTORS | EMISSIONS |
|---|---|---|---|---|
| | Description | Value<br>kg N/yr | kg $N_2O$–N/kg N[3] | $N_2O$<br>(kt) |
| 1. Atmospheric deposition[4] | N volatilized from managed soils from inputs of N | IE | IE | IE |
| 2. Nitrogen leaching and run-off[4] | N from fertilizers 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 fertilizer 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 information to relevant sections of the NIR if any additional information and/or further details are needed to understand the sources of this table. | |
| Documentation box | |

## TABLE 4(V) SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY

**Biomass Burning**[1]

**(Sheet 1 of 1)**

Inventory 2020

Submission 2022 v1

KAZAKHSTAN

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | | ACTIVITY DATA | | | IMPLIED EMISSION FACTOR | | | EMISSIONS | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Description[2] | Unit | Values | $CO_2$ | $CH_4$ | $N_2O$ | $CO_2$ (net) | $CH_4$ | $N_2O$ |
| Land-use category[3] | Subdivision[4] | | (ha or kg dm) | | (t/activity data unit) | | | (kt) | | |
| **Total for land-use categories** | | | ha | 187037,66 | NO,NE,IE | 0,01 | 0,00 | NO,NE,IE | 2,29 | 0,15 |
| **A. Forest land** | | | ha | 27,66 | NO,IE | 60,01 | 3,33 | NO,IE | 1,66 | 0,09 |
| 1. Forest land remaining forest land[5] | | | ha | 27,66 | NO,IE | 60,01 | 3,33 | NO,IE | 1,66 | 0,09 |
| *Controlled burning* | | | ha | NO | NO | NO | NO | NO | NO | NO |
| *Wildfires* | | | ha | 27,66 | IE | 60,01 | 3,33 | IE | 1,66 | 0,09 |
| 2. Land converted to forest land | | | ha | NO | 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 |
| **B. Cropland** | | | ha | NO,IE | NO,NE | NO,IE | NO,IE | NO,NE | NO,IE | NO,IE |
| 1. Cropland remaining cropland[5] | | | 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 | 187010,00 | NO,NE | 0,00 | 0,00 | NO,NE | 0,63 | 0,06 |
| 1. Grassland remaining grassland[5] | | | ha | 187010,00 | NO,NE | 0,00 | 0,00 | NO,NE | 0,63 | 0,06 |
| *Controlled burning* | | | ha | | | | | NO | NO | NO |
| *Wildfires* | | | ha | 187010,00 | NE | 0,00 | 0,00 | NE | 0,63 | 0,06 |
| 2. Land converted to grassland | | | 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 |
| **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 2006 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 change 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.

[5] Parties who wish to do so may report CO2 emissions from burning of organic soils here.

[6] $CH_4$ 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

[7] 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)**

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 (ΔC HWP IU DC) | |
| | (t C) | | (yr) | (kt C) | (kt $CO_2$) |
| **TOTAL HWP consumed domestically (ΔC HWPdom IU DC)** | | | | | |
| | NO | NO,IE | | NO | NO,IE |
| 1. Solid wood[7] | NO | NO | | NO | NO |
| 2. Paper and paperboard | NO | IE | 2,00 | 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[10] | Annual change in stock (ΔC 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 (ΔC HWP IU DH) | |
| | (t C) | | (yr) | (kt C) | (kt $CO_2$) |
| **TOTAL HWP from domestic harvest (ΔC HWP IU DH)** | | | | | |
| 1. Solid wood[7] | | | | | |
| 2. Paper and paperboard | | | | | |
| 3. Other *(please specify)* | | | | | |
| **HWP produced and consumed domestically (ΔC HWPdom IU DH)**[13] | | | | | |
| ***Total*** | | | | | |
| 1. Solid wood[7] | | | | | |
| 2. Paper and paperboard | | | | | |
| 3. Other *(please specify)* | | | | | |

| HWP produced and exported (ΔC 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[10] | Annual change in stock (ΔC 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 (ΔC 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)[16] |
|---|---|---|---|---|---|---|
| | Gains[4] | Losses[4] | Half-life[10] | Annual change in stock (ΔC 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,

(5) 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 | G.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 |

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

Inventory 2020
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**HWP activity data[2]**

| | Sawnwood | | | Wood panels | | | Paper and paperboard | | |
|---|---|---|---|---|---|---|---|---|---|
| | Production | Imports | Exports | Production | Imports | Exports | Production | Imports | Exports |
| Inventory 2020 | $m^3$ | $m^3$ | $m^3$ | $m^3$ | $m^3$ | $m^3$ | metric t | metric t | metric t |
| (1) | | | | | | | | | |
| 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 |

(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

(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

**Additional information**

**Factors used to convert from product units to carbon**

| | |
|---|---|
| 1. Solid wood[4] | |
| 2. Paper and paperboard[4] | NO |
| 3. Other (please specify) | |

(4) 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 2020
Submission 2022 v1
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| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | $CO_2$ [(1)] | $CH_4$ | $N_2O$ | $NO_x$ | CO | NMVOC | $SO_2$ |
|---|---|---|---|---|---|---|---|
| | (kt) | | | | | | |
| **Total waste** | 25,34 | 277,22 | 1,34 | NO,NE | NO,NE | NO,NE | NO,NE |
| **A. Solid waste disposal** | NO | 153,42 | | NO,NE | NO,NE | NO,NE | |
| 1. Managed waste disposal sites | NO | 26,98 | | NE | NE | NE | |
| 2. Unmanaged waste disposal sites | NO | 126,44 | | NO | NO | NO | |
| 3. Uncategorized waste disposal sites | NO | NO | | NO | NO | NO | |
| **B. Biological treatment of solid waste** | | NO | NO | NO | NO | NO | |
| 1. Composting | | NO | NO | NO | NO | NO | |
| 2. Anaerobic digestion at biogas facilities | | NO | NO | | | | |
| **C. Incineration and open burning of waste** | 25,34 | 0,02 | 0,02 | NO,NE | NO,NE | NO,NE | NO,NE |
| 1. Waste incineration | 25,34 | 0,02 | 0,02 | NO | NO | NO | NO |
| 2. Open burning of waste | NO | NO,NE | NO,NE | NE | NE | NE | NE |
| **D. Wastewater treatment and discharge** | | 123,78 | 1,32 | NO | NO | NO | |
| 1. Domestic wastewater | | 87,41 | 1,32 | NO | NO | | |
| 2. Industrial wastewater | | 36,37 | NE | NO | NO | NO | |
| 3. Other *(as specified in table 5.D)* | | 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 | | | | | | | |
| 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 | tage 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 2020
Submission 2022 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 | 796.62 | | | 0,03 | NO | 26,98 | NO | NO | NO |
| a. Anaerobic | 381.89 | 1,00 | 0,50 | 0,02 | NO | 8,44 | NO | NO | NO |
| b. Semi-aerobic | 414.73 | 0,50 | 0,50 | 0,04 | NO | 18,54 | NO | NO | NO |
| 2. Unmanaged waste disposal sites | 3708.00 | 0,40 | 0,50 | 0,03 | NO | 126,44 | 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 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 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 2020
Submission 2022 v1
KAZAKHSTAN

| 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 [1] | 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 | 25,34 | 0,02 | 0,02 |
| **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 | 25,34 | 0,02 | 0,02 |
| Municipal solid waste | NO | NO | NO | NO | NO | NO | NO |
| Other *(please specify)* [3] | NO | NO | NO | NO | 25,34 | 0,02 | 0,02 |
| **2. Open burning of waste** | NO,NE | NO | NO,NE | NO,NE | NO | NO,NE | NO,NE |
| **Biogenic** [1] | NE | NE | NE | NE | NE | NE | NE |
| Municipal solid waste | NE | NE | NE | NE | NE | NE | NE |
| Other *(please specify)* | | | | | | | |
| **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

[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

[3] 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 need to be calculated separately.

| **Documentation box:**<br>• 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<br>• 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<br>• 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)

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | ACTIVITY DATA AND RELATED INFORMATION | | | IMPLIED EMISSION FACTOR | | EMISSIONS | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $CH_4$ | | | $N_2O$[3] |
| | 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] | |
| | (kt DC[6]/yr) | | (kt N/yr) | (kg/kg DC) | kg N2O-N/kg N | (kt) | | | |
| 1. Domestic wastewater | 516,83 | NO | 148,63 | 0,17 | 0,00 | 87,41 | NO | NO | 1,32 |
| 2. Industrial wastewater | 484,90 | NO | NO | 0,08 | NE | 36,17 | 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) | 18879,55 |
| Protein consumption (kg/person/yr) | 40,60 |
| Fraction of nitrogen in protein | 0,16 |
| $F_{NON-CONS}$ | 1,10 |
| $F_{INDUSTRIAL}$ | 1,25 |
| $T_{PLANT}$ | NO |

Note: Parties are encouraged to supply the additional information regardless of the methodology applied
$F_{NON-CONS}$ = 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 rural 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, and | |
| Documentation box | Rural 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 2020
Submission 2022 v1
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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) | | | | | |
| **Total national emissions and removals** | 288768,47 | 1744,30 | 65,17 | 1135,44 | 665,50 | NO,NA | 0,00 | NO,NA | 70632,57 | 471847,24 | 51455,30 | 636,22 |
| **1. Energy** | 259331,29 | 534,91 | 4,35 | | | | | | 70597,69 | 471815,41 | 51065,41 | 636,22 |
| A. Fuel combustion Reference approach(2) | 228429,31 | | | | | | | | | | | |
| Sectoral approach(2) | 242487,38 | 66,65 | 4,34 | | | | | | 70597,69 | 471815,41 | 51065,41 | 636,22 |
| 1. Energy industries | 143762,48 | 1,89 | 1,92 | | | | | | 427,81 | 32,13 | 8,10 | 416,10 |
| 2. Manufacturing industries and construction | 26461,69 | 2,30 | 0,38 | | | | | | 35,22 | 12,65 | 1,81 | 51,32 |
| 3. Transport | 18164,13 | 7,17 | 1,28 | | | | | | 70078,80 | 471072,06 | 50985,07 | 41,75 |
| 4. Other sectors | 31970,65 | 52,73 | 0,47 | | | | | | 30,44 | 391,85 | 39,46 | 73,34 |
| 5. Other | 22128,44 | 2,56 | 0,29 | | | | | | 25,43 | 306,71 | 30,98 | 53,72 |
| B. Fugitive emissions from fuels | 16843,90 | 468,26 | 0,01 | | | | | | NO,NA | NO,NA | NO,NA | NO,NA |
| 1. Solid fuels | 16829,18 | 275,13 | 0,00 | | | | | | NO,NA | NO,NA | NO,NA | NO,NA |
| 2. Oil and natural gas and other emissions from energy production | 14,73 | 193,12 | 0,01 | | | | | | NA | NA | NA | NA |
| C. $CO_2$ Transport and storage | NO,NA | | | | | | | | | | | |
| **2. Industrial processes and product use** | 21499,55 | 0,46 | 0,66 | 1135,44 | 665,50 | NO,NA | 0,00 | NO,NA | 0,48 | 31,83 | 263,05 | 0,00 |
| A. Mineral industry | 8273,27 | | | | | | | | NO | NO | NO | NO |
| B. Chemical industry | 483,50 | NO | 0,66 | NO | NO | NO | NO | NO | 0,22 | 0,02 | NO | 0,00 |
| C. Metal industry | 12571,74 | 0,46 | NO | NO | 665,50 | NO | NO | NO | 0,27 | 31,81 | 1,07 | NO,NA |
| D. Non-energy products from fuels and solvent use | 171,04 | NO,NA | NO,NA | | | | | | NO,NA | NO,NA | 261,98 | NO,NA |
| E. Electronic industry | | | | NO | NO | NO | NO | NO | | | | |
| F. Product uses as substitutes for ODS | | | | 1135,44 | 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 2020
Submission 2022 v1
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| 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** | 3,67 | 929,43 | 58,68 | | | | | | 34,39 | NO | 126,85 | NO |
| A. Enteric fermentation | | 874,14 | | | | | | | | | | |
| B. Manure management | | 33,81 | 9,16 | | | | | | | | 107,43 | |
| C. Rice cultivation | | 21,48 | | | | | | | | | NO | |
| D. Agricultural soils | | NO | 49,52 | | | | | | 34,39 | NO | 19,42 | |
| 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 | 3,67 | | | | | | | | | | | |
| I. Other carbon-contining fertilizers | NO | | | | | | | | | | | |
| J. Other | NO | NO | NO | | | | | | NO | NO | NO | NO |
| **4. Land use, land-use change and forestry [3]** | 7908,63 | 2,29 | 0,15 | | | | | | NO | NO | NO | NO |
| A. Forest land [4] | -10335,60 | 1,66 | 0,09 | | | | | | NO | NO | NO | |
| B. Cropland [4] | 31905,13 | NO,IE | NO,IE | | | | | | NO | NO | NO | |
| C. Grassland [4] | -10120,00 | 0,63 | 0,06 | | | | | | | | | |
| D. Wetlands [4] | NO,NE,NA | NO,IE,NA | NO,IE,NA | | | | | | NO | NO | NO | |
| E. Settlements [4] | -3540,90 | 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** | 25,34 | 277,22 | 1,34 | | | | | | NO,NE | NO,NE | NO,NE | NO,NE |
| A. Solid waste disposal [5] | NO | 153,42 | | | | | | | NO,NE | NO,NE | NO,NE | |
| B. Biological treatment of solid waste [5] | | NO | NO | | | | | | NO | NO | NO | |
| C. Incineration and open burning of waste [5] | 25,34 | 0,02 | 0,02 | | | | | | NO,NE | NO,NE | NO,NE | NO,NE |
| D. Wastewater treatment and discharge | | 123,78 | 1,32 | | | | | | 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 2020
Submission 2022 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** | 380,63 | 0,00 | 0,01 | | | | | | NE,NA | NE,NA | NE,NA | NE,NA |
| Aviation | 369,71 | 0,00 | 0,01 | | | | | | NE | NE | NE | NE |
| Navigation | 10,92 | 0,00 | 0,00 | | | | | | NA | NA | NA | NA |
| **Multilateral operations** | NA | NA | NA | | | | | | NA | NA | NA | NA |
| **$CO_2$ emissions from biomass** | 178,92 | | | | | | | | | | | |
| **$CO_2$ captured** | NO,IE,NA | | | | | | | | | | | |
| **Long-term storage of C in waste disposal sites** | NO | | | | | | | | | | | |
| **Indirect $N_2O$** | | | NO,NA | | | | | | | | | |
| **Indirect $CO_2$** | NO,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)



| 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)]** | 288768,47 | 43607,52 | 19420,26 | 1135,44 | 665,50 | 2,31 | NO,NA | NO,NA | 353599,49 |
| **1. Energy** | 259331,29 | 13372,71 | 1296,20 | | | | | | 274000,19 |
| A. Fuel combustion (sectoral approach) | 242487,38 | 1666,27 | 1293,80 | | | | | | 245447,46 |
| 1. Energy industries | 143762,48 | 47,28 | 572,90 | | | | | | 144382,66 |
| 2. Manufacturing industries and construction | 26461,69 | 57,62 | 111,81 | | | | | | 26631,13 |
| 3. Transport | 18164,13 | 179,15 | 382,48 | | | | | | 18725,75 |
| 4. Other sectors | 31970,65 | 1318,13 | 140,35 | | | | | | 33429,13 |
| 5. Other | 22128,44 | 64,08 | 86,27 | | | | | | 22278,79 |
| B. Fugitive emissions from fuels | 16843,90 | 11706,44 | 2,40 | | | | | | 28552,73 |
| 1. Solid fuels | 16829,18 | 6878,36 | 0,08 | | | | | | 23707,61 |
| 2. Oil and natural gas | 14,73 | 4828,07 | 2,32 | | | | | | 4845,12 |
| C. $CO_2$ transport and storage | NO,NA | | | | | | | | NO,NA |
| **2. Industrial processes and product use** | 21499,55 | 11,42 | 195,88 | 1135,44 | 665,50 | 2,31 | NO,NA | NO,NA | 23510,09 |
| A. Mineral industry | 8273,27 | | | | | | | | 8273,27 |
| B. Chemical industry | 483,50 | NO | 195,88 | NO | NO | NO | NO | NO | 679,38 |
| C. Metal industry | 12571,74 | 11,42 | NO | NO | 665,50 | NO | NO | NO | 13248,66 |
| D. Non-energy products from fuels and solvent use | 171,04 | NO,NA | NO,NA | | | | | | 171,04 |
| E. Electronic Industry | | | | NO | NO | NO | NO | NO | NO |
| F. Product uses as ODS substitutes | | | | 1135,44 | NO,NA | NO,NA | NO,NA | NO,NA | 1135,44 |
| G. Other product manufacture and use | NO | NO | NO,NE | NO | NO | 2,31 | NO | NO | 2,31 |
| H. Other | NA | NA | NA | NO,NA | NO,NA | NA | NA | NA | NO,NA |
| **3. Agriculture** | 3,67 | 23235,76 | 17485,56 | | | | | | 40724,99 |
| A. Enteric fermentation | | 21853,50 | | | | | | | 21853,50 |
| B. Manure management | | 845,26 | 2728,60 | | | | | | 3573,86 |
| C. Rice cultivation | | 537,00 | | | | | | | 537,00 |
| D. Agricultural soils | | NO | 14756,96 | | | | | | 14756,96 |
| E. Prescribed burning of savannas | | NO | NO | | | | | | NO |
| F. Field burning of agricultural residues | | NO | NO | | | | | | NO |
| G. Liming | NO | | | | | | | | NO |
| H. Urea application | 3,67 | | | | | | | | 3,67 |
| I. Other carbon-containing fertilizers | NO | | | | | | | | NO |
| J. Other | NO | NO | NO | | | | | | NO |
| **4. Land use, land-use change and forestry[(1)]** | 7908,63 | 57,20 | 44,10 | | | | | | 8009,94 |
| A. Forest land | -10335,60 | 41,50 | 27,42 | | | | | | -10266,68 |
| B. Cropland | 31905,13 | NO,IE | NO,IE | | | | | | 31905,13 |
| C. Grassland | -10120,00 | 15,70 | 16,69 | | | | | | -10087,61 |
| D. Wetlands | NO,NE,NA | NO,IE,NA | NO,IE,NA | | | | | | NO,NE,IE,NA |
| E. Settlements | -3540,90 | NO | NO | | | | | | -3540,90 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| F. Other land | NO | NO | NO | | | | | | NO |
| G. Harvested wood products | NO,IE | | | | | | | | NO,IE |
| H. Other | NO | NO | NO | | | | | | NO |
| **5. Waste** | 25,34 | 6930,43 | 398,52 | | | | | | 7354,28 |
| A. Solid waste disposal | NO | 3835,50 | | | | | | | 3835,50 |
| B. Biological treatment of solid waste | | NO | NO | | | | | | NO |
| C. Incineration and open burning of waste | 25,34 | 0,43 | 5,16 | | | | | | 30,92 |
| D. Waste water treatment and discharge | | 3094,50 | 393,36 | | | | | | 3487,86 |
| 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** | 380,63 | 0,09 | 3,28 | | | | | | 384,00 |
| Aviation | 369,71 | 0,06 | 3,08 | | | | | | 372,85 |
| Navigation | 10,92 | 0,03 | 0,20 | | | | | | 11,14 |
| **Multilateral operations** | NA | NA | NA | | | | | | NA |
| **$CO_2$ emissions from biomass** | 178,92 | | | | | | | | 178,92 |
| **$CO_2$ 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,NA | | | | | | | | |
| **Total $CO_2$ equivalent emissions without land use, land-use change and forestry** | | | | | | | | | 345589,56 |
| **Total $CO_2$ equivalent emissions with land use, land-use change and forestry** | | | | | | | | | 353599,49 |
| **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 2020
Submission 2022 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 | CR,CS,D | T1,T2 | CS,D | | | | | | | | | | |
| A. Fuel combustion | T1,T2 | CS,D | T1,T2 | CS,D | T1,T2 | CS,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 | CS,D | T1,T2 | CS,D | T1,T2 | CS,D | | | | | | | | | | |
| 4. Other sectors | T1 | D | T1 | D | T1 | D | | | | | | | | | | |
| 5. Other | T1 | D | T1 | D | T1 | D | | | | | | | | | | |
| B. Fugitive emissions from fuels | T1 | D | T1 | CR,D | T1 | D | | | | | | | | | | |
| 1. Solid fuels | T1 | D | T1 | D | T1 | D | | | | | | | | | | |
| 2. Oil and natural gas | T1 | D | T1 | CR,D | T1 | D | | | | | | | | | | |
| C. $CO_2$ transport and storage | | | | | | | | | | | | | | | | |
| 2. Industrial processes | T1,T2 | CS,D | D | D | T1 | D | T2 | D | T1 | D | T1 | D | | | | |
| A. Mineral industry | T1,T2 | CS,D | | | | | | | | | | | | | | |
| B. Chemical industry | T1,T2 | CS,D | | | T1 | D | | | | | | | | | | |
| C. Metal industry | T1,T2 | 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)
RA (Reference Approach)
T1 (IPCC Tier 1)
T1a, T1b, T1c (IPCC Tier 1a, Tier 1b and Tier 1c, respectively)
T2 (IPCC Tier 2)
T3 (IPCC Tier 3)
CR (CORINAIR)
CS (Country Specific)
OTH (Other)
M (model)

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)
CR (CORINAIR)
CS (Country Specific)
PS (Plant Specific)
OTH (Other)
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 2020
Submission 2022 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[11] | | | | | 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 | | | | | | | | | | | | | | | | |
| E. Settlements | T1 | CS | | | | | | | | | | | | | | |
| F. Other land | | | | | | | | | | | | | | | | |
| G. Harvested wood products | | | | | | | | | | | | | | | | |
| H. Other | | | | | | | | | | | | | | | | |
| **5. Waste** | T1 | D | M,T1 | CS,D,M | T1 | D | | | | | | | | | | |
| A. Solid waste disposal | | | M | CS,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 2020
Submission 2022 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** | 1744,30 | 471847,24 | 51455,30 | 70632,57 | NO,NA | NO,NA | NO,NA |
| **1. Energy** | 534,91 | 471815,41 | 51065,41 | 70597,69 | | | |
| **2. Industrial processes and product use** | 0,46 | 31,83 | 263,05 | 0,48 | NA | NA | NA |
| **3. Agriculture** [3] | 929,43 | NO | 126,85 | 34,39 | | NO | NO |
| **4. LULUCF** [3] | 2,29 | NO | NO | NO | | NO | NO |
| **5. Waste** | 277,22 | 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)

| KEY CATEGORIES OF EMISSIONS AND REMOVALS | Gas | Criteria used for key source identification | | 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 | CO2 | | | |
| 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 |
| 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 | CO2 | | | |
| 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 | | | |
| 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 - Solid Fuels | CO2 | | | |
| 1.A.3.d Domestic Navigation - Solid Fuels | CH4 | | | |
| 1.A.3.d Domestic Navigation - Solid 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 | CO2 | | | |
| 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.a Other Sectors - Liquid Fuels | CO2 | X | X | X |
| 1.A.4.a Other Sectors - Liquid Fuels | CH4 | | | |
| 1.A.4.a Other Sectors - Liquid Fuels | N2O | | | |
| 1.A.4.b Other Sectors - Solid Fuels | CO2 | X | X | X |
| 1.A.4.b Other Sectors - Solid Fuels | CH4 | | | |
| 1.A.4.b Other Sectors - Solid Fuels | N2O | | | |
| 1.A.4.c Other Sectors - Gaseous Fuels | CO2 | X | X | X |
| 1.A.4.c Other Sectors - Gaseous Fuels | CH4 | | | |
| 1.A.4.c Other Sectors - Gaseous Fuels | N2O | | | |
| 1.A.4.c Other Sectors - Other Fossil Fuels | CO2 | | | |
| 1.A.4.c Other Sectors - Other Fossil Fuels | CH4 | | | |
| 1.A.4.c Other Sectors - Other Fossil Fuels | N2O | | | |
| 1.A.4.c Other Sectors - Peat | CO2 | | | |
| 1.A.4.c Other Sectors - Peat | CH4 | | | |
| 1.A.4.c Other Sectors - Peat | N2O | | | |
| 1.A.4.c Other Sectors - Biomass | CO2 | | | |
| 1.A.4.c Other Sectors - Biomass | CH4 | | | |
| 1.A.4.c Other Sectors - Biomass | N2O | | | |
| 1.A.5 Other (not specified elsewhere) - Liquid Fuels | CO2 | 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 |
| 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 | CO2 | | | |
| 1.A.5 Other (not specified elsewhere) - Biomass | CH4 | | | |
| 1.A.5 Other (not specified elsewhere) - Biomass | N2O | | | |
| 1.B.1 Fugitive emissions from fuels - Solid Fuels | CO2 | | | |
| 1.B.1.a Fugitive Emissions from Fuels - Coal Mining and Handling | CH4 | X | X | X |
| 1.B.1.a Fugitive Emissions from Fuels - Oil and Natural Gas - Oil | CO2 | | | |
| 1.B.1.a Fugitive Emissions from Fuels - Oil and Natural Gas - Oil | CH4 | X | X | X |
| 1.B.1.b Fugitive Emissions from Fuels - Oil and Natural Gas - Natural Gas | CO2 | | | |
| 1.B.1.b Fugitive Emissions from Fuels - Oil and Natural Gas - Natural Gas | CH4 | | | |
| 1.B.1.c Fugitive Emissions from Fuels - Venting and Flaring | CO2 | | | |
| 1.B.1.c Fugitive Emissions from Fuels - Venting and Flaring | CH4 | | | |
| 1.B.1.c Fugitive Emissions from Fuels - Venting and Flaring | N2O | | | |
| 1.B.2.1 Fugitive Emissions from Fuels - Other | CO2 | | | |
| 1.B.2.1 Fugitive Emissions from Fuels - Other | CH4 | | | |
| 1.B.2.1 Fugitive Emissions from Fuels - Other | N2O | | | |
| 2.A.1 Cement and Storage | CO2 | | | |
| 2.A.2 Lime Production | CO2 | | | |
| 2.A.3 Glass Production | CO2 | X | X | X |
| 2.A.4 Other Process Uses of Carbonates | CO2 | | | |
| 2.B.1 Ammonia Production | CO2 | X | X | X |
| 2.B.2 Nitric Acid Production | N2O | | | |
| 2.B.3 Adipic Acid Production | N2O | | | |
| 2.B.4 Caprolactam, Glyoxal and Glyoxylic Acid Production | N2O | | | |
| 2.B.5 Carbide Production | CO2 | | | |
| 2.B.5 Carbide Production | CH4 | | | |
| 2.B.5 Carbide Production | N2O | | | |
| 2.C.1 Iron and Steel Production | CO2 | | | |
| 2.C.1 Iron and Steel Production | CH4 | | | |
| 2.C.1 Iron and Steel Production | N2O | | | |
| 2.C.2 Ferroalloys Production | CO2 | | | |
| 2.C.2 Ferroalloys Production | CH4 | | | |
| 2.C.2 Ferroalloys Production | N2O | | | |
| 2.C.3 Aluminium Production | CO2 | | | |
| 2.C.3 Aluminium Production | CH4 | | | |
| 2.C.3 Aluminium Production | N2O | | | |
| 2.C.4 SF6 and PFCs from Other Production | CO2 | | | |
| 2.C.4 SF6 and PFCs from Other Production | CH4 | | | |
| 2.C.4 SF6 and PFCs from Other Production | N2O | | | |

| | | | | | |
|---|---|---|---|---|---|
| [illegible] | [illegible] | | | | |
| [illegible] | [illegible] | | | | |
| [illegible] | [illegible] | | | | |

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

**Recalculated year:** Inventory 2020
Submission 2022 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 | | 288 508.47 | | | | | | 43667.32 | | | | | | 19410.36 | | | | |
| 1. Energy | | 259 131.29 | | | | | | 13172.74 | | | | | | 1296.28 | | | | |
| A. Fuel combustion activities | | 242497.38 | | | | | | 1866.27 | | | | | | 1293.80 | | | | |
| 1. Energy Industries | | 145762.48 | | | | | | 47.28 | | | | | | 172.49 | | | | |
| 2. Manufacturing industries and construction | | 26481.69 | | | | | | 57.62 | | | | | | 111.84 | | | | |
| 3. Transport | | 18164.13 | | | | | | 170.15 | | | | | | 382.48 | | | | |
| 4. Other sectors | | 51970.07 | | | | | | 1238.13 | | | | | | 146.15 | | | | |
| 5. Other | | 22.28.10 | | | | | | 64.08 | | | | | | 86.77 | | | | |
| B. Fugitive emissions from fuels | | 16634.90 | | | | | | 11306.47 | | | | | | 2.48 | | | | |
| 1. Solid fuels | | 16029.18 | | | | | | 6876.34 | | | | | | 0.08 | | | | |
| 2. Oil and natural gas | | 14.73 | | | | | | 4429.07 | | | | | | 2.12 | | | | |
| C. $CO_2$ Transport and storage | | 561.54 | | | | | | | | | | | | | | | | |
| 2. Industrial processes and product use | | 21109.11 | | | | | | 11.4 | | | | | | 195.88 | | | | |
| A. Mineral industry | | 8271.17 | | | | | | | | | | | | | | | | |
| B. Chemical industry | | 483.30 | | | | | | 9.6 | | | | | | 195.88 | | | | |
| C. Metal industry | | 12171.34 | | | | | | 11.42 | | | | | | 96.1 | | | | |
| D. Non-energy products from fuels and solvent use | | 173.44 | | | | | | 361.9.9 | | | | | | 99.19.9 | | | | |
| G. Other product manufacture and use | | NA | | | | | | 9.93 | | | | | | 93.3.97 | | | | |
| H. Other | | NA | | | | | | NA | | | | | | NA | | | | |

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

**TABLE1 RECALCULATION - RECALCULATED DATA**
**(Sheet 2 of 4)**

**Recalculated year:** Inventory 2020
Submission 2022 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[2] | Previous submission | Latest submission | Difference | Difference[1] | Impact of recalculation on total emissions excluding LULUCF[2] | Impact of recalculation on total emissions including LULUCF[2] | Previous submission | Latest submission | Difference | Difference[1] | Impact of recalculation on total emissions excluding LULUCF[2] | Impact of recalculation on total emissions including LULUCF[2] |
| | $CO_2$ equivalent (kt) | | | (%) | | | $CO_2$ equivalent (kt) | | | (%) | | | $CO_2$ equivalent (kt) | | | (%) | | |
| 3. Agriculture | | | | | | | | | | | | | | | | | | |
| A. Enteric fermentation | | 3.67 | | | | | | 23111.76 | | | | | | 11441.36 | | | | |
| B. Manure management | | | | | | | | 21493.56 | | | | | | | | | | |
| C. Rice cultivation | | | | | | | | 845.24 | | | | | | 2728.69 | | | | |
| D. Agricultural soils[3] | | | | | | | | 537.00 | | | | | | | | | | |
| E. Prescribed burning of savannas | | | | | | | | NO | | | | | | 14756.46 | | | | |
| F. Field burning of agricultural residues | | | | | | | | NO | | | | | | NO | | | | |
| G. Liming | | NO | | | | | | NO | | | | | | NO | | | | |
| H. Urea application | | 2.67 | | | | | | | | | | | | | | | | |
| I. Other carbon-containing fertilizers | | NO | | | | | | | | | | | | | | | | |
| J. Other | | NO | | | | | | | | | | | | | | | | |
| 4. Land use, land-use change and forestry (net)[4] | | | | | | | | NO | | | | | | NO | | | | |
| A. Forest land | | 7908.11 | | | | | | 77.20 | | | | | | 46.31 | | | | |
| B. Cropland | | -16337.40 | | | | | | 41.30 | | | | | | 37.42 | | | | |
| C. Grassland | | 31865.11 | | | | | | NO,E | | | | | | NO,E | | | | |
| D. Wetlands | | -19120.46 | | | | | | 15.76 | | | | | | 10.69 | | | | |
| E. Settlements | | NO,NE,NA | | | | | | NO,E,NA | | | | | | NO,E,NA | | | | |
| F. Other land | | -2348.90 | | | | | | NO | | | | | | NO | | | | |
| G. Harvested wood products | | NO | | | | | | NO | | | | | | NO | | | | |
| H. Other | | NO,E | | | | | | | | | | | | | | | | |
| | | NO | | | | | | NO | | | | | | NO | | | | |

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

**TABLE 9 RECALCULATION - RECALCULATED DATA**
**(Sheet 3 of 4)**

**Recalculated year:** Inventory 2020
Submission 2022 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** | | | | | | | | | | | | | | | | | | |
| A. Solid waste disposal | | 21.34 | | | | | | [illegible] | | | | | | [illegible] | | | | |
| B. Biological treatment of solid waste | | [illegible] | | | | | | [illegible] | | | | | | | | | | |
| C. Incineration and open burning of waste | | 29.34 | | | | | | [illegible] | | | | | | [illegible] | | | | |
| D. Wastewater treatment and discharge | | | | | | | | [illegible] | | | | | | [illegible] | | | | |
| E. Other | | | | | | | | [illegible] | | | | | | [illegible] | | | | |
| **6. Other (as specified in summary 1.A)** | | [illegible] | | | | | | [illegible] | | | | | | [illegible] | | | | |
| | | [illegible] | | | | | | [illegible] | | | | | | [illegible] | | | | |
| **Memo Items:** | | | | | | | | | | | | | | | | | | |
| **International bunkers** | | | | | | | | | | | | | | | | | | |
| Aviation | | [illegible] | | | | | | | | | | | | | | | | |
| Navigation | | [illegible] | | | | | | [illegible] | | | | | | [illegible] | | | | |
| **Multilateral operations** | | [illegible] | | | | | | [illegible] | | | | | | [illegible] | | | | |
| **$CO_2$ emissions from biomass** | | NA | | | | | | [illegible] | | | | | | [illegible] | | | | |
| **$CO_2$ captured** | | [illegible] | | | | | | | | | | | | | | | | |
| **Long-term storage of C in waste disposal sites** | | [illegible] | | | | | | | | | | | | | | | | |
| **Indirect $N_2O$** | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| **Indirect $CO_2$** | | NE,NA | | | | | | | | | | | | NE,NA | | | | |

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

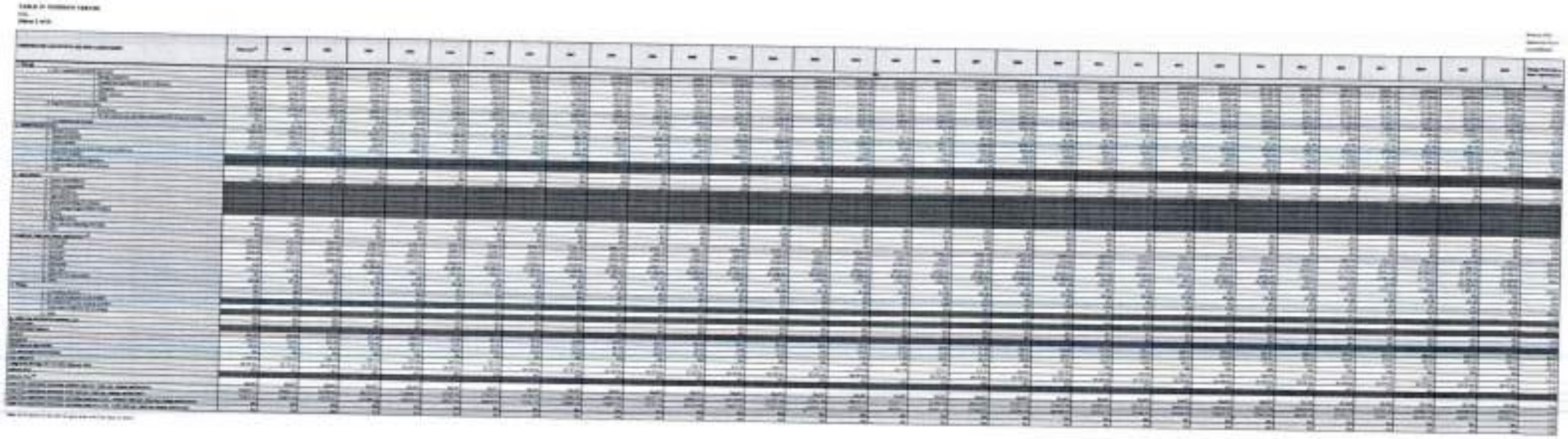
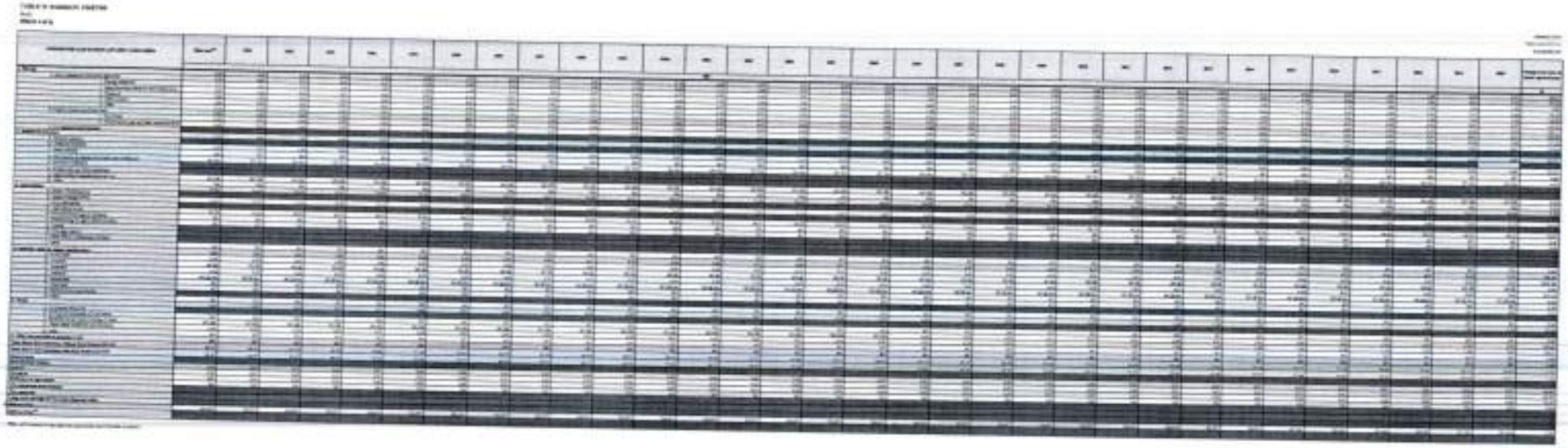
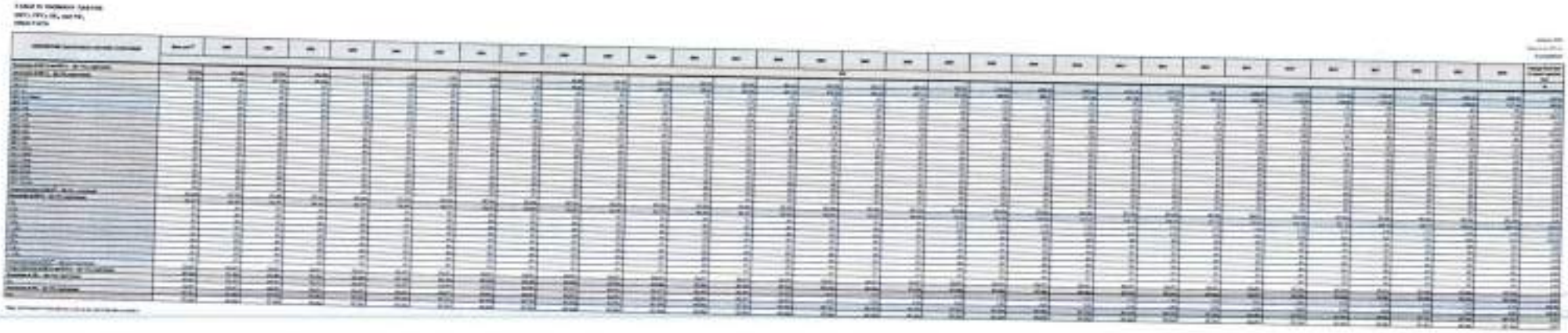
**TABLE 9 COMPLETENESS - INFORMATION ON NOTATION KEYS**
**(Sheet 1 of 1)**

Inventory 2020
Submission 2022 v1
KAZAKHSTAN

| GHG | Sector[1] | Sources and sinks not estimated ("NE")[1] | |
|---|---|---|---|
| | | 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 | via photosynthetic activity, within weeks to few years after burning (IPCC GLS, 2006) |
| CO2 | LULUCF | 4.C Grassland/4.C.1 Grassland Remaining Grassland/4(V) Biomass Burning/Wildfires | via photosynthetic activity, within weeks to few years after burning (IPCC GLS, 2006) |
| 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 I, 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 |
| CO2 | LULUCF | Converted to Settlements | Soil carbon changes were taken as a constant value (Tier 1 method, IPCC GLs, 2006) for the Settlements |

| GHG | Source/sink category | Sources and sinks reported elsewhere ("IE")[3] | | |
|---|---|---|---|---|
| | | Allocation as per IPCC Guidelines | Allocation used by the Party | Explanation |
| CH4 | 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 | The fuel used by mobile transport is included in the category 1.A.3 "Transport" |
| 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 | 2.C Metal Industry/2.C.1 Iron and Steel Production/2.C.1.f Other (please specify) | According to IPCC GLs, 2006, volume 3, ch. 4.2, CO2 emissions from coke production are presented in the Energy sector | Included in 1.A.2.a | 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.1 Forest Land Remaining Forest Land/4(V) Biomass Burning/Wildfires | | Included in 4.A.1 Carbon stock change | CO2 emissions indirectly accounted in the Carbon stock change |
| 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 | 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