

San Diego County Updated Greenhouse Gas Inventory

Executive Summary | March 2013



*An Analysis of Regional Emissions and Strategies to Achieve AB 32 Targets
Revised and Updated to 2010*



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For an electronic copy of this summary report and the full documentation of the San Diego Greenhouse Gas Inventory project, go to www.sandiego.edu/epic/ghginventory.



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1. Key Findings

- Estimated emissions in San Diego County in 2010 were 32 million metric tons of carbon dioxide equivalent (MMT CO₂e) – about 9% more than in 1990.
- In 2010, per-capita emissions for San Diego County were approximately 10 MMT CO₂E.
- In 2010, emissions from cars and light duty trucks represented about 44% of total greenhouse gas emissions in San Diego County, approximately the average of the years 2005-2010.
- The projection in 2020 – assuming no change in policy from 2009 – is about 37 MMT CO₂e, significantly lower than the previous (2008) projection of 43 MMT CO₂e, due in large part to the economic downturn.
 - » If reductions from state Pavley I standards (implemented 2010) and the state Renewable Portfolio Standard (RPS, 33% in 2020) were included, the projection for 2020 would be approximately 31.5 MMT CO₂e, about 7% above 1990 levels.
 - » If reductions from the Low Carbon Fuel Standard (LCFS) were also included, the projection for 2020 would be approximately 30 MMT CO₂e, about 3% above 1990 levels.
- State and federal policies would account for more than 70% of the total greenhouse gas emissions reductions needed for the San Diego region to reach 1990 levels of emissions by 2020.
 - » The Pavley I standards are expected to reduce emissions by an estimated 2.4 MMT CO₂e in 2020.
 - » The RPS is expected to reduce emissions by an estimated 3.1 MMT CO₂e reduction in 2020.
 - » The LCFS is expected to reduce emissions an estimated 1.1 CO₂e reduction in 2020.





2. Total Greenhouse Gas Emissions in San Diego County (2010)

In 2010 San Diego County emitted an estimated 32.1 million metric tons of carbon dioxide equivalent (MMT CO₂E), 3.1 MMT CO₂E (9%) more than 1990 emissions¹ Figure 1 shows San Diego County greenhouse gas emissions from 1990 through 2010. San Diego County greenhouse gas emissions by category is shown in Figure 2.

Figure 1. Net San Diego County Emissions, Revised Estimates (1990-2010)

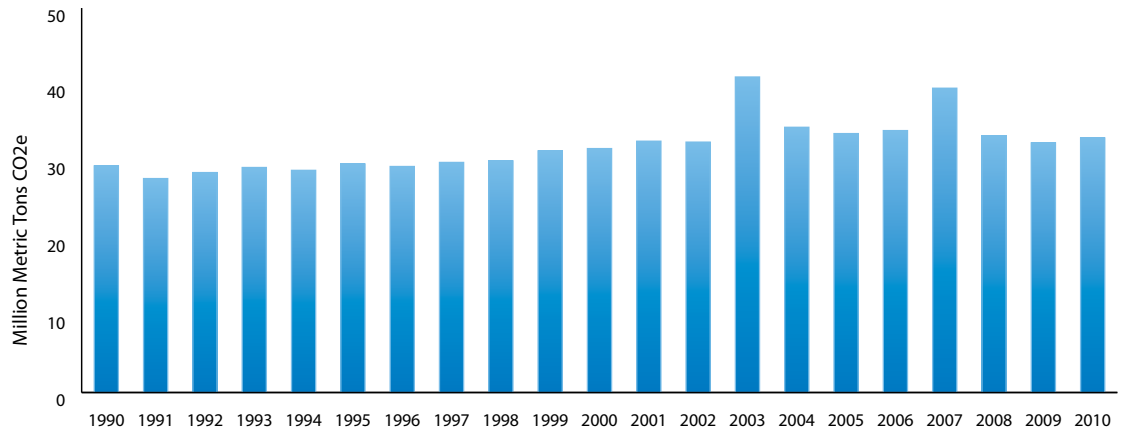
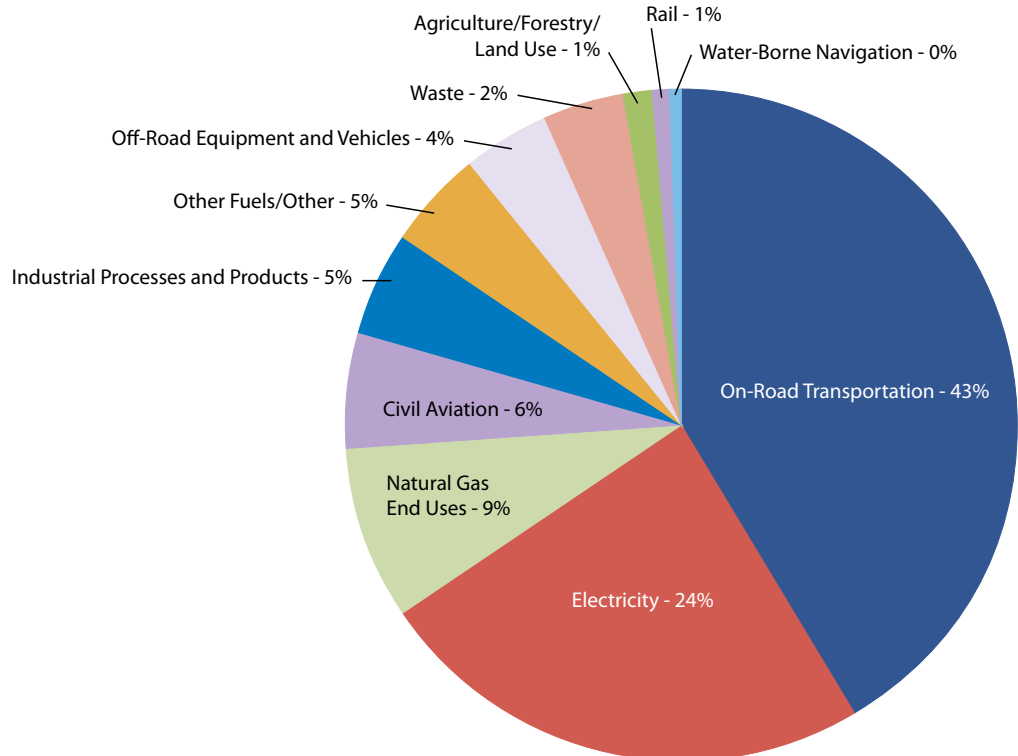


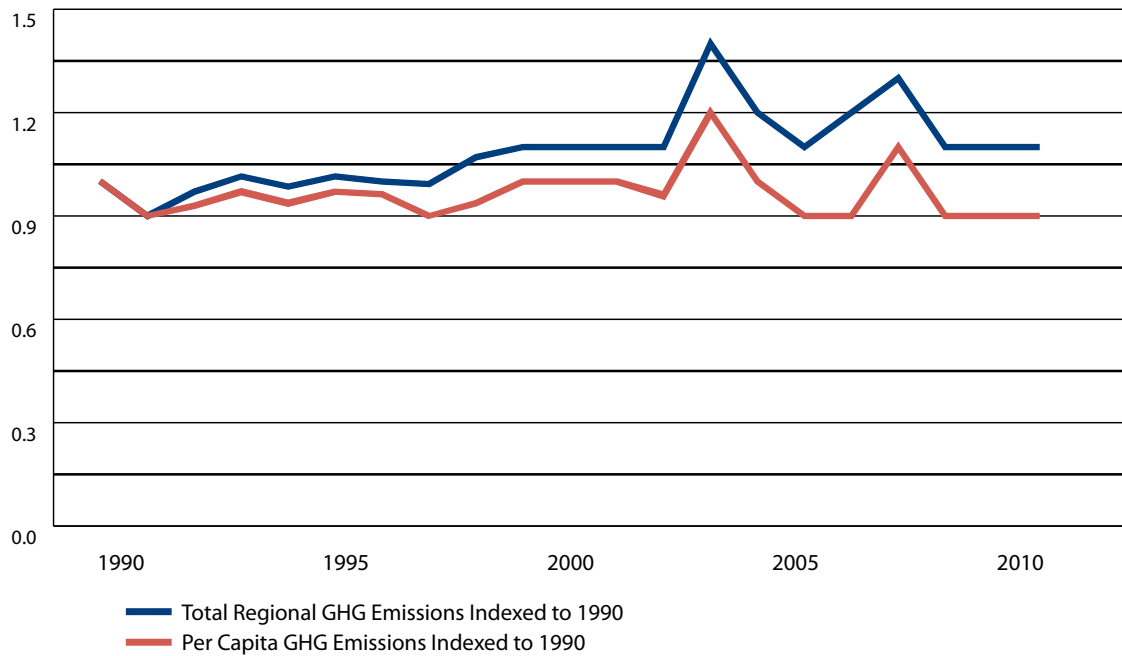
Figure 2. San Diego County Greenhouse Gas Emissions by Sector (2010)



1. Carbon dioxide equivalent includes the sum of all greenhouse gases converted to the global warming potential (GWP) of carbon dioxide. For example, the GWP for methane is 21. This means that 1 million metric tons of methane is equivalent to emissions of 21 million metric tons of carbon dioxide.

In 2010, per-capita greenhouse gas emissions for the San Diego region were 10.1 metric tons of CO₂e, less than the 1990-2006 average of 11.2 metric tons. This decrease is explained partly by the economic downturn.

Figure 3. Greenhouse Gas Emissions, Indexed to 1990, San Diego County



2.1. Emissions Projections to 2020

At the time of the first (2008) regional greenhouse gas inventory, the state Pavley I standards were not in force and the Low Carbon Fuel Standard (LCFS) had not yet been adopted. By 2010, the Pavley I standards were being implemented and the Renewable Portfolio Standard (RPS) target was increased to 33% renewable electricity by 2020. For purposes of projecting emissions to 2020, we therefore present three scenarios:

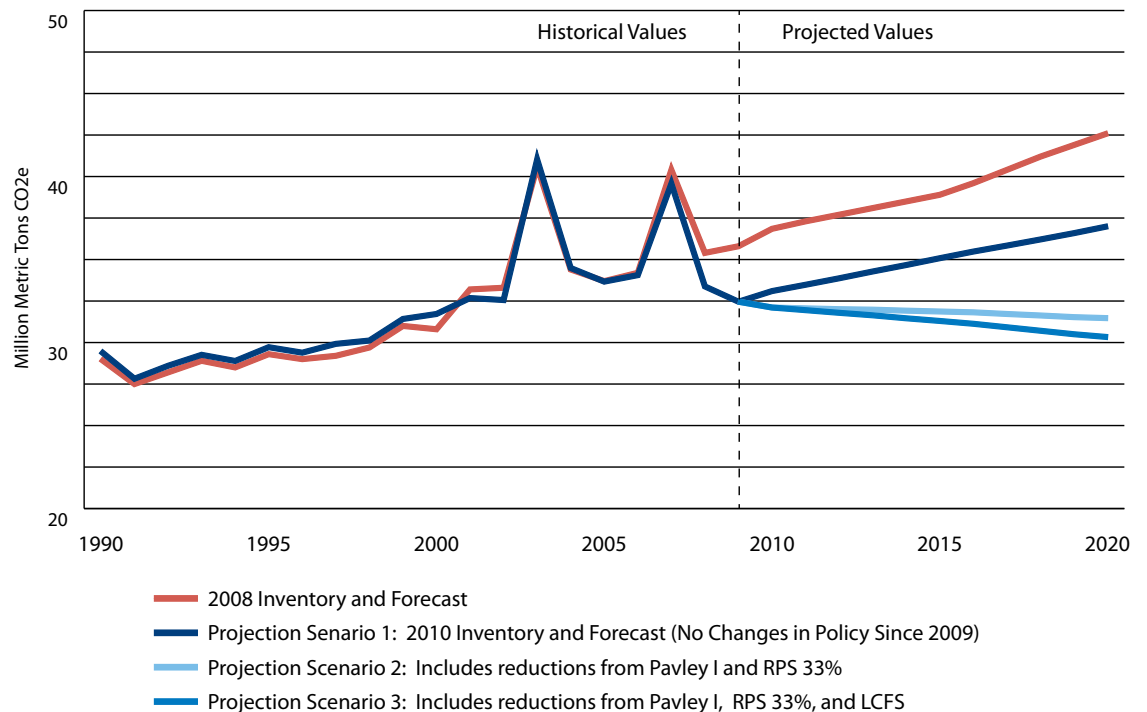
- **No Policy Changes** - The first projection scenario is based on the policies in existence in 2009 and does not include reductions expected from the Pavley I standards and the increased RPS target. In this scenario, greenhouse gas emissions from San Diego County are estimated at 37 MMT CO₂e in 2020
- **Pavley I + RPS 33%** - The second projection includes reductions expected from implementation of Pavley I and the RPS 33%. In this scenario, San Diego County greenhouse gas emissions are estimated at 31.5 MMT CO₂e in 2020.
- **Pavley I + RPS 33% + LCFS** - The third projection scenario includes reductions expected from Pavley I, the RPS of 33%, and the LCFS. In this scenario, greenhouse gas emissions from San Diego County are estimated to be approximately 30.3 MMT CO₂e in 2020. Note that although the LCFS was adopted in 2010, its future is uncertain at this time due to litigation.²

2. Two cases challenge the LCFS. In *Poet, LLC v. California Air Resources Board*, (2009), Poet, the largest ethanol producer in the world, challenges the LCFS on the basis that CARB failed to comply with the California Environmental Quality Act. Poet's petition for writ of mandate was denied and has been appealed to the California Court of Appeals in November 2011. No further dates have been set. *Rocky Mountain Farmers Union v. Goldstene* (2010) challenges the LCFS rule as violating the Commerce Clause of the United States Constitution. In December 2011 the Eastern District of California invalidated parts of the LCFS rule. Federal district court stayed enforcement upon appeal in April 2012. The parties are now awaiting a decision.



Figure 4 shows the emissions levels in 2020 under the three projection scenarios, as well as the previous (2008) forecast.

Figure 4. Projection Scenarios to 2020 for San Diego County



2.2. Emission Reduction Targets

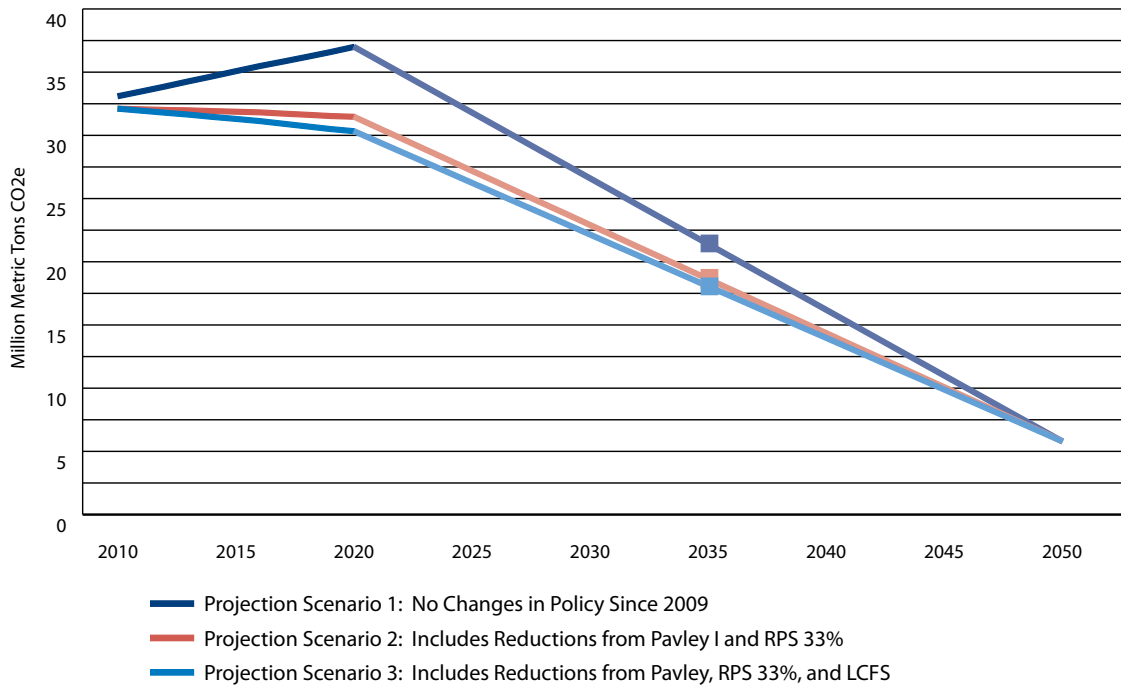
In 2006, California Governor Arnold Schwarzenegger signed the Global Warming Solutions Act (AB 32), establishing statutory limits on greenhouse gas emissions in California. AB 32 seeks to reduce statewide emissions to 1990 levels by the year 2020. While AB 32 does not specify reduction targets for specific sectors or jurisdictions, this study calculated theoretical reductions targets for San Diego County based on AB 32.

In 2005, Governor Schwarzenegger signed Executive Order S-3-05, which establishes long-term targets for greenhouse gas emissions reductions to levels 80% below 1990 levels in 2050. While this reduction target is not mandatory, it is generally accepted as the long-term target of California regulations. Like AB 32, Executive Order S-3-05 is intended to be applied statewide, but if applied hypothetically to San Diego County, total emissions would have to be 5.8 MMT CO₂e in 2050.

In 2009, California Senate Bill 375 came into effect as another regulatory tool to help California achieve its AB32 target. SB 375 requires regional planning agencies to achieve greenhouse gas emissions reductions through land use and transportation policy, specifically requiring a target for these emissions in 2020 as well as in the 2035 planning year. The year 2035 has therefore become another planning horizon year for cities and the region.

Figure 5 illustrates the theoretical decrease in emissions needed if San Diego County were required to meet both AB 32 and Executive Order S-3-05 targets along a linear trajectory. The 2035 planning year and its theoretical goals are also shown and depend on the projection chosen for 2020. The emissions goal for 2035 based on this linear trajectory varies, depending on the projection scenario, between 18.1 MMT CO₂e and 21.4 MMT CO₂e in order to achieve the 2050 target of 5.8 MMT CO₂e.

Figure 5. Applying Statewide Greenhouse Gas Reduction Targets in San Diego County



3. Summary Methodology

EPIC updated historical greenhouse gas emissions to 2010 using the best available data and made revised estimated projections for future emissions to 2020 for San Diego County based on the updated information. To be consistent with revisions and refinements in methodology at the California Air Resources Board (CARB), EPIC revised some historical data used to calculate the 2008 inventory. For example, the electricity sector data were revised back to 1990. On-road transportation emissions were revised from 2008 based on revised vehicle miles traveled data from the regional transportation agency SANDAG. Waste emissions were revised from 2008 based on refined emissions factors obtained from CARB. The “Other Fuels”, and “Industrial Processes” sectors were adjusted according to economic activity data through 2008. Civil aviation was updated using departure air miles through 2008. For the wildfire category, an average of emissions based on fires occurring since 1990 was used to project 2020 emissions levels. The “Off-road” and “Waterborne” category projections to 2020 remain the same as in the previous forecast of 2006. A summary of the methods is provided in Table 1. For a detailed presentation of the methods used, please see documents published in support of the 2008 inventory.³

3. See <http://www.sandiego.edu/epic/ghginventory>





Table 1. Summary of Inventory Methods and Data Sources

Inventory Category	Method	Data Sources
ON-ROAD TRANSPORTATION	CARB EMFAC2007 Model for San Diego County	1990-2008 CO ₂ e Emissions from CARB On-Road EMFAC2007 Model, based on Series 12 Input data from SANDAG, and VMT forecast data from SANDAG for 2020, 2035
ELECTRICITY	Fuel-based, CARB emissions factors (lbs/MWh) and average emissions for power suppliers used where fuel data unavailable (CARB Method); 2020-2035 projection based on CEC forecast trend	FERC FORM 1, CEC Energy Forecast 2010-2020, SEC Form 10-K, EIA Form 861
NATURAL GAS END USES	Fuel-based (CARB Method); 2020-2035 projection based on CEC forecast trend	FERC FORM 1, CEC Energy Forecast 2010-2020
OFF-ROAD EQUIPMENT AND VEHICLES	CARB OFFROAD Model for San Diego County; linear projection from 2020 to 2035	CO ₂ e Emissions from CARB OFFROAD Model
CIVIL AVIATION	Fuel-based (Average of jet fuel sold and passenger miles traveled methods), interstate emissions included (Modified CARB Method); linear projection from 2020 projection to 2035	Two main jet fuel and aviation gas suppliers to San Diego Int'l Airport, Bureau of Transportation Statistics Department (BTS RITA), San Diego Air Pollution Control District (natural gas)
WASTE	IPCC Mathematically Exact First Order Decay Model (CARB Method); linear projection from 2020 to 2035	CARB (waste water factors), City of San Diego (waste disposed), San Diego County Public Works Department, CARB (waste disposed), CIWMB, USD EPA
INDUSTRIAL PROCESSES AND PRODUCTS	Source-based, some scaled from statewide inventory data (CARB Method); projection based on US Census Bureau economic forecast data to 2035	CARB, US EPA, US Census Bureau, US Geological Survey, CA Dept. of Transportation, CEC
WATER-BORNE NAVIGATION	Based on CARB estimate (CARB Method); linear projection to 2035	CARB estimate, adjusted by local port business plan to 2020
RAIL TRANSPORTATION	Scaled from statewide inventory (CARB Method); linear projection from 2020 to 2035	CARB statewide GHG inventory, US Census Bureau (economic data)
OTHER/OTHER FUELS	Scaled from statewide inventory (CARB Method); linear projection from 2020 to 2035	CARB statewide GHG inventory, US Census Bureau (economic data)
AGRICULTURE (LIVESTOCK)	Scaled from statewide inventory (CARB Method); linear projection from previous 2020 value to 2035	CARB statewide GHG inventory, US Department of Agriculture, and San Diego County (crop reports)
EMISSIONS FROM DEVELOPMENT (Loss of Vegetation)	GIS analysis of developed areas from 1990-2007 (Modified CARB); linear projection from previous 2020 value to 2035	SANDAG and CA Dept of Forestry and Fire Protection (GIS data), Winrock International and C. Wiedenmyer paper (biomass data)
WILDFIRES	GIS analysis of burned areas from 1990-2007 (Modified CARB); annual projections from previous 2020 value to 2035 based on average annuals from 1990-2010.	SANDAG and CA Dept of Forestry and Fire Protection (GIS data), Winrock International and C. Wiedenmyer paper (biomass data), SANGIS (GIS burn areas)
SEQUESTRATION FROM LAND COVER	GIS analysis of San Diego County vegetation 1990-2007 (Modified CARB); linear projection from previous 2020 value to 2035	SANDAG and CA Dept of Forestry and Fire Protection (GIS data), Winrock International and C. Wiedenmyer paper (biomass data), SANGIS (GIS burn areas), H. Luo paper (carbon uptake by chaparral)

4. Conclusion

San Diego County emitted approximately 32 million MMT CO₂e in 2010 – about 9% above the 1990 level. This increase is not as large as previously projected due largely to the economic recession. Transportation remains the top emitting category, followed by electricity and natural gas. These highest emitting categories are significantly associated with activities by individuals (e.g., driving and home electricity and natural gas use); thus more than 70% of total regional emissions are associated with individual activities.

For 2020, we presented three projection scenarios. In the first, we projected emissions without changes to policy as of 2009. In the second projection scenario, we accounted for the reductions expected from Pavley I and the RPS 33%. In this second projection scenario, greenhouse gas emissions would be approximately 2 MMT CO₂e above the 1990 level, meaning that San Diego County would have to decrease emissions by about 2 MMT CO₂e in 2020 to reach the AB 32 target. In the third projection scenario, we included reductions expected from Pavley I, the RPS 33% standards reductions and the LCFS reductions by 2020. In this third projection scenario, San Diego County would need about 0.8 MMT CO₂e additional reductions to meet the AB 32 target in 2020.

5. Appendix

Table 2. San Diego County GHG Inventory and Emissions Projections (MMT Co2E)

	1990	1995	2000	2005	2010	Projected Values				
						2015	2020	2025	2030	2035
ON-ROAD TRANSPORTATION	14.3	13.3	13.9	15.9	14.4	15.0	15.7	16.8	18.0	18.3
Passenger Vehicles	7.4	6.5	6.3	6.2	5.9	6.1	6.4	6.7	7.1	7.3
Light-Duty Vehicles	5.1	5.1	5.9	7.8	7.0	7.2	7.4	7.8	8.3	8.6
Heavy-Duty Trucks and Vehicles	1.8	1.6	1.7	1.9	1.5	1.7	1.9	2.3	2.6	2.4
Motorcycles	0.04	0.03	0.02	0.06	0.04	0.05	0.05	0.05	0.05	0.05
ELECTRICITY*	6.8	7.5	8.5	7.7	8.3	8.9	9.5	10.0	10.6	11.2
Residential	2.5	2.8	2.9	2.8	3.1	3.4	3.7	3.9	4.1	4.3
Commercial	2.6	3.0	3.8	3.4	3.6	3.9	4.1	4.4	4.6	4.9
Industrial	0.7	0.7	0.8	0.6	0.6	0.7	0.7	0.7	0.8	0.8
Mining	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Agricultural	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
TCU	0.6	0.7	0.8	0.7	0.7	0.7	0.8	0.8	0.8	0.9
Street lighting	0.03	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.06	0.06
NATURAL GAS END USES*	3.0	2.8	3.1	2.9	2.9	3.1	3.3	3.5	3.7	3.9
Residential	1.9	1.7	1.8	1.7	1.7	1.8	1.9	2.0	2.1	2.2
Commercial	0.9	0.6	0.5	0.9	0.8	0.9	1.0	1.1	1.2	1.3
Industrial	0.9	0.3	0.7	0.1	0.2	0.2	0.2	0.2	0.2	0.2
Mining	0.04	0.02	0.01	0.03	0.02	0.02	0.02	0.02	0.02	0.02
Agricultural	0.03	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02
Other**	0.2	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2
OFF-ROAD EQUIPMENT AND VEHICLES	1.0	1.0	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9
Construction and Mining Equipment	0.4	0.5	0.6	0.6	0.7	0.7	0.8	0.8	0.9	1.0
Pleasure Craft	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.3
Industrial Equipment	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Agriculture Equipment	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Other	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4
CIVIL AVIATION	1.2	1.4	1.6	1.8	1.9	2.0	2.1	2.2	2.4	2.5
Interstate	1.0	1.1	1.4	1.7	1.69	1.83	1.95	2.07	2.20	2.32
Intrastate	0.2	0.2	0.2	0.2	0.17	0.16	0.15	0.16	0.16	0.17
WASTE	0.9	1.1	0.4	0.4	0.6	0.7	0.7	0.9	1.0	1.1
Landfills	0.3	0.5	0.2	0.2	0.4	0.5	0.5	0.6	0.7	0.8
Wastewater Treatment	0.6	0.6	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3
INDUSTRIAL PROCESSES AND PRODUCTS	0.5	0.7	1.6	1.9	1.8	1.9	1.9	2.0	2.1	2.12
HFCs	0.0	0.3	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2
SF6	0.2	0.1	1.2	1.3	1.0	0.9	0.7	0.8	0.8	0.9
Other	0.3	0.2	0.3	0.4	0.6	0.8	1.0	1.0	1.0	1.0
WATER-BORNE NAVIGATION	0.04	0.06	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3
Ocean Going Vessels (OGV)	0.03	0.05	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
Harbor Craft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
RAIL	0.21	0.22	0.17	0.30	0.32	0.39	0.47	0.54	0.61	0.68
OTHER FUELS/OTHER	1.83	1.54	1.41	1.56	1.58	1.63	1.71	1.80	1.88	1.97
Manufacturing	0.71	0.56	0.44	0.45	0.43	0.39	0.36	0.32	0.28	0.25
Transport	0.20	0.13	0.19	0.18	0.12	0.10	0.09	0.08	0.07	0.06
Residential	0.16	0.14	0.13	0.18	0.21	0.25	0.30	0.35	0.39	0.44
Energy	0.01	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08
Commercial	0.30	0.18	0.13	0.15	0.15	0.16	0.18	0.19	0.21	0.22
Agriculture	0.17	0.14	0.12	0.17	0.16	0.17	0.18	0.20	0.21	0.22
Cogen Adjustment (Thermal)	0.28	0.38	0.39	0.42	0.49	0.51	0.55	0.61	0.65	0.70
AGRICULTURE (Livestock)	0.15	0.12	0.09	0.07	0.05	0.04	0.03	0.02	0.02	0.01
Enteric Fermentation	0.07	0.06	0.05	0.04	0.03	0.02	0.02	0.01	0.01	0.01
Manure	0.07	0.06	0.04	0.03	0.02	0.02	0.01	0.01	0.00	0.00
LAND USE WILDFIRES	0.18	0.59	0.23	0.28	0.28	0.28	0.28	0.28	0.28	0.28
Forest	0.03	0.01	0.05	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Woodland growth	0.01	0.06	0.04	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Chaparral, scrub, and grasslands	0.14	0.53	0.15	0.23	0.23	0.23	0.23	0.23	0.23	0.23
DEVELOPMENT (LOSS OF VEGETATION)	0.06	0.06	0.19	0.20	0.18	0.18	0.18	0.18	0.18	0.18
Loss of farmland	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Loss of native vegetation	0.02	0.03	0.17	0.17	0.15	0.15	0.15	0.15	0.15	0.15
SEQUESTRATION FROM LAND COVER	(0.68)	(0.68)	(0.68)	(0.67)	(0.66)	(0.66)	(0.65)	(0.65)	(0.64)	(0.63)
Forest growth	(0.24)	(0.23)	(0.23)	(0.23)	(0.23)	(0.23)	(0.22)	(0.22)	(0.22)	(0.22)
Woodland growth	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.06)	(0.06)	(0.06)
Chaparral, scrub, and grasslands	(0.38)	(0.38)	(0.38)	(0.37)	(0.37)	(0.36)	(0.36)	(0.36)	(0.36)	(0.35)
TOTAL	29	30	32	34	33	35	37	40	42	44

*Historical Electricity and Natural Gas values based on the California Energy Commission 2009 energy forecast. Some values vary from 2008 Inventory.
 **Natural Gas Other includes consumption from Civil Aviation and Waterborne Navigation categories.



About the Energy Policy Initiatives Center (EPIC)

The Energy Policy Initiatives Center (EPIC) is a nonprofit academic and research center of the University of San Diego School of Law that studies energy policy issues affecting the San Diego region and California. EPIC integrates research and analysis, law school study and public education. The organization also serves as a source of legal and policy expertise and information in the development of sustainable solutions that meet our future energy needs.

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