2020 National Emissions Inventory Technical Support Document: Miscellaneous Non-Industrial NEC: Cremation – Human and Animal

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Office of Air Quality Planning and Standards
Air Quality Assessment Division
Research Triangle Park, NC

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29.1 Sector Descriptions and Overview

The cremation of human remains results in emissions of particulate matter, SO_2, NOx, VOC, CO, and HAPs. It is a significant source of mercury emissions, due to mercury in dental fillings, as well as mercury in blood and tissues. In 2020, human cremation resulted in the emissions of approximately 1.8 tons of mercury.

The cremation of animals also results in emissions of CAPs and HAPs, though it emits less mercury than human cremation. In 2020, animal cremation resulted in the emissions of approximately 2 lbs. of mercury.

SCCs for human and animal cremation are provided in Table 29-1.

Table 29-1: Human and animal cremation SCCs

SCC	SCC Level 1	SCC Level 2	SCC Level 3	SCC Level 4
2810060100	Miscellaneous Area Sources	Other Combustion	Cremation	Humans
2810060200	Miscellaneous Area Sources	Other Combustion	Cremation	Animals

A list of agencies that submitted human and/or animal cremation emissions is provided in Section 6.2.3.

29.2 EPA-developed estimates

The calculations for estimating emissions from human cremation involve estimating the number of deaths in each age group in each county, using data from the Centers for Disease Control and Prevention. The number of deaths is multiplied by the average weight by age group and the state-level cremation rate from the National Funeral Directors Association to estimate the total amount of cremations in each county in terms of mass. This number is multiplied by an emissions factor to estimate the emissions of CAPs and HAPs. Emissions of mercury include emissions from mercury in fillings in teeth and in blood and tissues. The emissions from mercury in fillings are estimated based on data on the number of filled teeth per person in each age group and assumptions about the proportion of fillings that contain mercury and the amount of mercury in each filling.

The calculations for estimating emissions from animal cremation involve determining the number of cremated animals nationally and distributing this number to each county based on population. The number of cremated animals is multiplied by average weights for cats and dogs to determine the amount of cremations in each county in terms of mass. This number is multiplied by an emissions factor to estimate the emissions of CAPs and HAPS.

29.2.1 Activity data

Human Cremation

The activity data for human cremation is based on the number of deaths in each county in 13 age groups, from the Centers for Disease Control and Prevention WONDER database [ref 1]. Data for some counties are withheld in the WONDER database. These gaps are filled using the data on the total number of deaths by age group in each state (which includes the number of deaths that are withheld at the county level). First, the sum of the reported county-level number of deaths in each age group and state is subtracted from the reported state-level

number of deaths in each age group to determine the total number of deaths withheld at the county level in each state and age group.

$$Deaths\_withheld_{s,a} = Deaths\_state_{s,a} - \sum Deaths\_county_{s,a} \quad \text{(H1)}$$

Where:

$Deaths\_withheld_{s,a}$ = Total number of withheld deaths in state *s* in age group *a*
$Deaths\_state_{s,a}$ = Total number of deaths reported at the state level in state *s* in age group *a*
$Deaths\_county_{s,a}$ = Total number of deaths reported at the county level in state *s* in age group *a*

The total number of withheld deaths are distributed to the counties based on the proportion of population in those counties to the total state population.

$$Pop\_ratio_c = \frac{Pop_c}{Pop_s} \quad \text{(H2)}$$

Where:

Pop_ratio_c = The population ratio used to distribute withheld deaths in state *s* to county *c*
Pop_c = The total population of county *c*
Pop_s = The total population of state *s*

The number of withheld deaths in each state is multiplied by the county population ratio to distribute the withheld deaths to the counties. Note that this step is only performed for counties where county-level data on number of deaths is withheld; this step is not performed where county-level data on deaths is reported.

$$Deaths_{c,a} = Deaths\_withheld_{s,a} \times Pop\_ratio_c \quad \text{(H3)}$$

Where:

$Deaths_{c,a}$ = The number of deaths in county *c* in age group *a*
$Deaths\_withheld_{s,a}$ = Total number of withheld deaths in state *s* in age group *a*, from equation H1
Pop_ratio_c = The population ratio used to distribute withheld deaths in state *s* to county *c*, from equation H2

The total number of deaths in each county (either reported directly in the CDC WONDER database or estimated using equation H3) is multiplied by a state-level cremation rate, reported by the National Funeral Directors Association (NFDA) [ref 2], shown in Table 29-2. It is assumed that the state-level cremation rate applies to all counties within the state.

$$Cremations_{c,a} = Deaths_{c,a} \times Cremation\_rate_s \quad \text{(H4)}$$

Where:

$Cremations_{c,a}$ = The number of human cremations in county *c* in age group *a*
$Deaths_{c,a}$ = The number of deaths in county *c* in age group *a*
$Cremation\_rate_s$ = The rate of human cremations in state *s*, from Table 29-2 [ref 2]

Table 29-2: Human cremation rate by state

State	Cremation Rate
Alabama	23.1%
Alaska	66.3%
Arizona	66.1%
Arkansas	32.7%
California	63.4%
Colorado	68.6%
Connecticut	50.3%
Delaware	46.2%
District of Columbia	40.0%
Florida	62.4%
Georgia	37.1%
Hawaii	72.7%
Idaho	56.8%
Illinois	42.8%
Indiana	36.6%
Iowa	42.2%
Kansas	44.6%
Kentucky	24.5%
Louisiana	26.3%
Maine	70.0%
Maryland	40.6%
Massachusetts	43.4%
Michigan	54.9%
Minnesota	57.2%
Mississippi	18.2%
Missouri	39.7%
Montana	72.8%
Nebraska	43.8%
Nevada	76.9%
New Hampshire	70.3%
New Jersey	40.6%
New Mexico	58.9%
New York	39.6%
North Carolina	39.8%
North Dakota	35.3%
Ohio	42.3%
Oklahoma	39.0%
Oregon	74.1%
Pennsylvania	43.1%
Rhode Island	46.6%
South Carolina	37.4%
South Dakota	35.4%
Tennessee	28.1%
Texas	39.3%
Utah	31.2%
Vermont	67.3%
Virginia	36.1%
Washington	75.5%
West Virginia	27.3%
Wisconsin	52.5%
Wyoming	66.7%

The CDC provides estimates of the average weight of individuals in each age group [ref 3]. This number is multiplied by the number of cremations in each county in each age group and then summed across all age groups to estimate the total amount of cremations in tons in each county.

$$Cremations\_tons_c = \sum_{a=1}^{A} Cremations_{c,a} \times W_a \times \frac{1\ ton}{2{,}000\ lbs} \quad \text{(H5)}$$

Where:

$Cremations\_tons_c$ = The weight of humans cremated in county *c*, in tons
$Cremations_c$ = The number of human cremations in county *c*, from equation H4
W_a = The average weight of individuals from age group *a*

Animal Cremation

The Pet Loss Professionals Alliance (PLPA) conducted a survey that estimated that there were 1,840,965 pet cremations in 2012, and that 99 percent of deceased pets are cremated [ref 4]. In addition, the Humane Society of the United States estimates that there are 2,700,000 adoptable dogs and cats euthanized in animal shelters each year [ref 5]. It is assumed that all of these shelter animals are cremated. Therefore, there are a total of approximately 4,540,965 animal creations each year. Note that this estimate does not double count the number of animal cremations, because the PLPA study counts the number of cremations of pets—i.e. animals that are owned by people—whereas the Humane Society estimates are for animals in shelters that were not adopted.

The population of cats and dogs is approximately 52.5 percent cats and 48.5 percent dogs [ref 5]. Using this percentage and the total number of pets and shelter animals cremated annually, a total number of cats and a total number of dogs cremated annually can be calculated.

$$Cremations_{c/d,US} = Ratio_{c/d} \times (Cremations\_pets_{US} + Cremations\_shelter_{US}) \quad \text{(A1)}$$

Where:

$Cremations_{c/d}$ = Total cats, *c*, or dogs, *d*, cremated annually in the United States
$Ratio_{c/d}$ = Ratio of cats, *c*, or dogs, *d*, in the pet population
$Cremations\_pets_{,US}$ = Total number of pets cremated annually in the United States
$Cremations\_shelter_{,US}$ = Total number of shelter animals cremated annually in the United States

The average weight of a domestic cat is approximately 4.5 kg (9.9 pounds) [ref 6]. The average weight of a dog is difficult to determine due to large differences in breeds, but an average across breeds is 48.5 pounds [ref 7].[,] Note that this is a straight average of the average adult weight for male and female dogs across breeds. It is not a weighted average that takes into account the popularity of different breeds in the United States. To calculate the weight, in tons, of both cats and dogs cremated annually, the average weight values are multiplied by the total number of cats and total number of dogs cremated annually.

$$Cremations\_tons_{c/d} = Cremations_{c/d} \times Weight_{c/d} \times \frac{1\ ton}{2{,}000\ pounds} \quad \text{(A2)}$$

Where:

$Cremations\_tons_{c/d,US}$ = Total weight, in tons, of cats, *c*, or dogs, *d*, cremated annually in the United States
$Cremations_{c/d,US}$ = Total cats, *c*, or dogs, *d*, cremated annually in the United States
$Weight_{c/d}$ = Average weight per animal, in pounds, of cats, *c*, or dogs, *d*

Once the weight of cats and weight of dogs cremated annually has been calculated, these values can be summed to derive a total weight of animals cremated annually.

$$Cremations\_tons_{animal} = Cremations\_tons_{c} + Cremations\_tons_{d} \quad \text{(A3)}$$

Where:

$Cremations\_tons_{animal,US}$ = Total weight of animals cremated annually in the United States, in tons
$Cremations\_tons_{c,US}$ = Total weight of cats, *c*, cremated annually in the United States, in tons
$Cremations\_tons_{d,US}$ = Total weight of dogs, *d*, cremated annually in the United States, in tons

29.2.2 Allocation procedure

Human Cremation

The number of deaths is reported by the CDC at the county level. Therefore, these data do not need to be allocated. For counties with withheld data on the number of deaths, the total number of withheld deaths is distributed to counties based on the proportion of population in those counties, as described in equations H1-H3.

Animal Cremation

The estimated national-level total weight of animals cremated are allocated to the county level based on the ratio of population in each county to the total national population.

$$Cremations\_tons_{animal,c} = Cremations\_tons_{animal,US} \times \frac{Pop_c}{Pop_{US}} \quad \text{(A1)}$$

Where:

$Cremations\_tons_{animal,c}$ = Total weight of animals cremated in county *c*, in tons
$Cremations\_tons_{animal,US}$ = Total weight of animals cremated annually in the United States, in tons, from equation A3
Pop_c = The total population of county *c*
Pop_{US} = The total population of the United States

29.2.3 Emission factors

Human and Animal Cremation – Blood and Tissues

The emissions factors for human and animal cremation for CAPs are from AP-42 [ref 8], and a report by EPA on emissions tests of a crematory [ref 9] and are in units of pounds of emissions per ton cremated. The emission factors for CAPs are also provided in the "Wagon Wheel Emission Factor Compendium" on the 2020 NEI Supporting Data and Summaries site. The emissions factors for most HAPs are a report

from the California Air Resources Board [ref 10], as well as from the EPA emissions test of a crematory. The VOC HAPs are computed in EIS using HAP Augmentation factors available in the zip file "HAPAugmentation_Nonpoint_28jan2023", on the 2020 NEI Supplemental data FTP site. The mercury emissions factor is from a review of multiple studies [ref 11]. These emission factors do not include emissions from dental fillings. As shown in Table 29-3, EPA uses the same emissions factors for emissions from cremation of blood and tissues for both humans and animals.

Table 29-3: Emissions factors for the cremation of human and animal blood and tissues

Pollutant	Pollutant Code	Emission Factor (lbs/ton)	Source
Carbon Monoxide	CO	2.947	8
Lead	7439921	0.009	9
Nitrogen Oxides	NOX	3.560	8
PM10 Primary	PM10-PRI	3.036	8 (65% of total PM)
PM2.5 Primary	PM25-PRI	2.022	8 (43.3% of total PM)
Sulfur Dioxide	SO2	2.173	8
Volatile Organic Compounds	VOC	0.299	8
Acenaphthene	83329	1.303E-06	10
Acenaphthylene	208968	8.971E-07	10
Acetaldehyde	75070	9.269E-04	10
Anthracene	120127	2.389E-06	10
Arsenic	7440382	5.097E-04	10
Benzo(a)anthracene	56553	1.166E-07	10
Benzo(a)pyrene	192972	4.720E-07	10
Benzo(b)fluoranthene	205992	1.737E-07	10
Benzo(g,h,i)perylene	191242	5.874E-07	10
Benzo(k)fluoranthene	207089	1.486E-07	10
Beryllium	7440417	1.760E-05	10
Cadmium	7440439	2.940E-03	9
Chromium (VI)	18540299	1.829E-04	10
Chrysene	218019	2.880E-07	10
Cobalt	7440484	8.869E-05	10
Dibenz(a,h)anthracene	53703	1.349E-07	10
Fluoranthene	206440	1.337E-06	10
Fluorene	86737	3.760E-06	10
Formaldehyde	50000	2.469E-04	10
Hydrogen Chloride	7647010	3.595E+00	9
Hydrogen Fluoride	7664393	8.651E-03	10
Indeno(1,2,3-cd)pyrene	193395	1.440E-07	10
Mercury	7439976	1.324E-04	10

Pollutant	Pollutant Code	Emission Factor (lbs/ton)	Source
Naphthalene	91203	7.520E-04	10
Nickel	7440020	4.149E-04	10
Phenanthrene	85018	1.531E-05	10
Pyrene	129000	1.474E-06	10
Selenium	7782492	4.971E-04	10

Human Cremation – Dental Mercury

In addition to mercury emitted from the cremation of blood and tissues, mercury is also emitted due to the cremation of dental fillings. The Bay Area Air Quality Management District (BAAQMD) issued a report in 2012 estimating the average amount of mercury in teeth per person for ten age groups, based on data from CDC's National Health and Nutrition Examination Survey [ref 12]. Table 29-4 shows the estimated amount of material in restored teeth by age group from the BAAQMD study [ref 12], which is matched to the age groups used by the CDC Wonder database, which is the source of data on deaths by age group.

The BAAQMD memorandum is used to estimate that 31.6 percent of filled teeth in the 5-24 age groups contain amalgam. According to the American Dental Association (ADA 1998) more than 75 percent of restorations before the 1970s used dental amalgam, which declined to 50 percent by 1991. Using these numbers, it is assumed that 50 percent of the filled teeth for 25-44 age groups contain amalgam, 62.5 percent of filled teeth in the 45-64 age group, and 75 percent of filled teeth for people over 65. The Food and Drug Administration has discouraged the use of dental amalgam in children under 6 [ref 13]. While EPA does not have data on the percent of fillings containing dental amalgam for the 1-4 age group, it is assumed that this age group has approximately half the dental amalgam of the other age groups under 20 years old. It is also assumed that children under the age of 1 have no dental mercury. The analysis also assumes that 45 percent of all amalgam-containing fillings are mercury, based on information from the Food and Drug Administration [ref 13].

Table 29-4: Estimated amount of material in restored teeth

Age Groups in CDC WONDER Database	Age Groups in BAAQMD Memorandum	Avg. Material in Restored Teeth (g)	% of Fillings Containing Mercury
< 1 year	0-4 years^{+}	0.000	0.0%
1-4 years		0.160	15.8%
5-9 years	5-14 years	0.720	31.6%
10-14 years			
15-19 years	15-24 years	1.070	31.6%
20-24 years			
25-34 years	25-34 years	2.230	50.0%
35-44 years	35-44 years	3.290	50.0%
45-54 years	45-54 years	4.310	62.5%
55-64 years	55-64 years	4.320	62.5%
65-74 years	65-74 years	3.780	75.0%

Age Groups in CDC WONDER Database	Age Groups in BAAQMD Memorandum	Avg. Material in Restored Teeth (g)	% of Fillings Containing Mercury
75-84 years	75-84 years	3.650	75.0%
85+ years	85+ years	2.960	75.0%

The emissions factor for mercury in teeth is calculated by multiplying the average amount of material in restored teeth per person by the percentage of fillings containing mercury in each age group and the proportion of mercury in dental amalgam (approximately 45 percent).

$$EF\_teeth_{Hg,a} = Material_a \times ContainHg_a \times HgProportion \times 0.0022 \frac{lb}{g} \quad \text{(H6)}$$

Where:

EF_teeth$_{Hg,a}$ = Emission factor for mercury emissions from teeth due to cremation for age group *a*, in lbs. per cremation
Material$_a$ = The average amount of material in restored teeth for age group *a*, in grams, from Table 29-4
ContainHg$_a$ = The proportion of people in age group *a* with fillings that contain mercury, from Table 29-4
HgProportion = The proportion of dental amalgam that is mercury (approximately 45 percent)

29.2.4 Controls

There are no controls assumed for this source category.

29.2.5 Emissions

Human Cremation

To estimate the emissions of CAPs from human cremation, the total number of human cremations in each county, in tons, is multiplied by the emissions factor for each pollutant, from Table 29-3.

$$Emissions_{p,c} = Cremation\_tons_c \times EF_p \quad \text{(H7)}$$

Where:

Emissions$_{p,c}$ = Emissions of pollutant *p* from human cremation in county *c*, in pounds
Cremations_tons$_c$ = The number of human cremations in county *c*, in tons
EF$_p$ = Emissions factor for pollutant *p* from human cremation, in lbs. per ton

The emissions from mercury in teeth are estimated based on the number of cremations rather than the weight. To estimate the emissions of mercury from teeth during human cremation, the number of cremations in each age group is multiplied by the emissions factor for each age group and then summed across age groups.

$$Emissions\_teeth_{Hg,c} = \sum_{a=1}^{A} Cremations_{c,a} \times EF\_teeth_{Hg,a} \quad \text{(H8)}$$

Where:

$Emissions\_teeth_{Hg,c}$ = Emissions of mercury in teeth from human cremation in county *c*, in pounds
$Cremations_{c,a}$ = The number of human cremations in county *c* in age group *a*
$EF\_teeth_{Hg,a}$ = Emissions factor for mercury emissions from teeth due to cremation for age group *a*, in lbs. per cremation

The emissions from mercury from blood and tissues are estimated by multiplying the total number of cremations in each county, in tons, by the emissions factor for mercury from blood and tissues.

$$Emissions\_tissue_{Hg,c} = Cremations\_tons_c \times EF\_tissue_{Hg} \quad \text{(H9)}$$

Where:

$Emissions\_tissue_{Hg,c}$ = Emissions of mercury in tissues from human cremation in county *c*, in pounds
$Cremations\_tons_c$ = The number of human cremations in county *c*, in tons
$EF\_tissue_{Hg,a}$ = Emissions factor for mercury emissions from blood and tissues due to cremation for in lbs. per ton

The total emissions of mercury from cremation in each county is calculated by adding the emissions of mercury from teeth and the emissions of mercury from tissues.

$$Emissions_{Hg,c} = Emissions\_teeth_{Hg,c} + Emissions\_tissue_{Hg,c} \quad \text{(H10)}$$

Where:

$Emissions_{Hg,c}$ = Emissions of mercury from human cremation in county *c*, in pounds
$Emissions\_teeth_{Hg,c}$ = Emissions of mercury in teeth from human cremation in county *c*, in pounds
$Emissions\_tissue_{Hg,c}$ = Emissions of mercury in tissues from human cremation in county *c*, in pounds

Animal Cremation

$$Emissions_{p,c} = Cremation\_tons_c \times EF_p \quad \text{(A5)}$$

Where:

$Emissions_{p,c}$ = Emissions of pollutant *p* from animal cremation in county *c*, in pounds
$Cremations\_tons_c$ = The number of animal cremations in county *c*, in tons
EF_p = Emissions factor for pollutant *p* from animal cremation, in lbs. per ton

29.2.6 Sample calculations

Table 29-5 lists the sample calculations for estimating mercury emissions from human cremation in the 85+ age group and animal cremation of cats in Clark County, ID. To estimate the total emissions in Clark County, these steps would be repeated to estimate emissions from all age groups and from cremation of dogs.

Table 29-5: Sample calculations for mercury emissions from human cremation for the 85+ age group and cremation of cats in Clark County, ID

Eq. #	Equation	Values for Clark County, ID	Result
H1	$Deaths\_withheld_{s,a} = Deaths\_state_{s,a} - \sum Deaths\_county_{s,a}$	$4{,}013\ state\ level\ deaths - 3{,}997\ total\ county\ level\ deaths$	16 withheld deaths in Idaho
H2	$Pop_{ratio_c} = \frac{Pop_c}{Pop_s}$	$\frac{873\ people\ in\ Clark\ County}{1{,}975\ total\ population\ of\ counties\ with\ withheld\ deaths}$	0.442 population ratio
H3	$Deaths_{c,a} = Deaths_{withheld_{s,a}} \times Pop_{ratio_c}$	$16\ withheld\ deaths \times 0.442\ population\ ratio$	7 deaths in Clark County, ID
H4	$Cremations_{c,a} = Deaths_{c,a} \times Cremation_{rate_s}$	$7\ deaths \times 56.8\%\ cremation\ rate$	4 cremations in Clark County, ID
H5	$Cremations\_tons_c = \sum_{a=1}^{A} Cremations_{c,a} \times W_a \times \frac{1\ ton}{2{,}000\ lbs}$	$4\ cremations \times 158.25\ lbs\ per\ person\ in\ 85 + age\ group \div 2000\ lbs\ per\ ton$	0.3165 tons cremations in Clark County, ID
H6	$EF\_teeth_{Hg,a} = Material_a \times ContainHg_a \times HgProportion \times 0.0022 \frac{lb}{g}$	$2.96\ g\ mercury \times 75\ \%\ with\ mercury \times 45\%\ of\ fillings\ are\ mercury \times 0.0022$	0.0022 lbs. mercury per cremation
H7	$Emissions_{p,c} = Cremation_{tons_c} \times EF_p$	N/A	Completed in equation H9 for mercury
H8	$Emissions_{teeth_{Hg,c}} = \sum_{a=1}^{A} Cremations_{c,a} \times EF_{teeth_{Hg,a}}$	$4\ cremations \times 0.0022\ lbs\ per\ cremation$	0.0088 lbs. mercury from teeth in 85+ age group in Clark County, ID

Eq. #	Equation	Values for Clark County, ID	Result
H9	$Emissions_{tissue\,Hg,c} = Cremations_{tons\,c} \times EF_{tissue\,Hg}$	$0.3165\ tons\ cremations \times 0.0015\ lbs\ per\ ton$	0.00047 lbs. mercury from tissues in 85+ age group in Clark County, ID
H10	$Emissions_{Hg,c} = Emissions_{teeth\,Hg,c} + Emissions_{tissue\,Hg,c}$	$0.0088\ lbs\ from\ teeth + 0{,}00047\ lbs.\ from\ tissues$	0.0093 lbs. mercury from cremation of 85+ age group in Clark County ID
A1	$Cremations_{c/d,US} = Ratio_{c/d} \times (Cremations\_pets_{US} + Cremations\_shelter_{US})$	$52.5\%\ of\ cats\ in\ pet\ population \times (1{,}840{,}965\ pet\ cremations + 2{,}700{,}000\ shelter\ animal\ cremations)$	2,384,006 cremated cats in the U.S.
A2	$Cremations_{tons\frac{c}{d}} = Cremations_{\frac{c}{d}} \times Weight_{\frac{c}{d}} \times \frac{1\ ton}{2{,}000\ pounds}$	$2{,}384{,}006\ cremated\ cats \times 9.9\ lbs\ per\ cat \div 2000\ lbs\ per\ ton$	11,800 tons of cremated cats in the U.S.
A3	$Cremations_{tons\,animal} = Cremations_{tons\,c} + Cremations_{tons\,d}$	N/A	Cremations of dogs are not estimated in this sample calculation
A4	$Cremations\_tons_{animal,c} = Cremations\_tons_{animal,US} \times \frac{Pop_c}{Pop_{US}}$	$11{,}800\ cremated\ cats \times \frac{873\ people\ in\ Clark}{329{,}164{,}967\ people\ in\ US}$	0.03 tons cats cremated in Clark County, ID

Eq. #	Equation	Values for Clark County, ID	Result
A5	$Emissions_{p,c} = Cremation_{tons_c} \times EF_p$	$0.03 \times 0.0015\ lbs\ per\ ton$	0.000045 lbs. mercury emissions from cremation of cats in Clark County, ID

29.2.7 Improvements/Changes in the 2020 NEI

There are no significant changes from the methodology used to calculate the 2020 NEI emissions.

29.2.8 Puerto Rico and U.S. Virgin Islands

Since insufficient data exists to calculate emissions from human cremation for the counties in Puerto Rico and the US Virgin Islands, emissions are based on two proxy counties in Florida: 12011, Broward County for Puerto Rico and 12087, Monroe County for the US Virgin Islands. The total emissions in tons for these two Florida counties are divided by their respective populations creating a tons per capita emissions factor. For each Puerto Rico and US Virgin Island county, the tons per capita emissions factor is multiplied by the county population (from the same year as the inventory's activity data) which served as the activity data. In these cases, the throughput (activity data) unit and the emissions denominator unit are "EACH".

Emissions from animal cremation are based on county population; therefore, the emissions from animal cremation in Puerto Rico and the Virgin Islands are calculated using the method described for the rest of the counties.

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