Additional File 1

Additional Table 1. Emission factors for each year from 2010 to 2020.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Electricity (tCO_2e/kWh)	0·000473	0·000518	0·000516	0·000513	0·000497	0·000486	0·000485	0·000476	0·000458	0·000431	0·000406
Gas (tCO_2e/Nm^3)	0·000223	0· 000223	0· 000223	0·000223	0· 000223	0·000223	0·000223	0·000223	0·000223	0·000223	0·000223
Clean water (tCO_2e/m^3)	0·00013	0·000147	0·000146	0·000143	0·000139	0·000135	0·000137	0·000135	0·000132	0·000127	0·000122
Sewage (tCO_2e/m^3)	0·000293	0·000302	0·000287	0·000307	0·000291	0·00027	0·000302	0·000292	0·000295	0·000287	0·000272
Solid waste (tCO_2e/kg)	NA	NA	NA	NA	0·0008214	0·0008214	0·0008214	0·0008214	0·0008214	0·0008214	0·0008214
Scrap metal (tCO_2e/kg)	NA	NA	NA	NA	0·0000122	0·0000122	0·0000122	0·0000122	0·0000122	0·0000122	0·0000122
Medical waste (infectious) (tCO_2e/kg)	NA	NA	NA	NA	0·00255	0·00255	0·00255	0·00255	0·00255	0·00255	0·00255
Medical waste (non-infectious) (tCO_2e/kg)	NA	NA	NA	NA	0·00255	0·00255	0·00255	0·00255	0·00255	0·00255	0·00255
Pharmaceuticals (tCO_2e/Yen)	0·00000283	0·00000283	0·00000283	0·00000283	0·00000283	0·00000283	0·00000283	0·00000283	0·00000283	0·00000283	0·00000283
Medical supplies (tCO_2e/Yen)	0·00000329	0·00000329	0·00000329	0·00000329	0·00000329	0·00000329	0·00000329	0·00000329	0·00000329	0·00000329	0·00000329

Note: kg: kilogram; kWh: kilowatt; NA: Not available; tCO_2e: tonnes of carbon dioxide equivalent.

References for emission factors:

Electricity: The Chubu Electric Power's website (https://miraiz.chuden.co.jp/info/topics/__icsFiles/afieldfile/2020/09/16/topics_att_20200916_01.pdf.pdf). For an emission factor in 2020, (https://miraiz.chuden.co.jp/info/topics/1206545_1939.html).

Gas: https://ghg-santeikohyo.env.go.jp/files/calc/itiran_2020_rev.pdf

Clean water and sewage: Answered by the Nagoya City Waterworks & Sewerage Bureau.

Solid waste, scrap metal, pharmaceuticals, and medical supplies: https://www.env.go.jp/earth/ondanka/supply_chain/gvc/estimate_tool.html#no07

Medical waste (both infectious and non-infectious): https://www.env.go.jp/earth/ondanka/suishin_g/3rd_edition/ref2.pdf

Additional Table 2. Carbon emission sources for each year between 2010 and 2020 (values are the median of 12 monthly values in a year, with the interquartile range in parentheses).

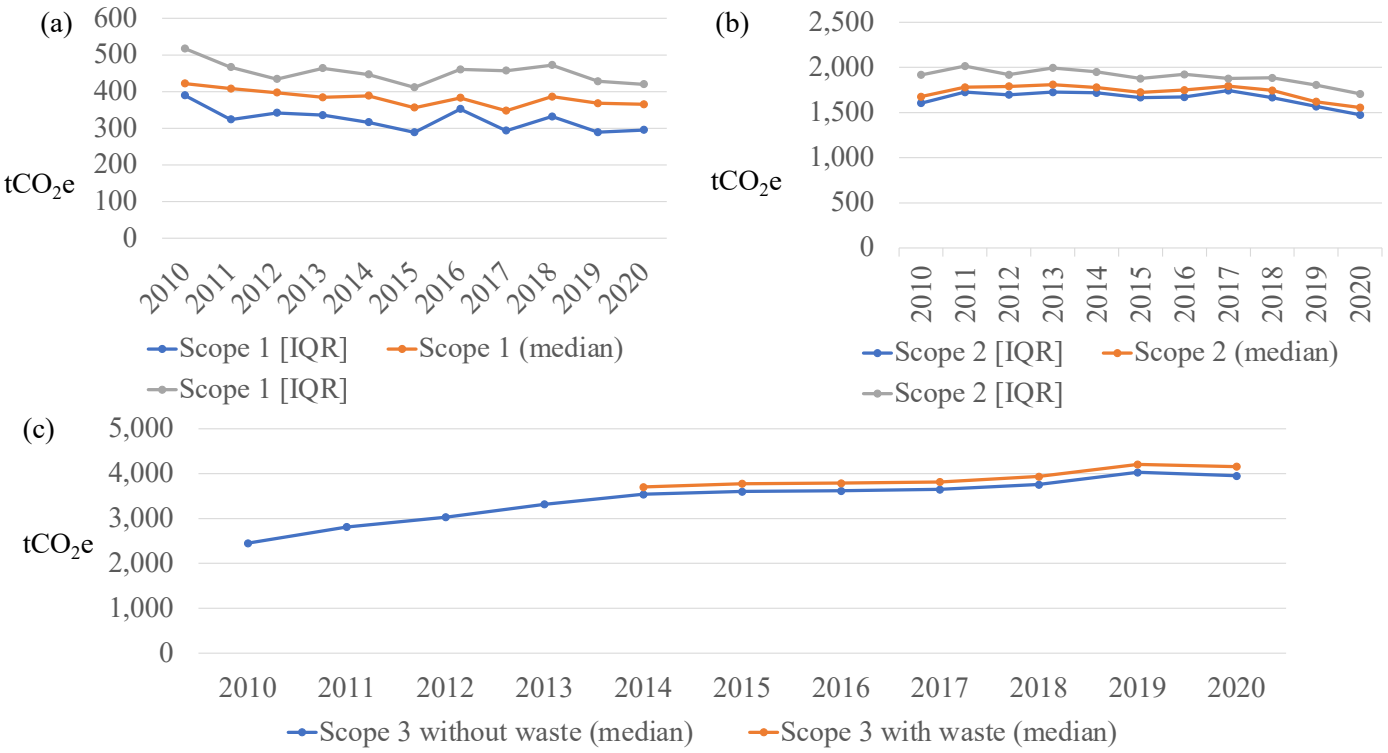
	2010	2011	2012	2013	2014
Gas, (m^3)	189,142·00 [174,571·00, 231,952·25]	182,888·50 [145,141·00, 209,253·25]	178,008·00 [153,299·75, 194,791·50]	172,378·50 [150,541·25, 207,928·25]	174,292·50 [141,698·50, 200,211·50]
Emission from gas, (tCO2e)	421·79 [389·29, 517·25]	407·84 [323·66, 466·63]	396·96 [341·86, 434·39]	384·40 [335·71, 463·68]	388·67 [315·99, 446·47]
Electricity, (kWh)	3,544,415·50 [3,391,485·00, 4,054,412·00]	3,435,184·50 [3,331,413·50, 3,890,282·50]	3,470,566·00 [3,287,747·00, 3,719,727·25]	3,526,377·00 [3,365,848·00, 3,889,756·25]	3,577,543·50 [3,459,199·00, 3,924,728·75]
Emission from electricity, (tCO2e)	1,676·51 [1,604·17, 1,917·74]	1,779·43 [1,725·67, 2,015·17]	1,790·81 [1,696·48, 1,919·38]	1,809·03 [1,726·68, 1,995·44]	1,778·04 [1,719·22, 1,950·59]
Clean water, (m^3)	23,397·00 [21,923·00, 24,667·00]	23,414·00 [20,368·00, 26,292·00]	21,208·00 [19,331·00, 25,248·00]	19,303·50 [18,011·00, 23,696·00]	17,901·50 [17,326·00, 23,583·00]
Emission from clean water, (tCO_2e)	3·04 [2·85, 3·21]	3·44 [2·99, 3·86]	3·10 [2·82, 3·69]	2·76 [2·58, 3·39]	2·49 [2·41, 3·28]
Sewage, (m^3)	39,860·00 [35,341·00, 42,226·00]	36,087·00 [33,532·00, 39,230·00]	31,735·00 [28,453·00, 35,137·00]	30,904·50 [29,410·00, 34,536·00]	29,222·50 [28,728·00, 35,585·00]
Emission from sewage, (tCO_2e)	11·68 [10·35, 12·37]	10·90 [10·13, 11·85]	9·11 [8·17, 10·08]	9·49 [9·03, 10·60]	8·50 [8·36, 10·36]
Emission from medicine, (tCO_2e)	2,437·40 [2,437·40, 2,437·40]	2,798·95 [2,798·95, 2,798·95]	3,018·22 [3,018·22, 3,018·22]	3,307·55 [3,307·55, 3,307·55]	3,528·61 [3,528·61, 3,528·61]
Solid waste, (kg)	NA	NA	NA	NA	46,976·00 [44,608·75, 48,179·00]
Emission from solid waste, (tCO_2e)	NA	NA	NA	NA	38·59 [36·64, 39·57]
Scrap metal, (kg)	NA	NA	NA	NA	530·00 [520·00, 620·00]
Emission from scrap metal, (tCO_2e)	NA	NA	NA	NA	0·01 [0·01, 0·01]
Medical waste (infectious), (kg)	NA	NA	NA	NA	38,334·00 [36,829·75, 39,703·75]
Emission from medical waste (infectious), (tCO_2e)	NA	NA	NA	NA	97·75 [93·92, 101·24]
Medical waste (non-infectious), (kg)	NA	NA	NA	NA	11,660·00 [11,087·50, 12,110·00]
Emission from medical waste (non-infectious), (tCO_2e)	NA	NA	NA	NA	29·73 [28·27, 30·88]
Scope 1, (tCO_2e)	421·79 [389·29, 517·25]	407·84 [323·66, 466·63]	396·96 [341·86, 434·39]	384·40 [335·71, 463·68]	388·67 [315·99, 446·47]
Scope 2, (tCO_2e)	1,676·51 [1,604·17, 1,917·74]	1,779·43 [1,725·67, 2,015·17]	1,790·81 [1,696·48, 1,919·38]	1,809·03 [1,726·68, 1,995·44]	1,778·04 [1,719·22, 1,950·59]

Scope 3 without waste, (tCO_2e)	2,452·09 [2,450·66, 2,452·98]	2,813·17 [2,812·07, 2,814·61]	3,030·42 [3,029·20, 3,031·99]	3,319·70 [3,319·10, 3,321·54]	3,539·58 [3,539·40, 3,542·24]
Scope 3 with waste, (tCO_2e)	NA	NA	NA	NA	3704·60 [3701·06, 3711·31]
Emission without waste, (tCO_2e)	4,571·77 [4,498·01, 4,833·19]	5,066·30 [4,924·75, 5,203·18]	5,208·93 [5,162·56, 5,442·37]	5,547·94 [5,471·65, 5,718·49]	5,729·66 [5,626·97, 5,849·74]
Emission with waste, (tCO_2e)	NA	NA	NA	NA	5,910·61 [5,781·36, 6,011·71]
Average monthly temperature, (°C)	16·00 [7·80, 24·45]	16·35 [7·90, 24·12]	16·60 [9·20, 23·18]	16·60 [8·58, 23·93]	16·75 [8·70, 23·55]

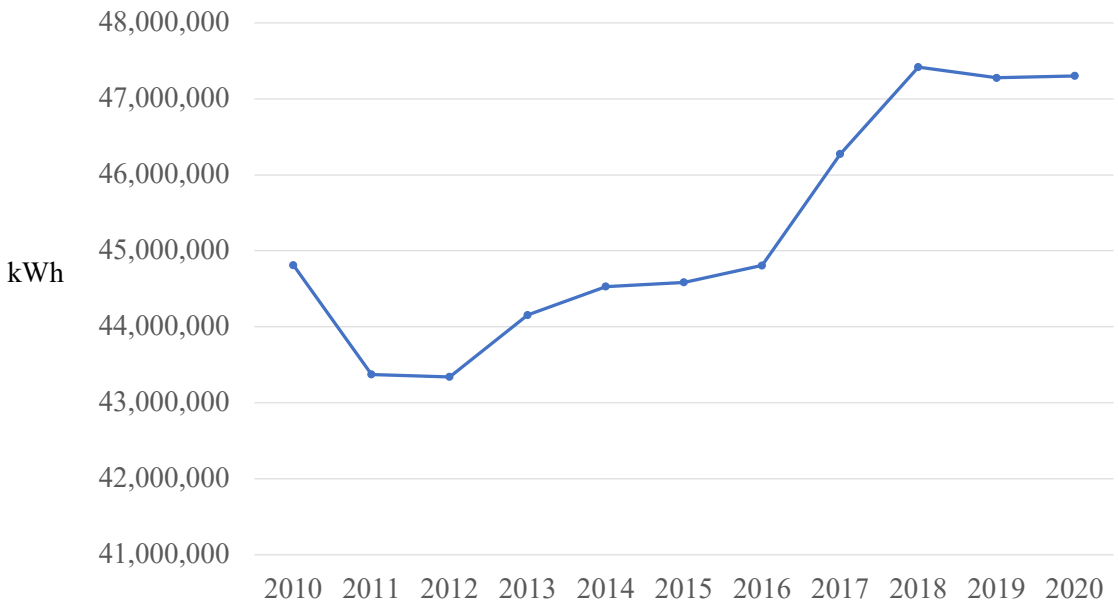
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**p**
Gas, (m^3)	159,791·00 [129,491·75, 184,504·00]	171,611·50 [157,966·75, 206,460·75]	155,943·50 [131,526·50, 205,045·25]	173,122·00 [148,836·25, 211,692·75]	164,967·00 [129,572·50, 191,875·25]	163,675·50 [132,427·00, 188,383·75]	0·570
Emission from gas, (tCO_2e)	356·33 [288·77, 411·44]	382·69 [352·27, 460·41]	347·75 [293·30, 457·25]	386·06 [331·90, 472·07]	367·88 [288·95, 427·88]	365·00 [295·31, 420·10]	0·570
Electricity, (kWh)	3,546,714·50 [3,428,474·75, 3,861,134·00]	3,605,080·00 [3,449,287·00, 3,966,512·75]	3,767,851·50 [3,664,384·00, 3,941,978·75]	3,811,958·50 [3,637,235·75, 4,115,118·50]	3,760,401·50 [3,638,998·50, 4,187,604·25]	3,832,045·00 [3,634,811·25, 4,206,047·50]	0·178
Emission from electricity, (tCO_2e)	1,723·70 [1,666·24, 1,876·51]	1,748·46 [1,672·90, 1,923·76]	1,793·50 [1,744·25, 1,876·38]	1,745·88 [1,665·85, 1,884·72]	1,620·73 [1,568·41, 1,804·86]	1,555·81 [1,475·73, 1,707·66]	0·024
Clean water, (m^3)]	19,897·00 [19,130·00, 23,140·00]	20,132·50 [17,819·00, 22,319·00]	19,130·00 [18,823·00, 22,796·00]	22,288·50 [21,042·00, 24,970·00]	23,004·50 [21,291·00, 27,745·00]	19,371·00 [18,193·00, 23,871·00]	0·001
Emission from clean water, (tCO_2e)	2·69 [2·58, 3·12]	2·76 [2·44, 3·06]	2·58 [2·54, 3·08]	2·94 [2·78, 3·30]	2·92 [2·70, 3·52]	2·36 [2·22, 2·91]	< 0·001
Sewage, (m^3)	31,622·00 [29,614·00, 35,142·00]	32,511·50 [28,628·00, 34,442·00]	31,313·50 [30,116·00, 34,361·00]	33,817·50 [32,674·00, 38,376·00]	32,179·50 [29,782·00, 39,306·00]	29,321·00 [28,259·00, 33,654·00]	< 0·001
Emission from sewage, (tCO_2e)	8·54 [8·00, 9·49]	9·82 [8·65, 10·40]	9·14 [8·79, 10·03]	9·98 [9·64, 11·32]	9·24 [8·55, 11·28]	7·98 [7·69, 9·15]	< 0·001
Emission from medicine, (tCO_2e)	3,592·69 [3,592·69, 3,592·69]	3,604·80 [3,604·80, 3,604·80]	3,637·42 [3,637·42, 3,637·42]	3,743·86 [3,743·86, 3,743·86]	4,019·37 [4,019·37, 4,019·37]	3,940·52 [3,940·52, 3,940·52]	< 0·001
Solid waste, (kg)	45,878·50 [43,419·50, 47,368·00]	46,044·00 [44,653·25, 46,718·50]	46,321·50 [44,247·00, 47,387·75]	47,409·00 [46,490·25, 48,832·00]	46,219·50 [43,784·25, 47,937·50]	42,379·00 [40,210·25, 44,453·25]	0·011
Emission from solid waste, (tCO_2e)	37·68 [35·66, 38·91]	37·82 [36·68, 38·37]	38·05 [36·34, 38·92]	38·94 [38·19, 40·11]	37·96 [35·96, 39·38]	34·81 [33·03, 36·51]	0·011

Scrap metal, (kg)	540·00 [497·50, 652·50]	495·00 [475·00, 560·00]	520·00 [460·00, 580·00]	470·00 [440·00, 530·00]	440·00 [407·50, 480·00]	400·00 [352·50, 427·50]	< 0·001
Emission from scrap metal, (tCO_2e)	0·01 [0·01, 0·01]	0·01 [0·01, 0·01]	0·01 [0·01, 0·01]	0·01 [0·01, 0·01]	0·01 [0·00, 0·01]	0·00 [0·00, 0·01]	< 0·001
Medical waste (infectious), (kg)	41,742·50 [39,682·75, 43,595·75]	41,178·50 [40,695·00, 42,960·50]	41,280·00 [40,495·00, 42,717·50]	43,665·00 [42,175·00, 45,977·50]	44,890·00 [42,332·50, 46,235·00]	57,890·00 [55,120·00, 59,150·00]	< 0·001
Emission from medical waste (infectious), (tCO_2e)	106·44 [101·19, 111·17]	105·01 [103·77, 109·55]	105·26 [103·26, 108·93]	111·35 [107·55, 117·24]	114·47 [107·95, 117·90]	147·62 [140·56, 150·83]	< 0·001
Medical waste (non-infectious), (kg)	11,457·00 [10,930·00, 12,002·50]	10,690·00 [10,235·00, 10,862·50]	10,195·00 [9,420·00, 10,472·50]	10,825·00 [10,510·00, 11,070·00]	9,290·00 [9,052·50, 9,955·00]	9,505·00 [8,780·00, 10,595·00]	< 0·001
Emission from medical waste (non-infectious), (tCO_2e)	29·22 [27·87, 30·61]	27·26 [26·10, 27·70]	26·00 [24·02, 26·70]	27·60 [26·80, 28·23]	23·69 [23·08, 25·39]	24·24 [22·39, 27·02]	< 0·001
Scope 1, (tCO_2e)	356·33 [288·77, 411·44]	382·69 [352·27, 460·41]	347·75 [293·30, 457·25]	386·06 [331·90, 472·07]	367·88 [288·95, 427·88]	365·00 [295·31, 420·10]	0·570
Scope 2, (tCO_2e)	1,723·70 [1,666·24, 1,876·51]	1,748·46 [1,672·90, 1,923·76]	1,793·50 [1,744·25, 1,876·38]	1,745·88 [1,665·85, 1,884·72]	1,620·73 [1,568·41, 1,804·86]	1,555·81 [1,475·73, 1,707·66]	0·024
Scope 3 without waste, (tCO_2e)	3,603·91 [3,603·27, 3,605·30]	3,617·38 [3,615·84, 3,618·26]	3,649·11 [3,648·77, 3,650·53]	3,756·78 [3,756·15, 3,758·48]	4,031·52 [4,030·64, 4,034·17]	3,950·80 [3,950·53, 3,952·58]	< 0·001
Scope 3 with waste, (tCO_2e)	3,779·23 [3,768·46, 3,786·33]	3,789·57 [3,785·05, 3,791·15]	3,817·30 [3,814·88, 3,825·85]	3,936·35 [3,926·97, 3,942·05]	4,206·52 [4,200·88, 4,214·15]	4,157·07 [4,154·17, 4,160·05]	< 0·001
Emission without waste, (tCO_2e)	5,714·69 [5,654·98, 5,796·50]	5,756·48 [5,693·77, 5,928·51]	5,838·56 [5,724·26, 5,933·23]	5,885·67 [5,778·91, 6,017·09]	6,029·14 [5,971·20, 6,128·39]	5,855·63 [5,774·43, 6,082·18]	< 0·001
Emission with waste, (tCO_2e)	5,889·88 [5,826·59, 5,968·39]	5,924·88 [5,862·87, 6,099·16]	6,010·07 [5,892·79, 6,103·71]	6,061·99 [5,962·84, 6,192·01]	6,209·19 [6,139·21, 6,294·47]	6,057·13 [5,975·74, 6,277·47]	0·006
Average monthly temperature, (°C)	16·80 [10·20, 22·50]	17·80 [8·33, 23·47]	16·30 [9·82, 22·70]	17·70 [9·60, 23·45]	17·20 [10·22, 23·80]	16·00 [10·88, 24·80]	1·000

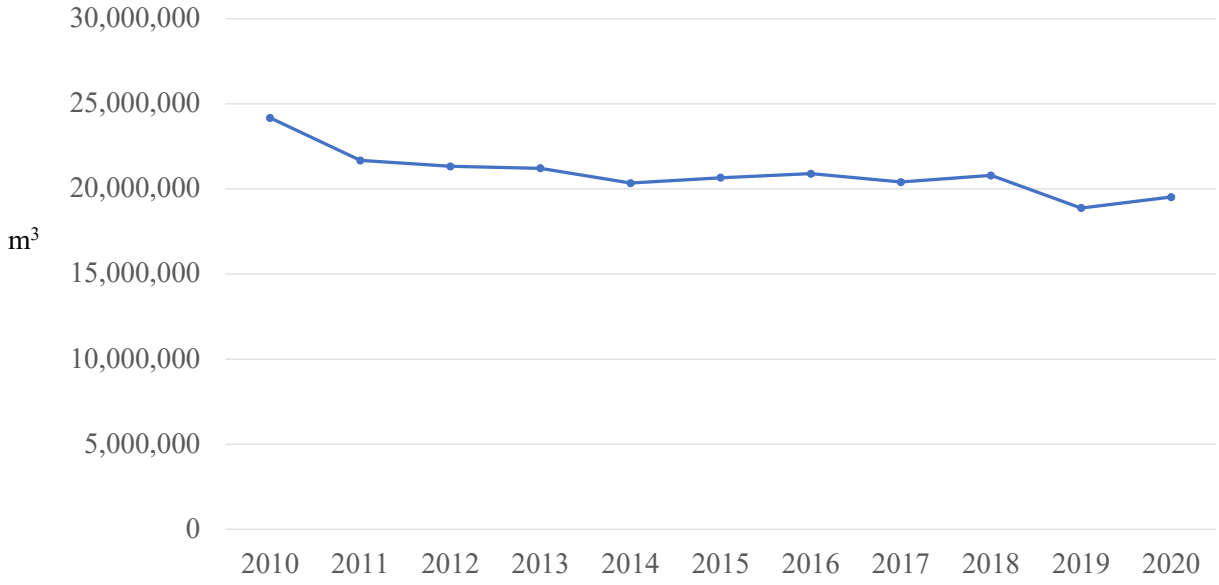
Note: kg: kilogram; kWh: kilowatt; NA: Not available; tCO_2e: tonnes of carbon dioxide equivalent; p: p-value



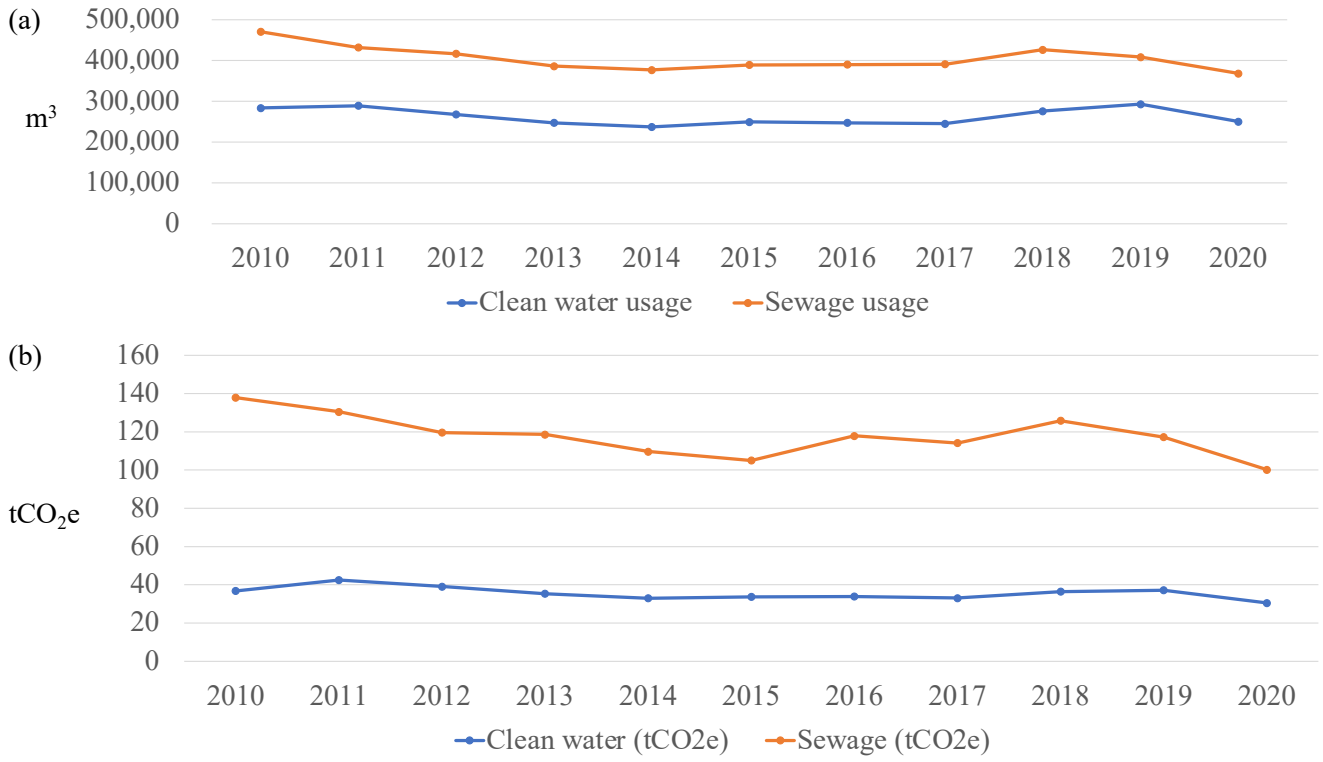
Additional Figure 1. Monthly carbon footprint of each emissions scope from 2010 to 2020. (a) Scope 1; (b) scope 2; (c) scope 3 with and without waste. Because the interquartile ranges were too close to the median, only the median values are shown.



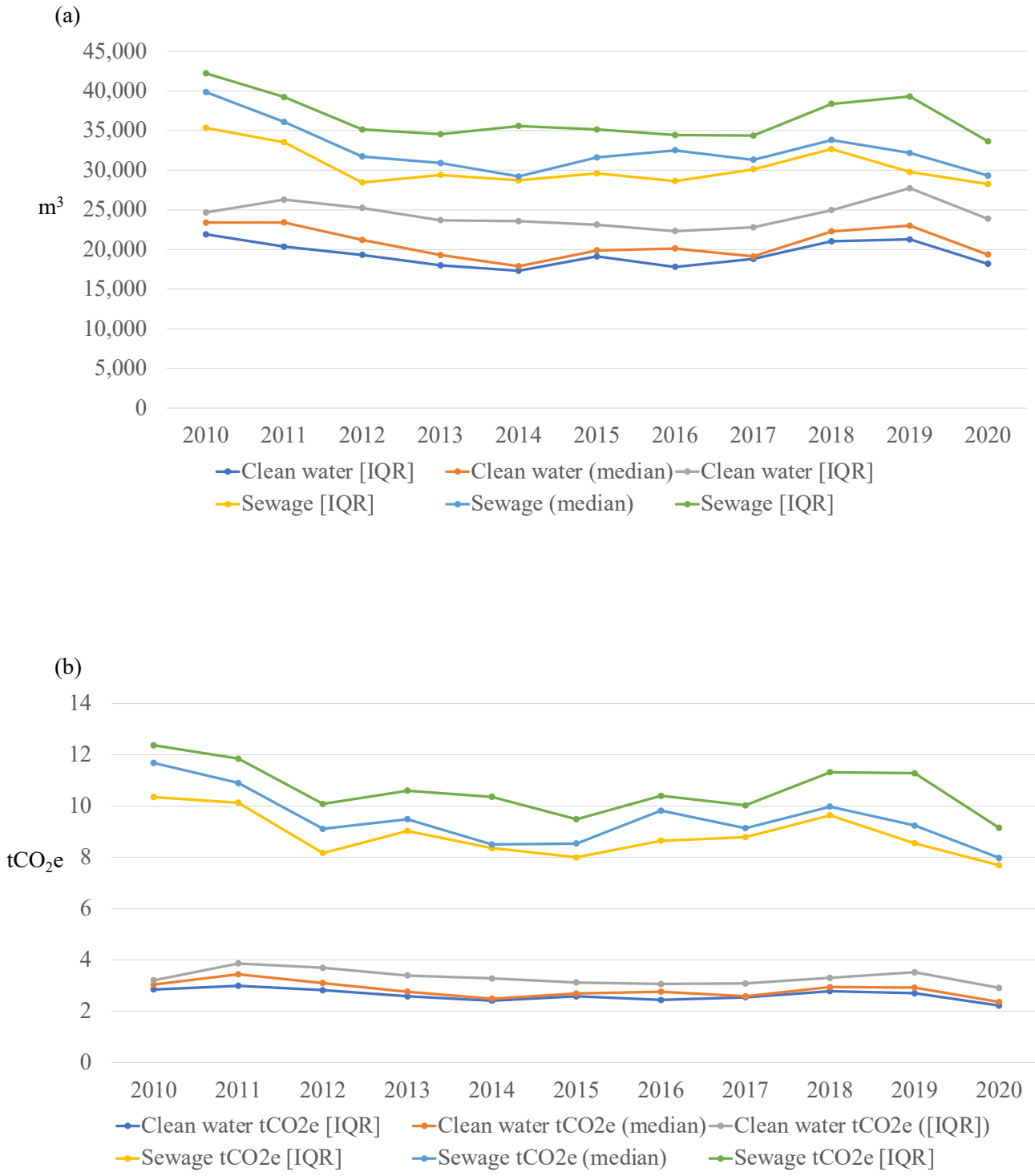
Additional Figure 2. Electricity usage from 2010 to 2020.



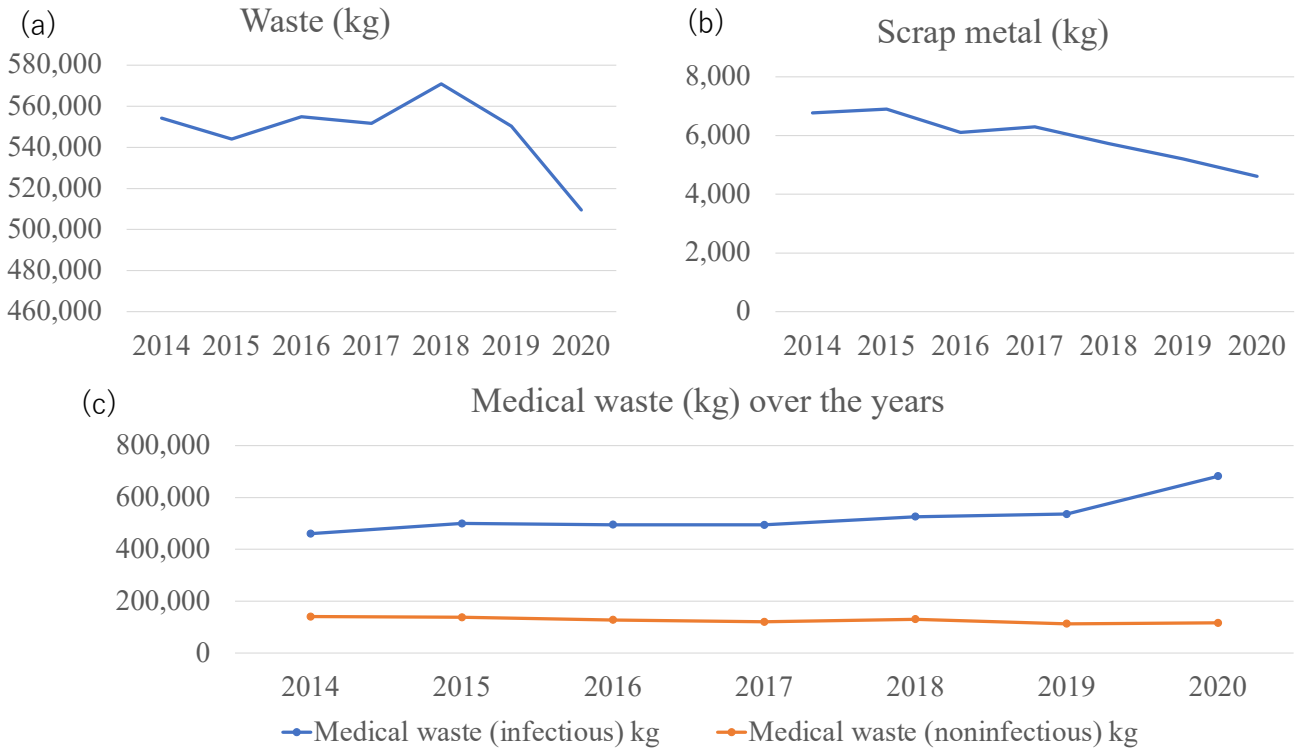
Additional Figure 3. Gas usage from 2010 to 2020.



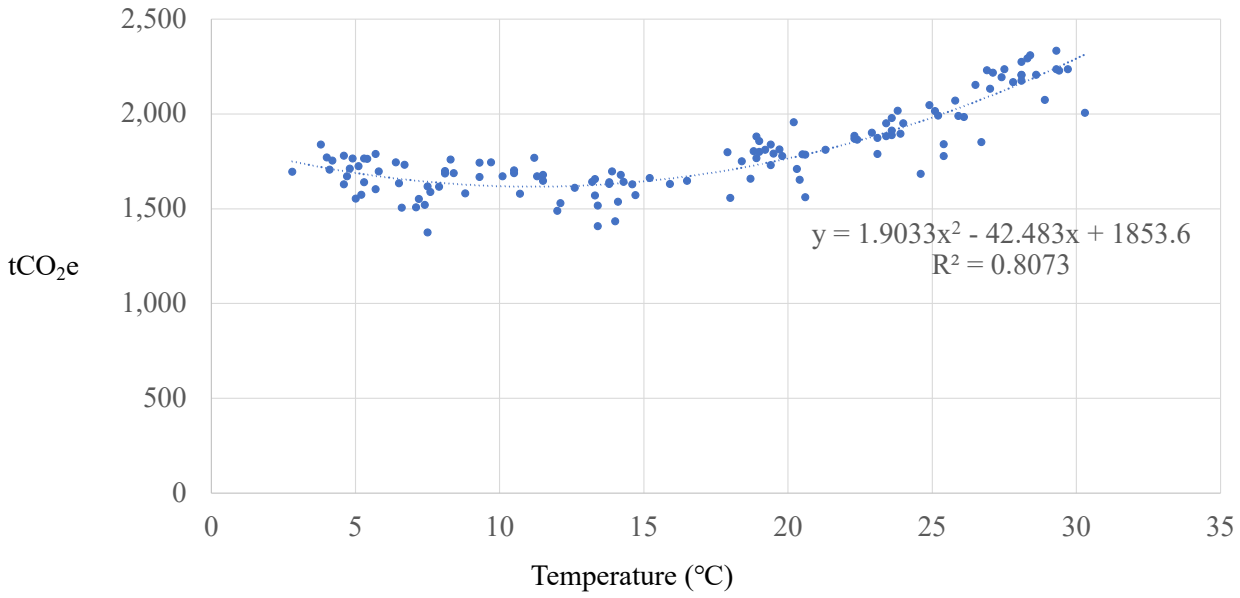
Additional Figure 4. Annual usage and carbon footprint of clean water and sewage from 2010 to 2020: (a) usage; (b) carbon footprint



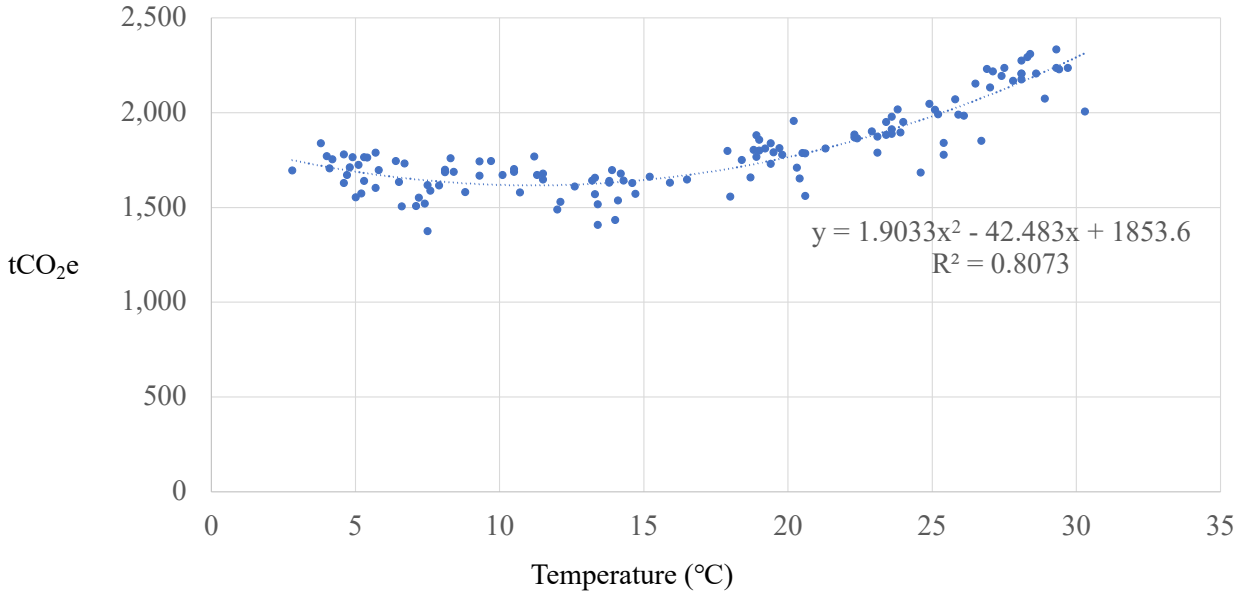
Additional Figure 5. Monthly usage and carbon footprint of clean water and sewage from 2010 to 2020: (a) usage; (b) carbon footprint.



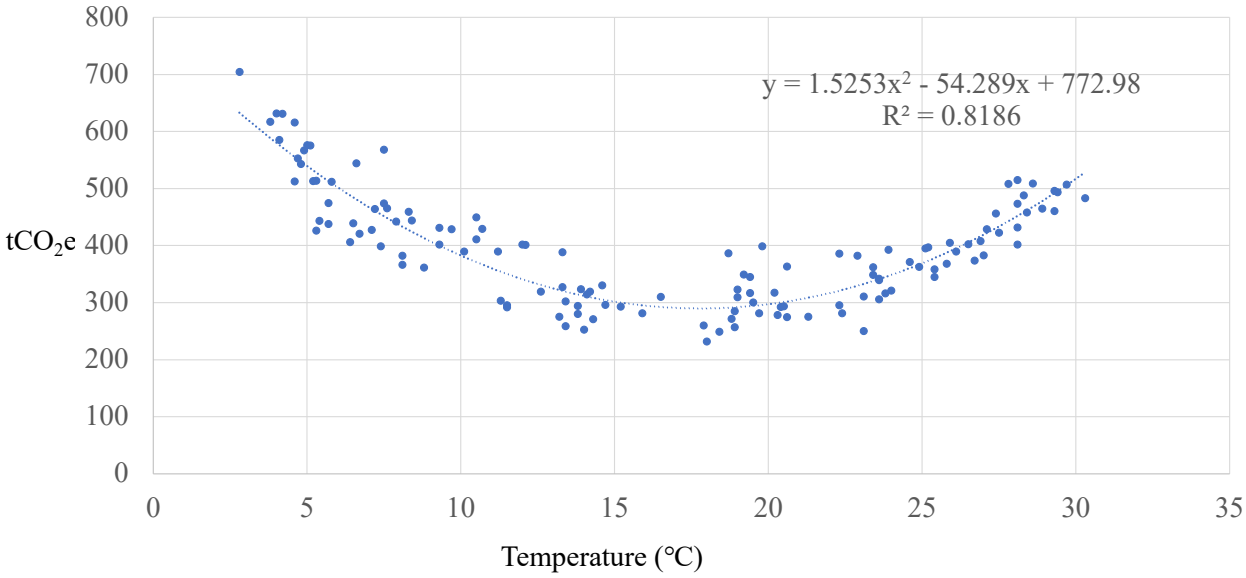
Additional Figure 6. Amount of waste (kg) from 2010 to 2020: (a) solid waste; (b) scrap waste; (c) medical waste.



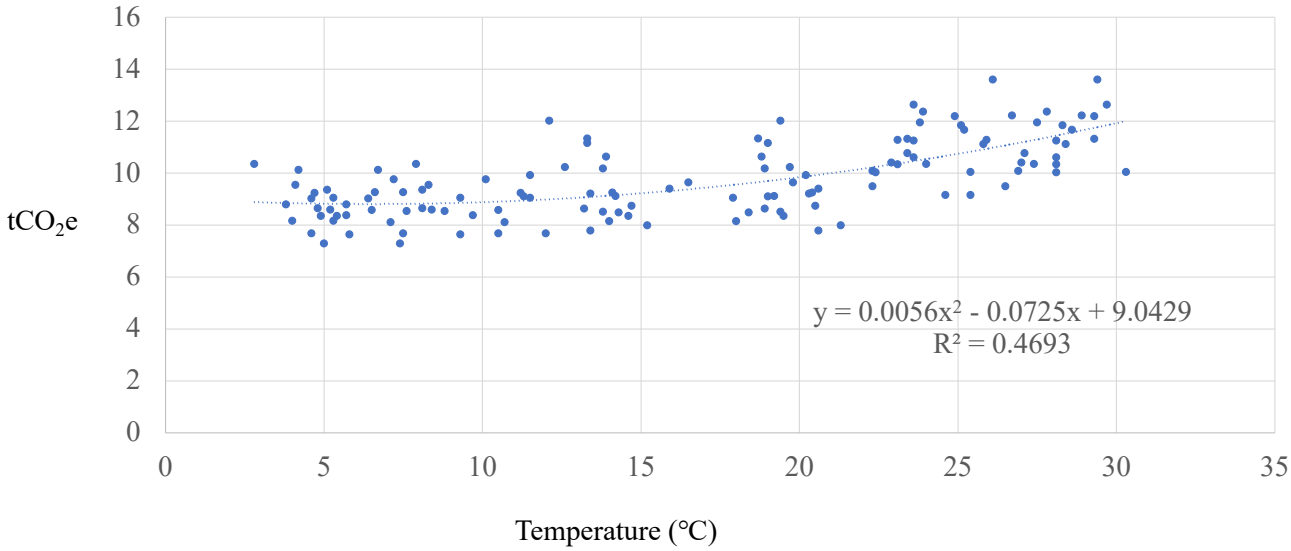
Additional Figure 7. Scatter plot and trendline showing the relationship between electricity usage (kWh) and monthly average external temperature from April 2014 to March 2021.



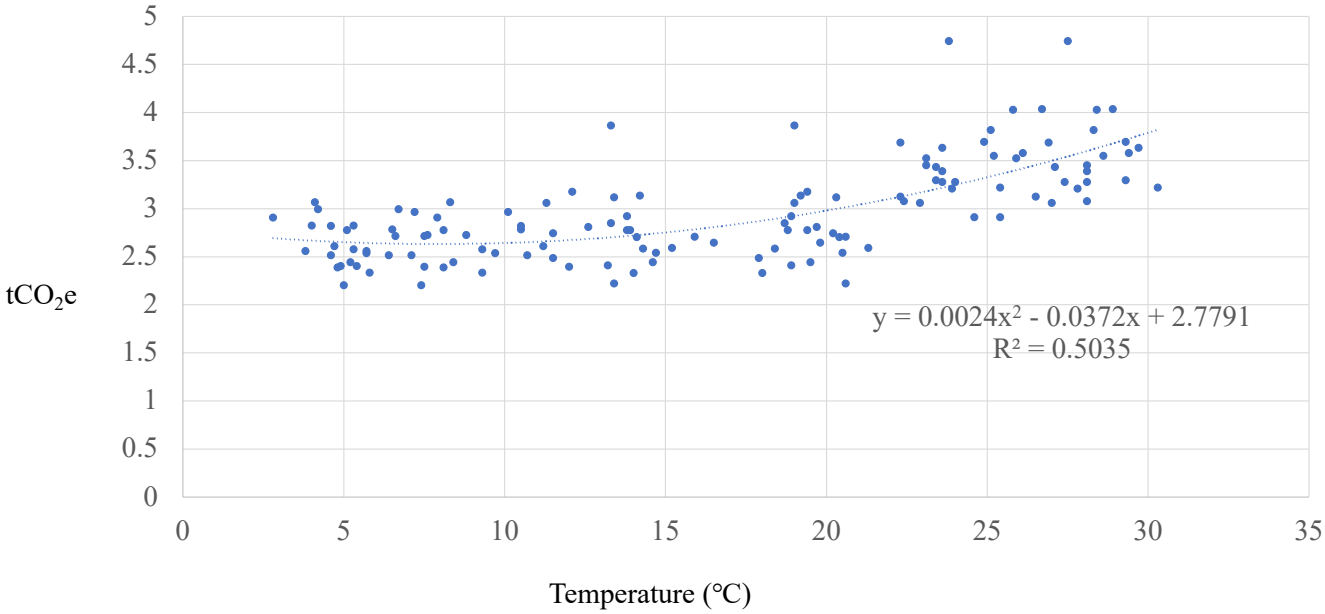
Additional Figure 8. Scatter plot and trendline showing the relationship between carbon emissions from electricity usage (tCO_2e) and monthly average external temperature from April 2010 to March 2021.



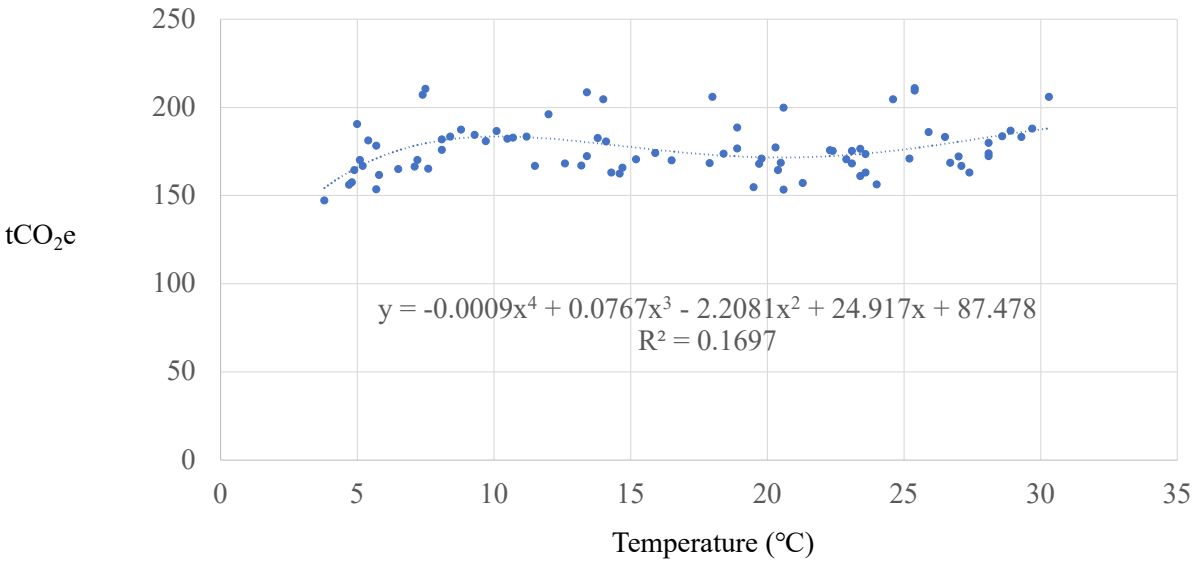
Additional Figure 9. Scatter plot and trendline showing the relationship between carbon emissions from gas usage (tCO_2e) and monthly average external temperature from April 2010 to March 2021.



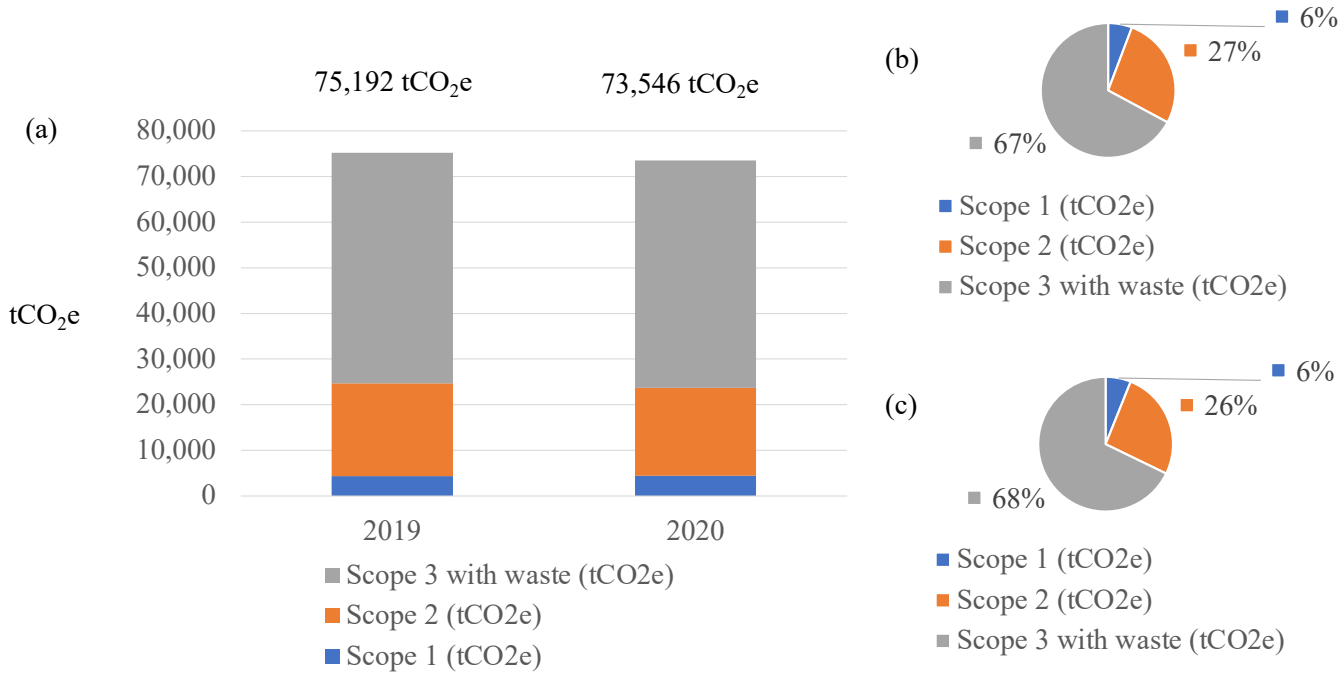
Additional Figure 10. Scatter plot and trendline showing the relationship between carbon emissions from sewage usage (tCO_2e) and monthly average external temperature from April 2010 to March 2021.



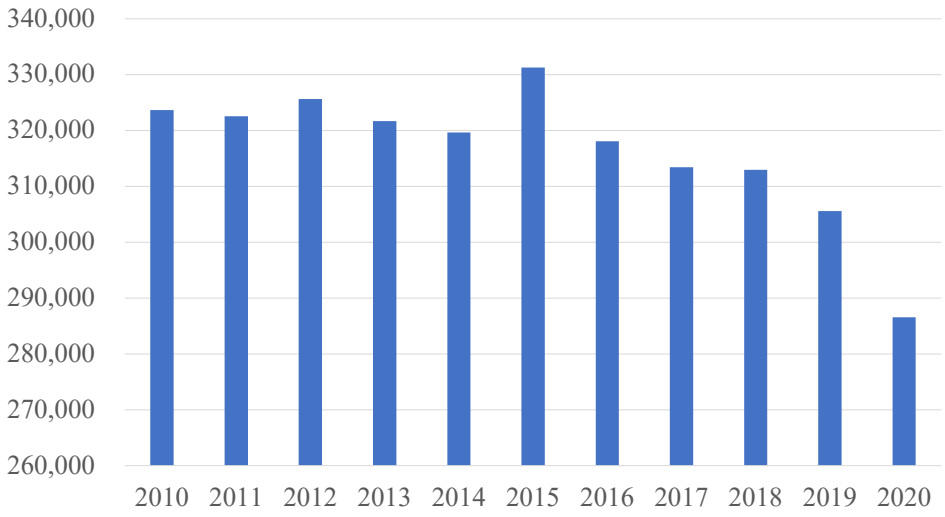
Additional Figure 11. Scatter plot and trendline showing the relationship between carbon emissions from clean water usage (tCO_2e) and monthly average external temperature from April 2010 to March 2021.



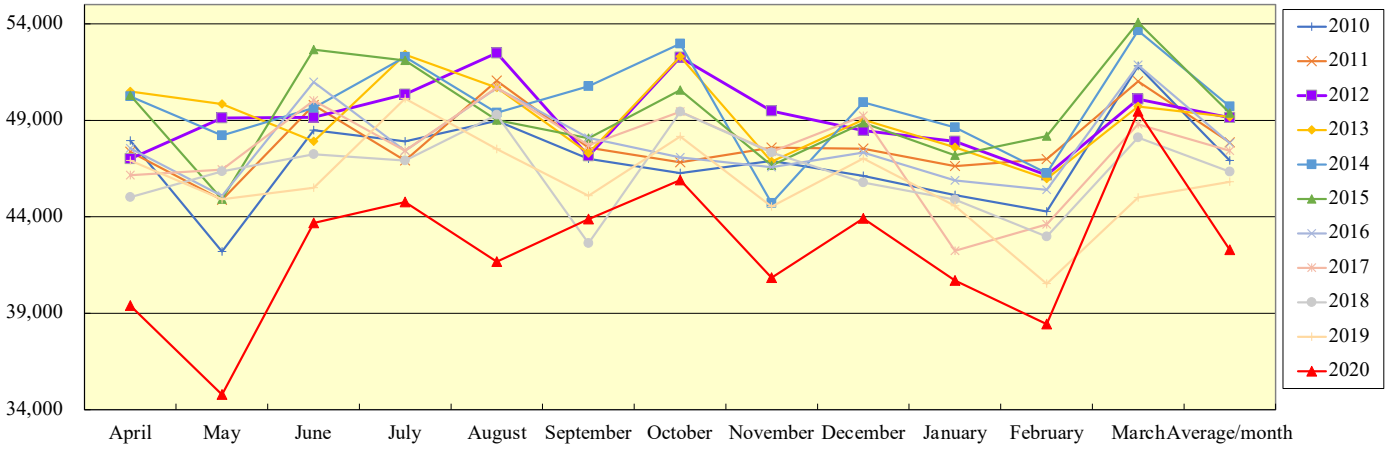
Additional Figure 12. Scatter plot and trendline showing the relationship between carbon emissions from waste (tCO2e) and temperature from April 2014 to March 2021.



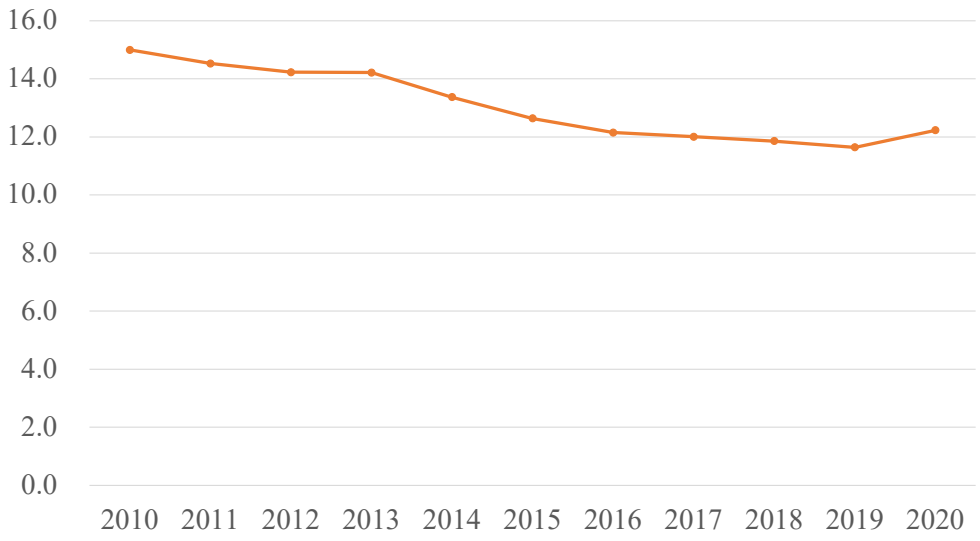
Additional Figure 13. (a) Total carbon footprint and (b–c) relative proportions of each emission scope for 2019 and 2020.



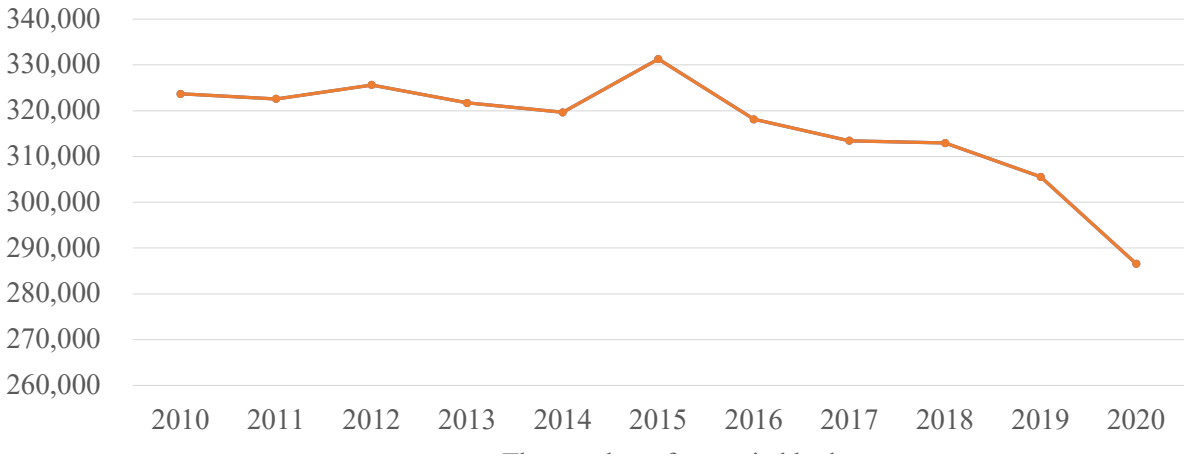
Additional Figure 14. Total annual inpatient admissions from 2010 to 2020.



Additional Figure 15. Total outpatients per month from 2010 to 2020.



Additional Figure 16. Average hospital stay (days) from 2010 to 2020.



Additional Figure 17. Annual number of occupied beds from 2010 to 2020.