



Appendix B: Modeling Coefficients and Data Assumptions

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RIVERSIDE COUNTY
Greenhouse Gas Emissions Inventory
Modeling Assumptions

Assumptions

- ¹ Electricity providers for Riverside County unincorporated are Southern California Edison and Imperial Irrigation District. Both companies provided electricity usage organized by rate code for accounts within the unincorporated areas.
- ² Natural gas is serviced to Riverside County by the Southern California Gas Company. The Gas Company provided annual totals of residential, commercial, and industrial natural gas use for the unincorporated areas of Riverside County for the year 2008.
- ³⁻¹¹ Riverside County receives water from a number of agencies and water districts, however, all of the water comes from either local sources (groundwater, surface water, or recycled water) or imported sources (The State Water Project or Colorado River Water). The energy associated with local sources is already included in the electricity data provided by the utilities. Imported water data was collected from Coachella Valley Water District, Desert Water Agency, Eastern Municipal Water District, Western Municipal Water District, Rancho California Water District, Palo Verde Irrigation District, Elsinore Valley Municipal Water District, and San Geronio Pass Water Agency.
- ¹² Riverside County Waste Management operates six active landfills: Badlands, Blythe, Desert Center, Lamb Canyon, Mecca II, and Oasis. El Sobrante Landfill is privately operated in the County. There are also closed landfills that continue to off gas methane as the waste decomposes. Waste Management provided fugitive methane emissions and onsite equipment fuel usage data for each active and closed landfill.
- ¹³ Annual VMT for Riverside County accounts for miles traveled on trips with at least one end point in the unincorporated areas of the County. For this analysis, the total miles traveled for trips with both end points in the County was added to half of the miles traveled for trips with one end point in the County since those miles are shared with another jurisdiction.
- ¹⁴ Emissions from aviation activities were based on aviation and jet fuel consumption from airport fueling stations in the unincorporated areas of Riverside County.
- ¹⁵ Population, housing, and land use data was used to estimate landscaping and woodburning emissions, project future business as usual emissions, and categorize emissions as residential vs. non-residential.
- ¹⁶ Emissions from agricultural activities vary depending on the type of crop or animal managed on the land. Southern California Association of Governments prepared CA GIS data detailing the acreage of each type of agricultural land use for the unincorporated areas of Riverside County.

Data Sources

- ¹ Source: Southern California Edison, *Electricity Use Report for the Unincorporated Area of Riverside County, July 2009-June 2010*.
- ² Source: Imperial Irrigation District, *kWh Billing Summary, 2008*.
- ³ Source: Southern California Gas Company, *Riverside County Summary Data, 2008*.
- ⁴ Source: Coachella Valley Water District, *Urban Water Management Plan, 2005 (Appendix E)*.
- ⁵ Source: Desert Water Agency, *Urban Water Management Plan, 2005*.
- ⁶ Source: Eastern Municipal Water District, *Urban Water Management Plan, 2005*.
- ⁷ Source: Western Municipal Water District, *Integrated Regional Water Management Plan, May 2008 (Section 4.1.2.2)*.
- ⁸ Source: Western Municipal Water District, *Comprehensive Annual Financial Report, 2009*.
- ⁹ Source: Western Municipal Water District, *Urban Water Management Plan, 2005*.
- ¹⁰ Source: Rancho California Water District, *Urban Water Management Plan, 2005*.
- ¹¹ Source: Elsinore Valley Municipal Water District, *Financial Report 2007-2008*.
- ¹² Source: San Geronio Pass Water Agency, *Supplemental Water Supply Planning Study, October 2009*.
- ¹³ Source: Riverside County Waste Management, 2008.
- ¹⁴ Source: Riverside County Transportation and Land Management Agency, RivTAM Base Year Model for 2007 Socio-Economic Data.
- ¹⁵ Source: Riverside County Economic Development Agency, airport fuel records, 2008.
- ¹⁶ Source: CA Department of Finance, Population and Housing Estimates, 2008.
- ¹⁷ Source: CA Department of Conservation, Division of Land Resource Protection, 2008 farmland GIS data. Prepared by Southern California Association of Governments (SCAG).

RIVERSIDE COUNTY
Greenhouse Gas Emissions Inventory
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**Mobile Source
Emissions**

	CO ₂	CH ₄	N ₂ O	Not Gas Dependent
<i>Onroad Emission Factors (g/mile)</i>				
Non Cat passenger Car ¹⁸	469.64	-	-	
Cat passenger Car ¹⁸	340.71	-	-	
Diesel Passenger Car ¹⁸	359.47	-	-	
Non cat light-duty truck ¹⁸	470.04	-	-	
Cat light duty truck ¹⁸	424.04	-	-	
Diesel Light duty Truck ¹⁸	346.44	-	-	
Non Cat light-duty truck 2 ¹⁸	470.42	-	-	
Cat light duty truck 2 ¹⁸	424.09	-	-	
Diesel Light duty truck 2 ¹⁸	351.88	-	-	
Non Cat Medium duty Truck ¹⁸	580.07	-	-	
Cat med duty truck ¹⁸	580.46	-	-	
Diesel Med duty truck ¹⁸	346.44	-	-	
Non Cat lite-heavy duty truck ¹⁸	567.9	-	-	
Cat Light-heavy duty truck ¹⁸	567.9	-	-	
Diesel Lite-heavy duty truck ¹⁸	519.7	-	-	
Non Cat lite-heavy duty truck 2 ¹⁸	567.9	-	-	
Cat Light-heavy duty truck 2 ¹⁸	567.9	-	-	
Diesel Lite-heavy duty truck 2 ¹⁸	528.63	-	-	
Non Cat med-heavy duty truck ¹⁸	567.9	-	-	
Cat med-heavy duty truck ¹⁸	567.9	-	-	
Diesel med-heavy duty truck ¹⁸	1505	-	-	
Non cat Heavy Duty truck ¹⁸	567.9	-	-	
Cat heavy duty truck ¹⁸	567.9	-	-	
Diesel heavy duty truck ¹⁸	1924.2	-	-	
Non Cat Other Bus ¹⁸	567.9	-	-	
Cat other bus ¹⁸	567.9	-	-	
Diesel Other Bus ¹⁸	1505	-	-	
Non Cat Urban Bus ¹⁸	567.9	-	-	
Cat Urban Bus ¹⁸	567.9	-	-	
Diesel Urban Bus ¹⁸	2779.2	-	-	
Non cat motorcycle ¹⁸	121.23	-	-	
Cat motorcycle ¹⁸	138.33	-	-	
Diesel Motorcycle ¹⁸	0	-	-	
Non Cat School Bus ¹⁸	567.9	-	-	
Cat School Bus ¹⁸	567.9	-	-	
Diesel School Bus ¹⁸	1505	-	-	
Non Cat Motor home ¹⁸	567.9	-	-	
Cat Motor home ¹⁸	567.9	-	-	
Diesel Motor home ¹⁸	1505	-	-	
CO2 to CO2e multiplier ¹⁹	-	-	-	1.0526
Aviation Gasoline (kg/gal) ²⁰	8.32	-	-	
Aviation Gasoline (gr/gal) ²¹	-	7.04	0.11	
Jet Fuel (kg/gal)	9.57			
Jet Fuel (gr/gal)		0.27	0.31	

¹⁸ Source: Emissions Factors Software (EMFAC2007), California Air Resources Board, Version 2.3, November 2006.

¹⁹ Source: Bay Area Air Quality Management District Greenhouse Gas Model (BGM) version 1.1.9 Beta. April 29, 2010.

²⁰ Source: California Climate Action Registry General Reporting Protocol, Version 3.1 January 2009 (Table C.3)

²¹ Source: California Climate Action Registry General Reporting Protocol, Version 3.1 January 2009 (Table C.6)

**RIVERSIDE COUNTY
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Landscape and Wood Burning Hearth Emissions

	CO ₂	CH ₄	N ₂ O	Not Gas Dependent
Mutifamily acres/property ²²				24.55
Multifamily landscaping tons/property/day ²²	0.25			
Multifamily average units/acre ²²				24.44
Single family tons/acre/day ²²	0.0193			
Single family average units/acre ²²				3.00
Non-Residential acres-to-building sq ft ratio ²²				1/2
Non-Residential tons/acre/day ²²	0.0102			
Woodburning emissions (lbs/ton of wood) ²³	3400			
Woodburning emissions (g/MMBTU) ²³		316.000	4.2000	
lbs/cord of wood ²³				2458
Energy Intensity of wood (MMBTU/ton) ²³				15.38

²² Source: URBEMIS2007 Emissions Estimation for Land Use Development Projects, Version 9.2

²³ Source: EPA AP-42 Emission Coefficients, Fifth Edition, Volume I October 1996 (Section 1.10)

Natural Gas

	CO ₂	CH ₄	N ₂ O
Natural Gas Emissions (kg/MMBtu) ²⁴	53.06	0.005	0.0001

²⁴ Source: California Climate Action Registry General Reporting Protocol, Version 3.1 January 2009 (Table C.7) - Kg/MMBtu

Electricity

	CO ₂	CH ₄	N ₂ O
Southern California Edison 2005 (lbs/MWh) ²⁵	665.26	0.0076	0.0113
California Average 2005 (lbs/MWh) ²⁵	724.12	0.003	0.0081
Imperial Irrigation District 2005 (lbs/MWh) ²⁵	612.12	0.0314	0.0064

²⁵ Source: Source: EPA Emission & Generation Resource Integrated Database (eGRID) Version 1.1

Solid Waste

	CO ₂	CH ₄	N ₂ O
Density (g/cubic meter) ²⁶		662	

²⁶ Source: USEPA (2007). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005. United States Environmental Protection Agency. EPA 430-R-07-002. and Annex 3.10: Methodology for Estimating CH₄ and N₂O Emissions from Manure Management. April 15, 2007. Washington DC. http://www.epa.gov/climatechange/emissions/usgginv_archive.html

**RIVERSIDE COUNTY
Greenhouse Gas Emissions Inventory
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Imported Water

	CO ₂	CH ₄	N ₂ O	Not Gas Dependent
<i>Energy Intensity of Water Use (kWh/MG)</i>				
Water Treatment ²⁷				111
Water Distribution ²⁷				1272
Wastewater Treatment ²⁷				1911
CA State Water Project Supply and Conveyance ²⁷				8325
Colorado River Water Supply and Conveyance ²⁷				6140

²⁷ Source: CAPCOA Quantifying Greenhouse Gas Emissions, August 2010. Energy Intensity of Water Use to LA Basin (TableWSW-3.1)

Standard Conversion Rates

	CO ₂	CH ₄	N ₂ O	Not Gas Dependent
gr/lb ²⁸				453.59291
lbs/short ton ²⁸				2000
metric tons/short ton ²⁸				0.907185
kg/ short ton ²⁸				907.18474
kg/metric ton ²⁸				1000
g/metric ton ²⁸				1,000,000
lbs/metric ton ²⁸				2204.62
therms per MMBTU ²⁸				0.10
kWh/MWh ²⁸				1000
kWh/GWh ²⁸				1,000,000
scf/Mcf ²⁸				1,000
Mcf/MMBTU ²⁸				0.9649
Gallons/Acre foot ²⁹				325,851.43
Gallons/ccf ²⁹				748.00

²⁸ Source: California Climate Action Registry General Reporting Protocol, Version 3.1 January 2009 (Appendix B)

²⁹ Source: <http://onlineconversion.com/volume.htm>

**RIVERSIDE COUNTY
Greenhouse Gas Emissions Inventory
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Agricultural

	CO₂	CH₄	N₂O	Not Gas Dependent
# of hectares/acre ³⁰				0.4046945
Ratio CH ₄ -C ³⁰				0.005
Conversion CH ₄ -C to Full Mol. Wt. ³⁰				1.33
Emission factor for liquid systems (kg N ₂ O-N/kg N) ³⁰				0.001
Emission factor for solid systems (kg N ₂ O-N/kg N) ³⁰				0.02
Ratio N ₂ O:N ₂ [C ₁₀] ³⁰				1.5714286
Volitazition percent for all non-PRP ag soils ³⁰				0.2
Volitazition percent for manure management ³⁰				0
Rate NH ₃ -NO _x ³⁰				0.01
Emission Factor for pastures, ranges, and paddocks ³⁰				0.02
Emission factor for ground application ³⁰				0.0125
Cwt (hundred weight) ³⁰				100 lbs
Volitazition of synthetic fertilizers ³⁰				0.1
Volitazition of organic fertilizers ³⁰				0.2
% leached from soils ³⁰				0.3
Leaching Factor (kg N ₂ O-N / kg N) ³⁰				0.025
Nitrogen Content of Non-manure Organics ³⁰				0.041
Emission factor for soils (kg N ₂ O-N/kgN) ³⁰				0.01
N ₂ O Emissions from Volitazition ³⁰				0.01
N content of aboveground biomass for N-fixing crop production ³⁰				0.03
Emission Factor for Temperate zone Histols (kg N ₂ O-N / ha_yr) ³⁰				8
Emission Factor for Subtropic zone Histols (kg N ₂ O-N / ha_yr) ³⁰				12
N ₂ O-N Emissions Ratio [R _{N₂O_N}] ³⁰				0.007
% of target year applied ³⁰				0.65
% of following year applied ³⁰				0.35

³⁰ Source: EPA State Inventory Tool for Agriculture, July 2008.

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