



Tableau as an innovative tool for improving the sharing of emission inventory data

Azra Kovacevic, Jennifer Ojiaku, Kari Palmer

August 17, 2017

Agenda

Past process

Improved data sharing

Tableau software

Point source emissions

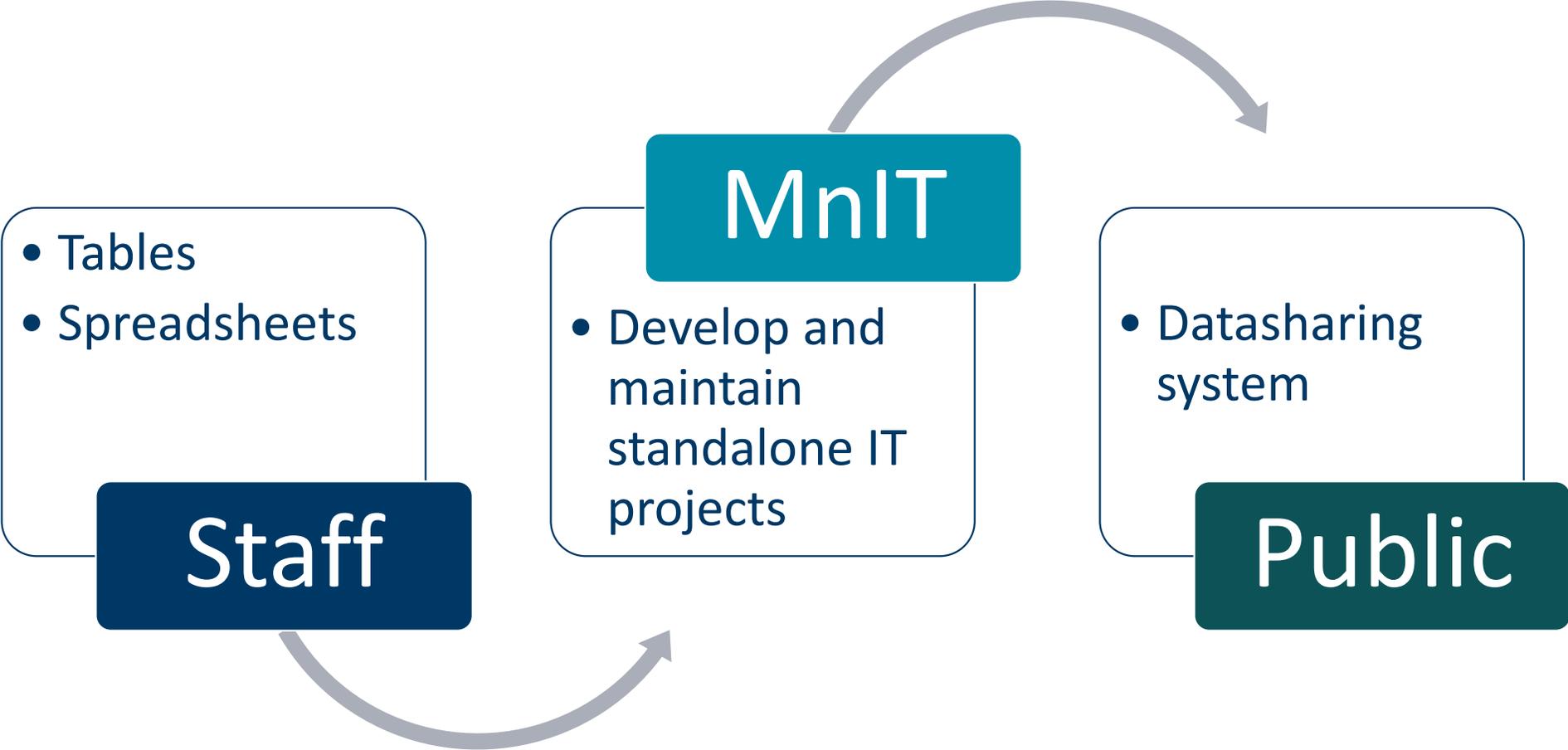
Statewide emission inventory

Greenhouse gas emissions

Data download

Tableau limitations

Past process



Data sharing goal

- Automated
- Interactive
- User-friendly
- Without the constraint of IT resources
- Easy for staff to update



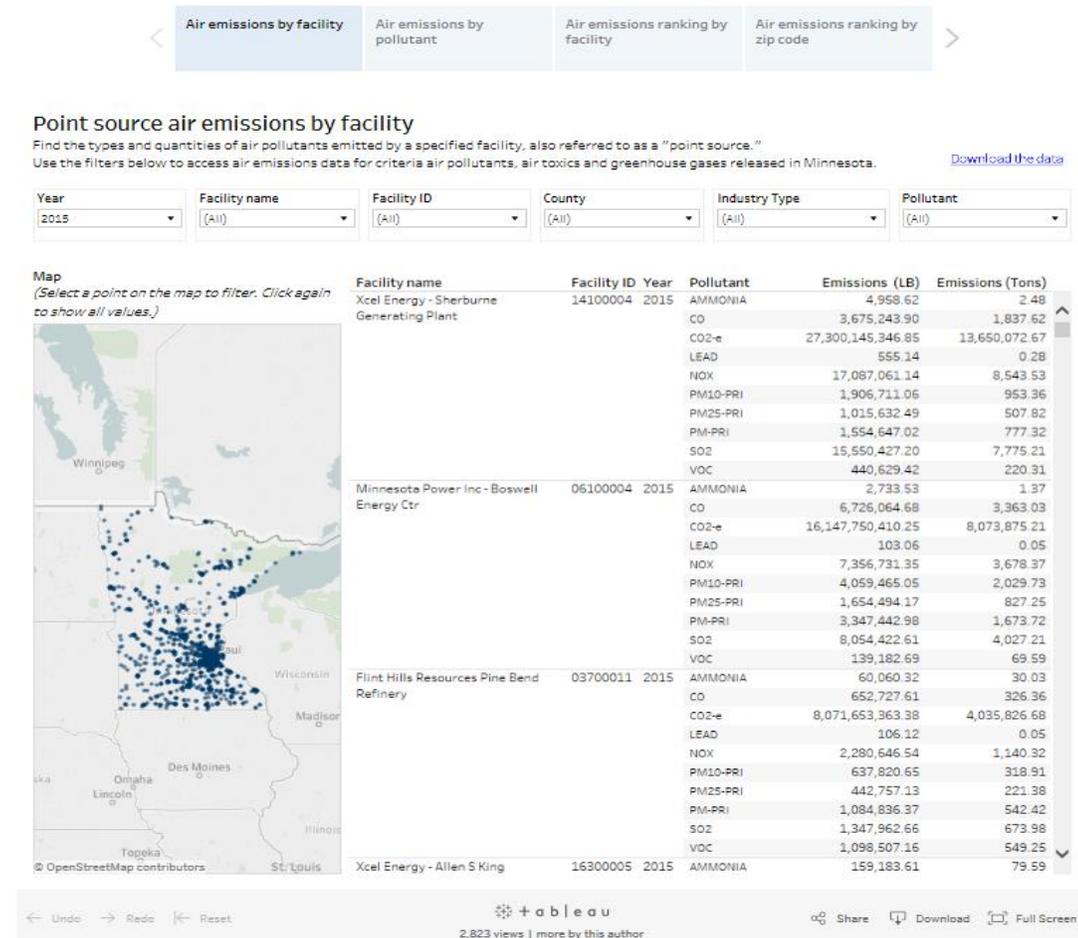


- Speed
- Easy to use
- Interactive dashboard
- Direct connection
- Easy to publish and share
- Online resources and support

Point source data

- Workbook contains interactive maps, charts and data tables
- It includes air toxic, criteria and greenhouse gas pollutants
- Emissions data are available by county, industry type, individual facility
- Data are available from 2006

Point source air emissions data



Point source air emissions by facility

Find the types and quantities of air pollutants emitted by a specified facility, also referred to as a "point source."

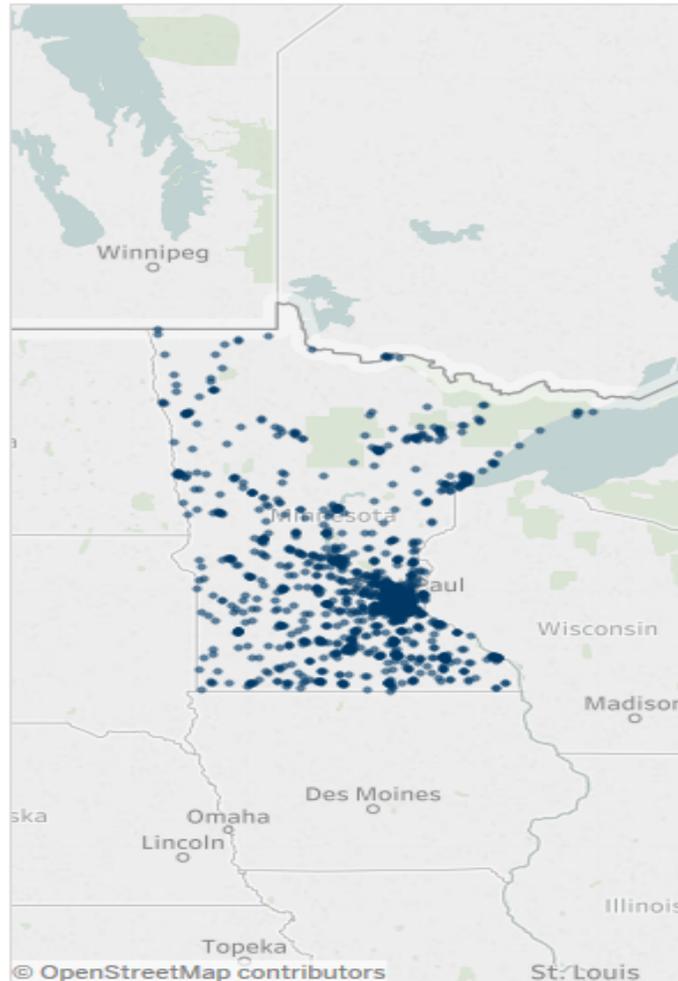
Use the filters below to access air emissions data for criteria air pollutants, air toxics and greenhouse gases released in Minnesota.

[Download the data](#)

Year 2015	Facility name (All)	Facility ID (All)	County (All)	Industry Type (All)	Pollutant (All)
--------------	------------------------	----------------------	-----------------	------------------------	--------------------

Map

(Select a point on the map to filter. Click again to show all values.)



Facility name	Facility ID	Year	Pollutant	Emissions (LB)	Emissions (Tons)
Xcel Energy - Sherburne Generating Plant	14100004	2015	AMMONIA	4,958.62	2.48
			CO	3,675,243.90	1,837.62
			CO2-e	27,300,145,346.85	13,650,072.67
			LEAD	555.14	0.28
			NOX	17,087,061.14	8,543.53
			PM10-PRI	1,906,711.06	953.36
			PM25-PRI	1,015,632.49	507.82
			PM-PRI	1,554,647.02	777.32
			SO2	15,550,427.20	7,775.21
			VOC	440,629.42	220.31
Minnesota Power Inc - Boswell Energy Ctr	06100004	2015	AMMONIA	2,733.53	1.37
			CO	6,726,064.68	3,363.03
			CO2-e	16,147,750,410.25	8,073,875.21
			LEAD	103.06	0.05
			NOX	7,356,731.35	3,678.37
			PM10-PRI	4,059,465.05	2,029.73
			PM25-PRI	1,654,494.17	827.25
			PM-PRI	3,347,442.98	1,673.72
			SO2	8,054,422.61	4,027.21
			VOC	139,182.69	69.59
Flint Hills Resources Pine Bend Refinery	03700011	2015	AMMONIA	60,060.32	30.03
			CO	652,727.61	326.36
			CO2-e	8,071,653,363.38	4,035,826.68
			LEAD	106.12	0.05
			NOX	2,280,646.54	1,140.32
			PM10-PRI	637,820.65	318.91
			PM25-PRI	442,757.13	221.38
			PM-PRI	1,084,836.37	542.42
			SO2	1,347,962.66	673.98
			VOC	1,098,507.16	549.25
Xcel Energy - Allen S King	16300005	2015	AMMONIA	159,183.61	79.59

Point source air emissions by facility

Find the types and quantities of air pollutants emitted by a specified facility, also referred to as a "point source."

Use the filters below to access air emissions data for criteria air pollutants, air toxics and greenhouse gases released in Minnesota.

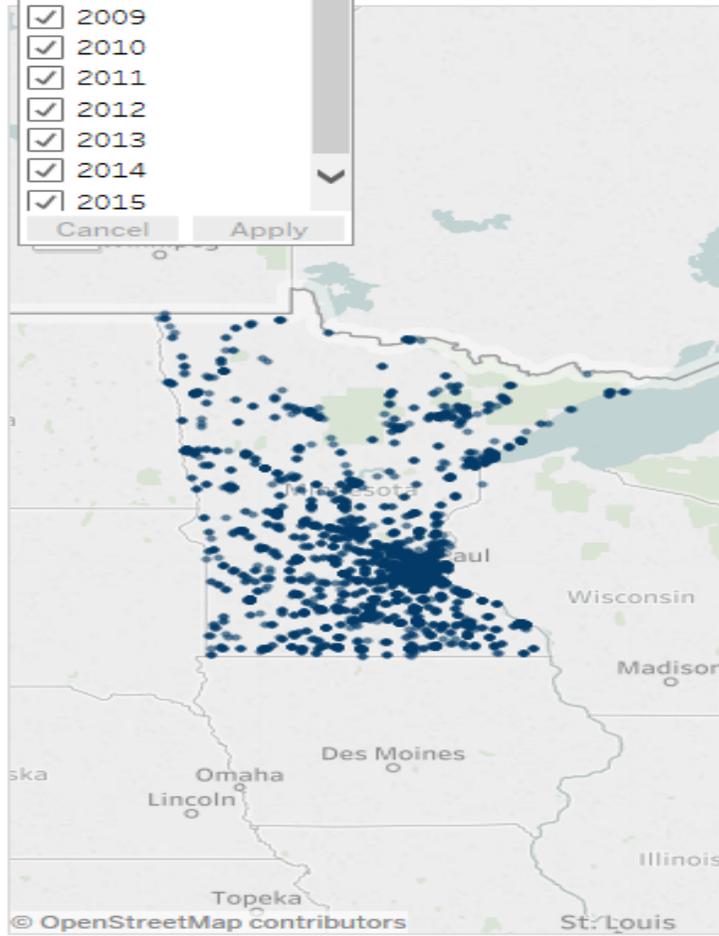
[Download the data](#)

Year: (All) | Facility name: (All) | Facility ID: (All) | County: (All) | Industry Type: (All) | Pollutant: (Multiple values)

Map to filter. Click again

- (All)
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014
- 2015

Cancel Apply



Facility name	Facility ID	Year	Pollutant	Emissions (LB)	Emissions (Tons)
Xcel Energy - Sherburne Generating Plant	14100004	2006	VOC	562,537.76	281.27
		2007	VOC	570,273.28	285.14
		2008	BENZENE	586.29	0.29
			VOC	514,269.21	257.13
		2009	VOC	553,152.68	276.58
		2010	VOC	486,695.89	243.35
		2011	BENZENE	530.22	0.27
			VOC	469,829.52	234.91
		2012	CO2-e	18,703,725,821.93	9,351,862.91
			VOC	304,031.65	152.02
		2013	CO2-e	19,957,139,248.65	9,978,569.62
			VOC	316,473.15	158.24
2014	CO2-e	29,843,639,301.12	14,921,819.65		
	VOC	484,274.25	242.14		
2015	CO2-e	27,300,145,346.85	13,650,072.67		
	VOC	440,629.42	220.31		
Minnesota Power Inc - Boswell Energy Ctr	06100004	2006	VOC	193,378.00	96.69
		2007	VOC	190,557.02	95.28
		2008	BENZENE	662.55	0.33
			VOC	137,489.36	68.74
		2009	VOC	94,993.82	47.50
		2010	VOC	132,806.75	66.40
		2011	BENZENE	726.46	0.36
			VOC	133,135.18	66.57
		2012	CO2-e	17,151,721,466.97	8,575,860.73
			VOC	135,248.01	67.62
		2013	CO2-e	18,235,581,488.90	9,117,790.74
			VOC	141,738.58	70.87
2014	CO2-e	17,274,535,348.67	8,637,267.67		
	VOC	134,347.69	67.17		
2015	CO2-e	16,147,750,410.25	8,073,875.21		

Point source air emissions by facility

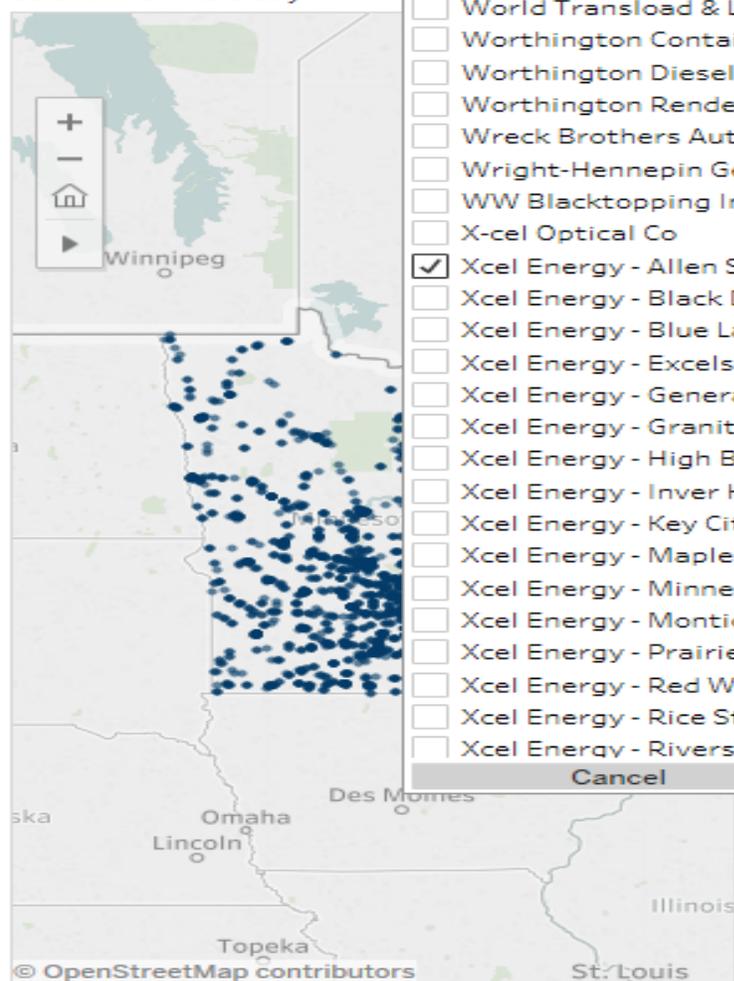
Find the types and quantities of air pollutants emitted by a specified facility, also referred to as a "point source."

Use the filters below to access air emissions data for criteria air pollutants, air toxics and greenhouse gases released in Minnesota.

[Download the data](#)

Year: (All) |
 Facility name: (All) |
 Facility ID: (All) |
 County: (All) |
 Industry Type: (All) |
 Pollutant: (Multiple values)

Map
(Select a point on the map to show all values.)



- woodco Framing Inc
 - Woodcraft Industries - Foreston
 - Woodcraft Industries Cabinet Door Divisi
 - Woodcraft Industries Inc - St Cloud
 - World Transload & Logistics LLC
 - Worthington Container Inc
 - Worthington Diesel Generating Plant
 - Worthington Rendering Co
 - Wreck Brothers Auto Inc
 - Wright-Hennepin Generation
 - WW Blacktopping Inc
 - X-cel Optical Co
 - Xcel Energy - Allen S King Generating Plant
 - Xcel Energy - Black Dog
 - Xcel Energy - Blue Lake
 - Xcel Energy - Excelsior Tech Center
 - Xcel Energy - General Office
 - Xcel Energy - Granite City Generating
 - Xcel Energy - High Bridge Combined Cycle Plant
 - Xcel Energy - Inver Hills Generating Plt
 - Xcel Energy - Key City/Wilmarth
 - Xcel Energy - Maple Grove Materials
 - Xcel Energy - Minnesota Valley
 - Xcel Energy - Monticello Generating Plt
 - Xcel Energy - Prairie Island Nuclear Plant
 - Xcel Energy - Red Wing Generating Plant
 - Xcel Energy - Rice Street Service Center
 - Xcel Energy - Riverside Generating Plant
- Cancel Apply

Facility ID	Year	Pollutant	Emissions (LB)	Emissions (Tons)
14100004	2006	VOC	562,537.76	281.27
	2007	VOC	570,273.28	285.14
	2008	BENZENE	586.29	0.29
		VOC	514,269.21	257.13
	2009	VOC	553,152.68	276.58
	2010	VOC	486,695.89	243.35
	2011	BENZENE	530.22	0.27
		VOC	469,829.52	234.91
	2012	CO2-e	18,703,725,821.93	9,351,862.91
		VOC	304,031.65	152.02
2013	CO2-e	19,957,139,248.65	9,978,569.62	
	VOC	316,473.15	158.24	
2014	CO2-e	29,843,639,301.12	14,921,819.65	
	VOC	484,274.25	242.14	
2015	CO2-e	27,300,145,346.85	13,650,072.67	
	VOC	440,629.42	220.31	
06100004	2006	VOC	193,378.00	96.69
	2007	VOC	190,557.02	95.28
	2008	BENZENE	662.55	0.33
		VOC	137,489.36	68.74
	2009	VOC	94,993.82	47.50
	2010	VOC	132,806.75	66.40
	2011	BENZENE	726.46	0.36
		VOC	133,135.18	66.57
	2012	CO2-e	17,151,721,466.97	8,575,860.73
		VOC	135,248.01	67.62
	2013	CO2-e	18,235,581,488.90	9,117,790.74
		VOC	141,738.58	70.87
	2014	CO2-e	17,274,535,348.67	8,637,267.67
		VOC	134,347.69	67.17
	2015	CO2-e	16,147,750,410.25	8,073,875.21

Point source air emissions by facility

Find the types and quantities of air pollutants emitted by a specified facility, also referred to as a "point source."

Use the filters below to access air emissions data for criteria air pollutants, air toxics and greenhouse gases released in Minnesota.

[Download the data](#)

Year: (All) |
 Facility name: Xcel Energy - Allen S K... |
 Facility ID: 16300005 |
 County: WASHINGTON |
 Industry Type: Utilities |
 Pollutant: (All)

Map

(Select a point on the map to filter. Click again to show all values.)



Facility name	Facility ID	Year	Pollutant	Emissions (lb)
Xcel Energy - Allen S King Generating Plant	16300005	2006	CO	502,061
			LEAD	127
			NOX	14,206,811
			PM10-PRI	936,760
			PM-PRI	953,533
			SO2	28,722,360
			VOC	238,462
		2007	CO	260,834
			LEAD	48
			NOX	7,805,262
			PM10-PRI	441,714
			PM-PRI	457,620
			SO2	5,097,987
			VOC	52,600
2008	ACENAPHTHEN	0		
	ACENAPHTHYL	0		
	ACETALDEHYDE	99		
	ACETONE	34		
	ACETOPHENONE	37		
	ACROLEIN	60		
	AMMONIA	53,985		
	ANTHRACENE	0		
	ANTIMONY	2		
	ARSENIC	15		
	BENZ(A)ANTHR	0		
	BENZ(BK)FL	0.00		
	BENZ(GHI)PE	0.05		
	BENZALDEHYDE	131.05		
BENZENE	122.06			
BENZO(A)PYRE	0.06			
BENZO(B)FLUO	0.00			

- (All)
 - ACENAPHTHEN
 - ACENAPHTHYL
 - ACETALDEHYDE
 - ACETONE
 - ACETONITRILE
 - ACETOPHENONE
 - ACROLEIN
 - ALLYL CHLORI
 - AMMONIA
 - ANTHRACENE
 - ANTIMONY
 - ARSENIC
 - BENZ(A)ANTHR
 - BENZ(BK)FL
 - BENZ(GHI)PE
 - BENZALDEHYDE
 - BENZENE
 - BENZO(A)PYRE
 - BENZO(B)FLUO
 - BENZO(E)PYRE
 - BENZO(J)FLUO
 - BENZO(K)FLUO
 - BENZOFLUO
 - BENZYL CHLOR
 - BERYLLIUM
 - BIPHENYL
- Cancel Apply

Point source air emissions by facility

Find the types and quantities of air pollutants emitted by a specified facility, also referred to as a "point source."

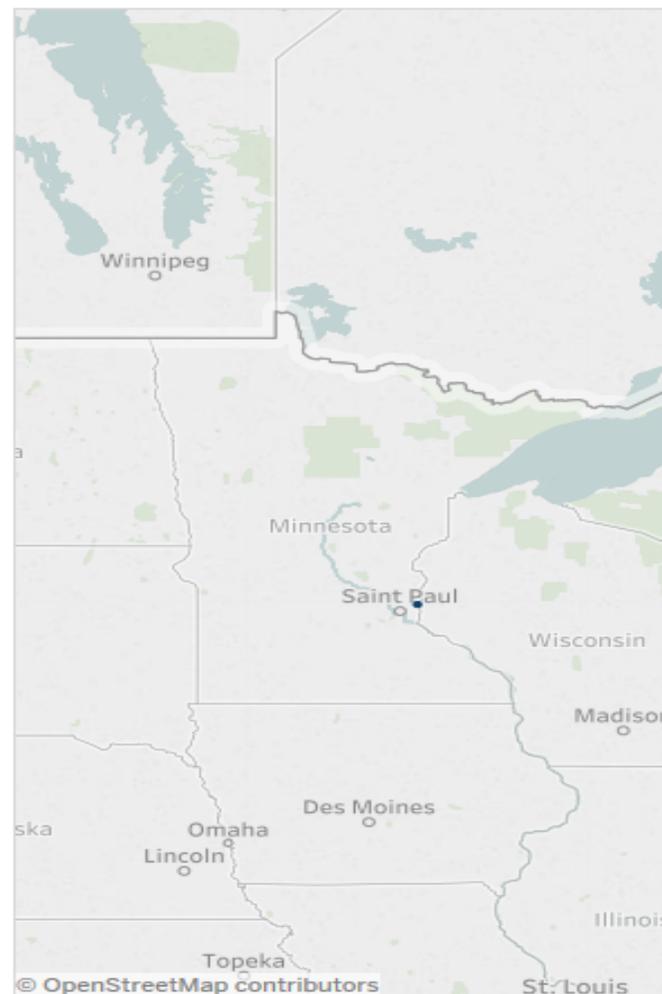
Use the filters below to access air emissions data for criteria air pollutants, air toxics and greenhouse gases released in Minnesota.

[Download the data](#)

Year (All) ▼	Facility name Xcel Energy - Allen S K... ▼	Facility ID 16300005 ▼	County WASHINGTON ▼	Industry Type Utilities ▼	Pollutant (Multiple values) ▼
-----------------	---	---------------------------	------------------------	------------------------------	----------------------------------

Map

(Select a point on the map to filter. Click again to show all values.)



Facility name	Facility ID	Year	Pollutant	Emissions (LB)	Emissions (Tons)
Xcel Energy - Allen S King Generating Plant	16300005	2006	VOC	238,462.81	119.23
		2007	VOC	52,600.31	26.30
		2008	BENZENE	122.06	0.06
			VOC	199,064.29	99.53
		2009	VOC	215,307.92	107.65
		2010	VOC	216,861.98	108.43
		2011	BENZENE	128.41	0.06
			VOC	207,681.85	103.84
		2012	CO2-e	7,195,501,209.88	3,597,750.60
			VOC	203,797.40	101.90
		2013	CO2-e	5,493,016,491.71	2,746,508.25
			VOC	157,181.12	78.59
		2014	CO2-e	6,502,182,349.67	3,251,091.17
			VOC	185,771.87	92.89
		2015	CO2-e	6,659,421,382.97	3,329,710.69
			VOC	186,050.40	93.03

Point source air emissions by pollutant

Compare the total amount of a single air pollutant emitted by a facility (also referred to as a "point source") across multiple years. Use the filters below to access air emissions data for criteria air pollutants, air toxics and greenhouse gases released in Minnesota.

[Download the data](#)

Choose a pollutant
NOX

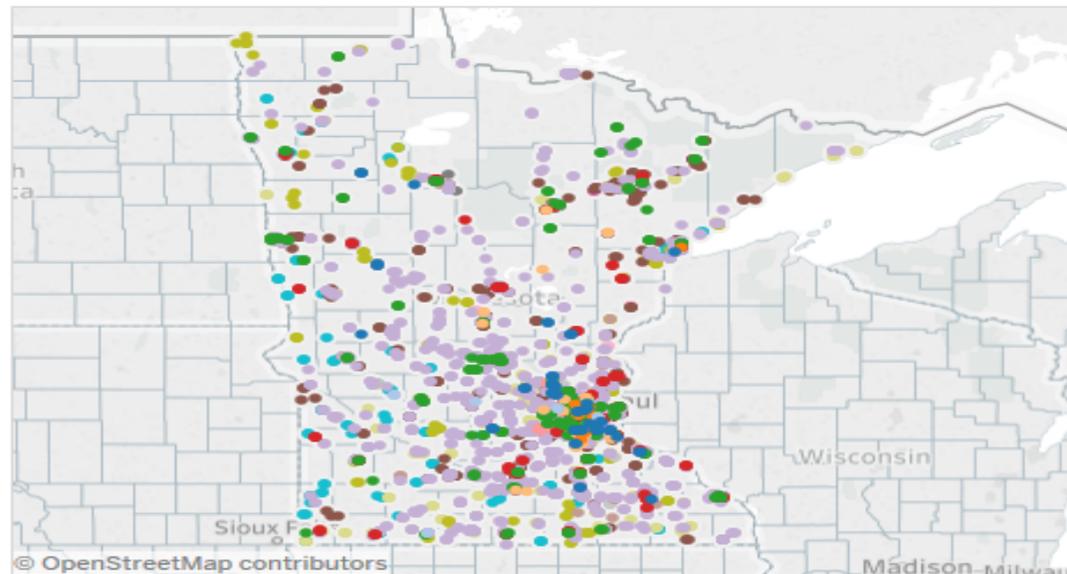
Year
(All)

County
(All)

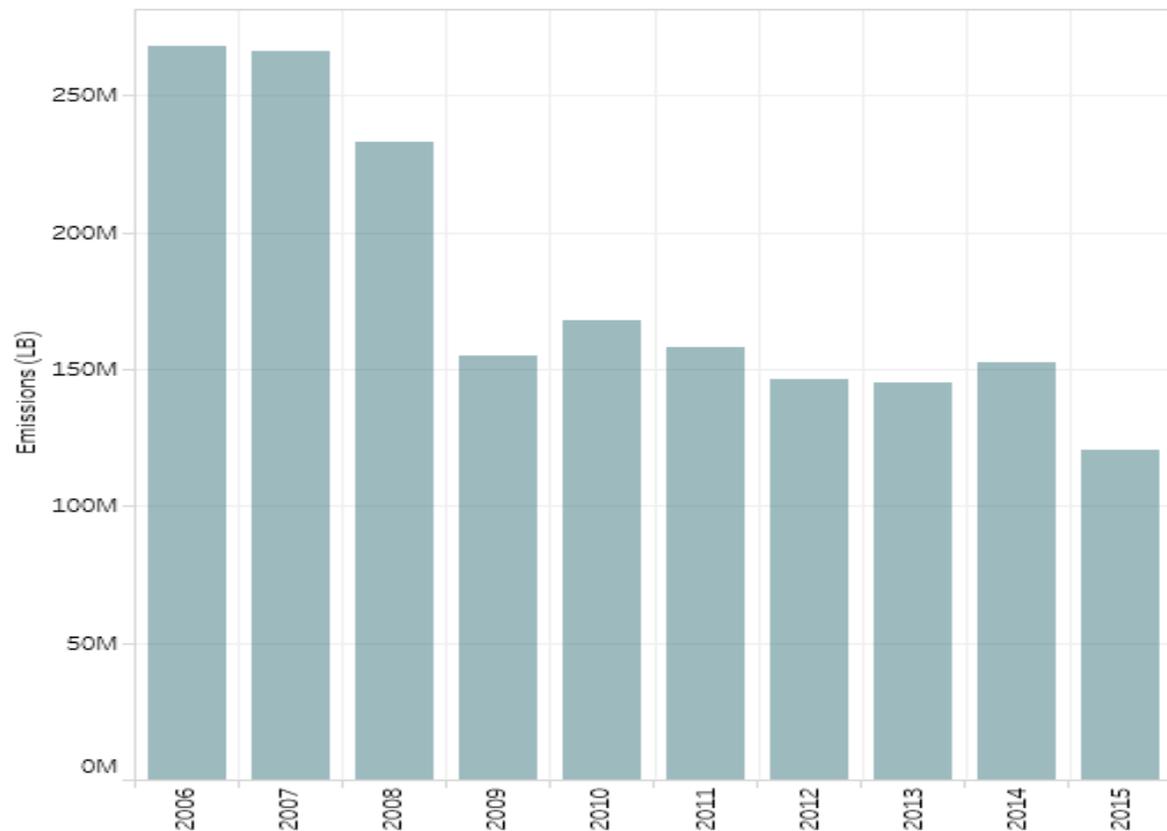
Facility name
(All)

Facility ID
(All)

Map (Select point on map to filter bar chart. Click again to show all values.)



Annual emission totals, NOX



Industry type (Click to filter by industry type. Click again to show all values.)

- Administrative and Support and Waste Management and Remediation Services
- Agriculture, Forestry, Fishing and Hunting
- Arts, Entertainment, and Recreation
- Construction
- Educational Services
- Finance and Insurance
- Health Care and Social Assistance
- Information
- Management of Companies and Enterprises
- Manufacturing
- Mining, Quarrying, and Oil and Gas Extraction
- Other Services (except Public Administration)
- Professional, Scientific, and Technical Services
- Public Administration
- Real Estate and Rental and Leasing
- Retail Trade
- Transportation and Warehousing
- Utilities**
- Wholesale Trade

Point source air emissions by pollutant

Compare the total amount of a single air pollutant emitted by a facility (also referred to as a "point source") across multiple years. Use the filters below to access air emissions data for criteria air pollutants, air toxics and greenhouse gases released in Minnesota.

[Download the data](#)

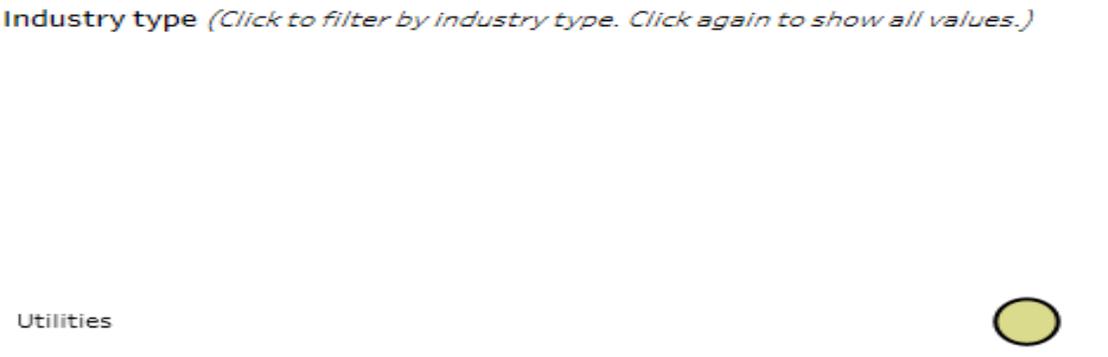
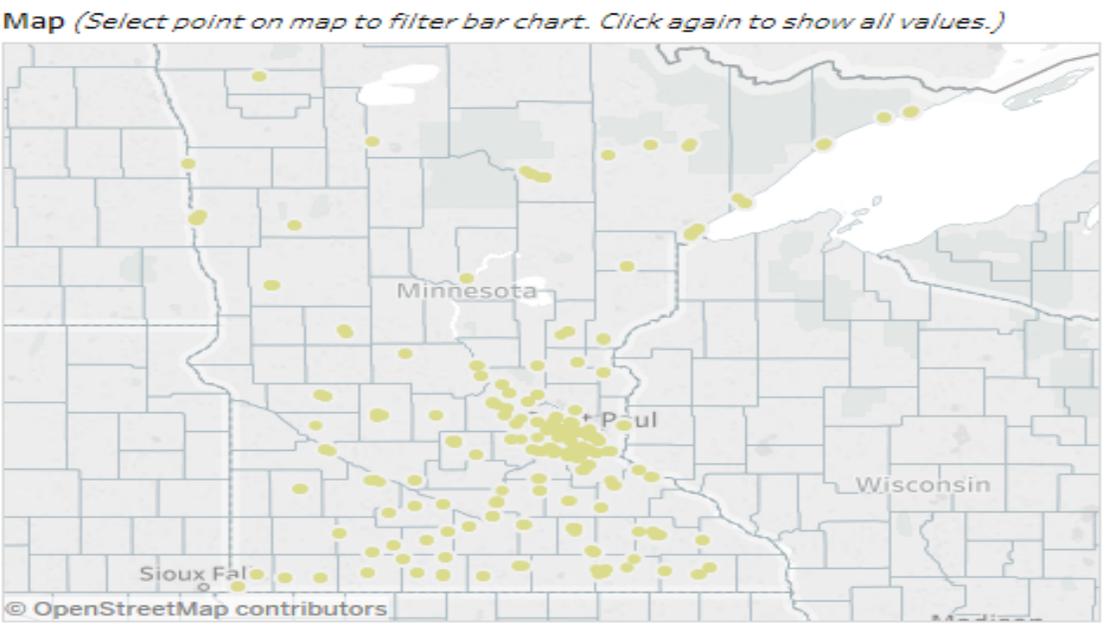
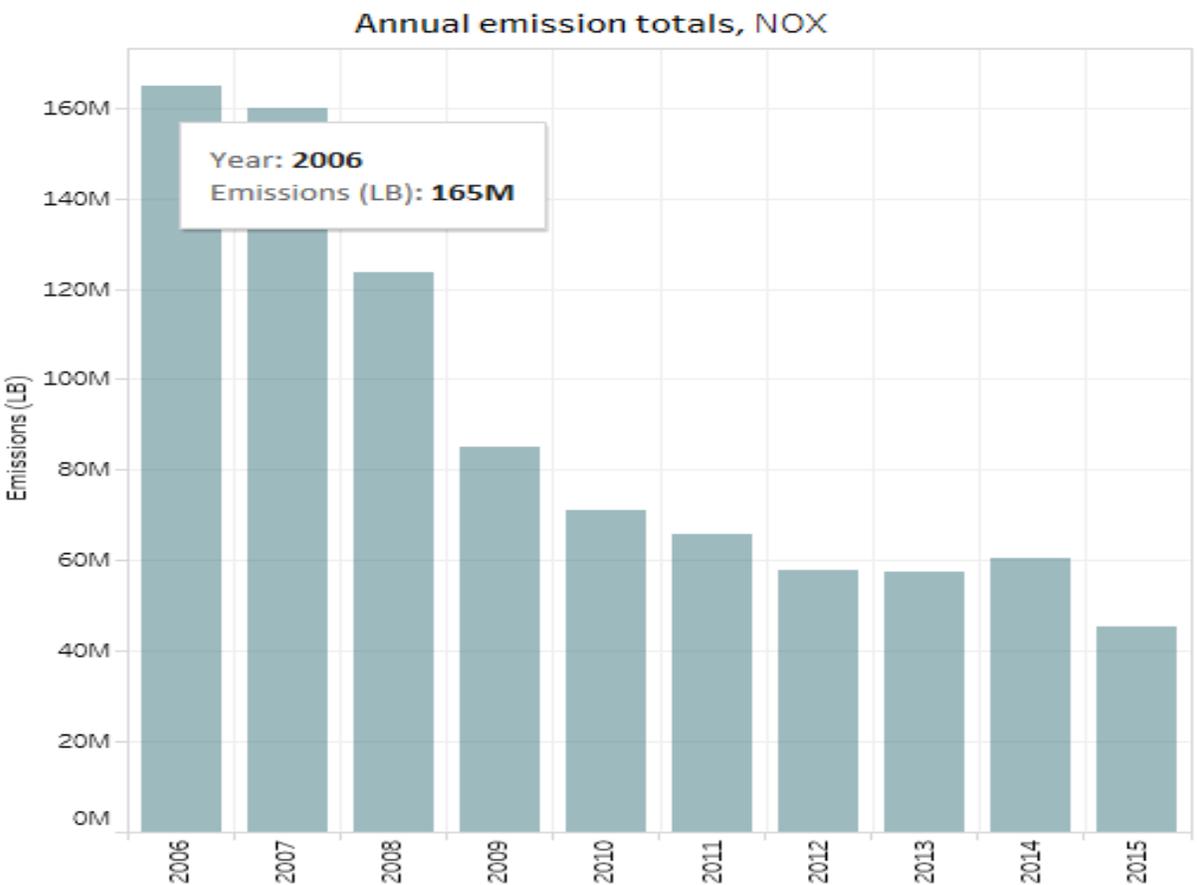
Choose a pollutant
NOX

Year
(All)

County
(All)

Facility name
(All)

Facility ID
(All)

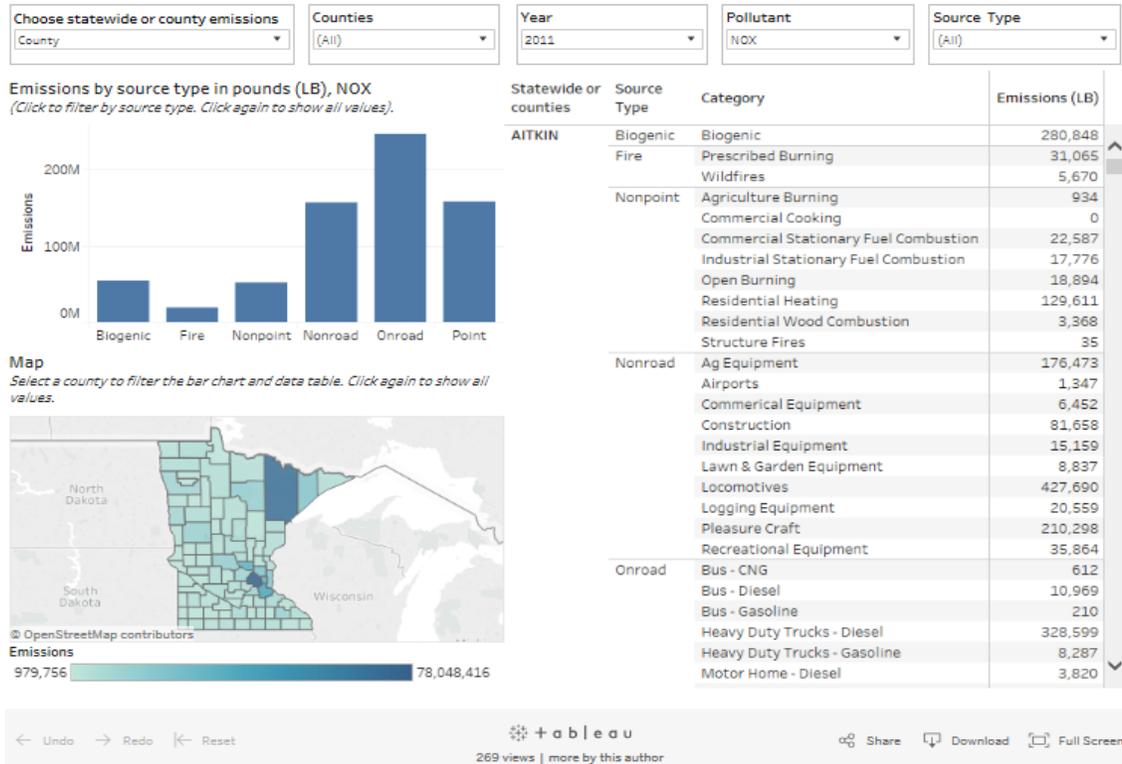


Statewide and county emissions

Statewide and county air emissions

Statewide and county criteria air pollutant and air toxic emissions for 2008 and 2011

Criteria air pollutant and air toxic emission totals are available below by a single air pollutant. Please select 'Statewide' or 'County' under 'Choose statewide or county emissions' to look at data. Use other filters to see the breakdown of emissions for 2008 and 2011. To view 'Statewide' or 'County' data at the Source Classification Code (SCC) level please visit http://files.pca.state.mn.us/pub/file_requests/datasets/Air/ and see AirEmissionsInventory.zip



- MPCA estimates statewide emission inventory every three years.

- This work book contains both statewide and county emissions for criteria and air toxic pollutants
- Emissions are available for 2008 and 2011

Statewide and county criteria air pollutant and air toxic emissions for 2008 and 2011

Criteria air pollutant and air toxic emission totals are available below by a single air pollutant. Please select '*Statewide*' or '*County*' under '*Choose statewide or county emissions*' to look at data. Use other filters to see the breakdown of emissions for 2008 and 2011. To view '*Statewide*' or '*County*' data at the Source Classification Code (SCC) level please visit http://files.pca.state.mn.us/pub/file_requests/datasets/Air/ and see AirEmissionsInventory.zip

Choose statewide or county emissions

County ▼

Counties

(All) ▼

Year

2011 ▼

Pollutant

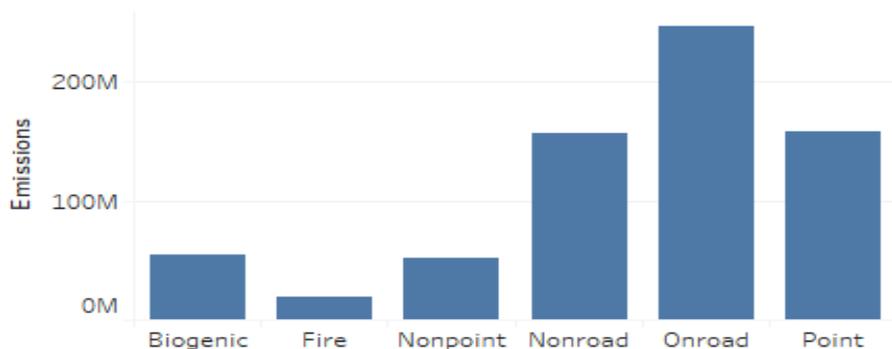
NOX ▼

Source Type

(All) ▼

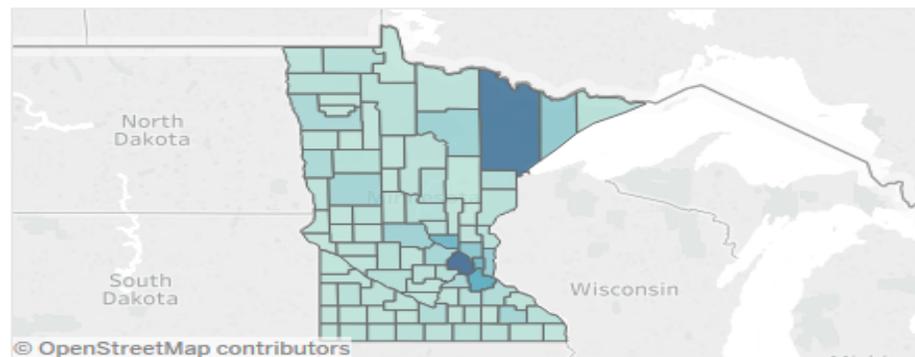
Emissions by source type in pounds (LB), NOX

(Click to filter by source type. Click again to show all values).



Map

Select a county to filter the bar chart and data table. Click again to show all values.



© OpenStreetMap contributors

Emissions: 979,756 78,048,416

Statewide or counties	Source Type	Category	Emissions (LB)			
AITKIN	Biogenic	Biogenic	280,848			
		Fire	Prescribed Burning	31,065		
			Wildfires	5,670		
	Nonpoint	Nonpoint	Agriculture Burning	934		
			Commercial Cooking	0		
			Commercial Stationary Fuel Combustion	22,587		
			Industrial Stationary Fuel Combustion	17,776		
			Open Burning	18,894		
			Residential Heating	129,611		
			Residential Wood Combustion	3,368		
			Structure Fires	35		
			Nonroad	Nonroad	Ag Equipment	176,473
					Airports	1,347
	Commerical Equipment	6,452				
	Construction	81,658				
Industrial Equipment	15,159					
Onroad	Onroad	Lawn & Garden Equipment	8,837			
		Locomotives	427,690			
		Logging Equipment	20,559			
		Pleasure Craft	210,298			
		Recreational Equipment	35,864			
		Bus - CNG	612			
		Bus - Diesel	10,969			
		Bus - Gasoline	210			
		Heavy Duty Trucks - Diesel	328,599			
		Heavy Duty Trucks - Gasoline	8,287			
Motor Home - Diesel	3,820					

Statewide and county criteria air pollutant and air toxic emissions for 2008 and 2011

Criteria air pollutant and air toxic emission totals are available below by a single air pollutant. Please select 'Statewide' or 'County' under 'Choose statewide or county emissions' to look at data. Use other filters to see the breakdown of emissions for 2008 and 2011. To view 'Statewide' or 'County' data at the Source Classification Code (SCC) level please visit ftp://files.pca.state.mn.us/pub/file_requests/datasets/Air/ and see AirEmissionsInventory.zip

Choose statewide or county emissions

County ▼

Counties

(All) ▼

Year

2011 ▼

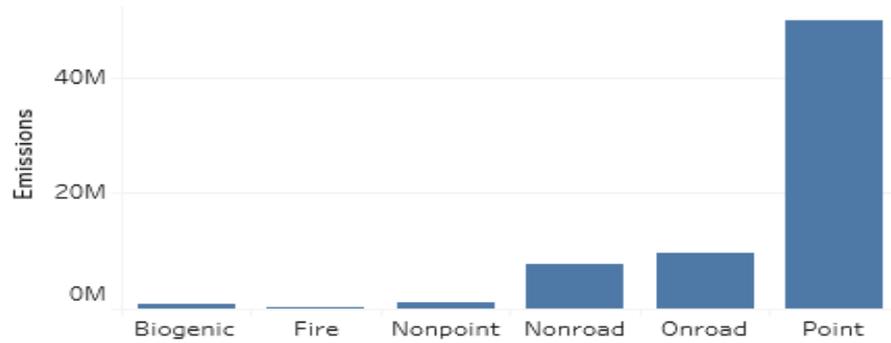
Pollutant

NOX ▼

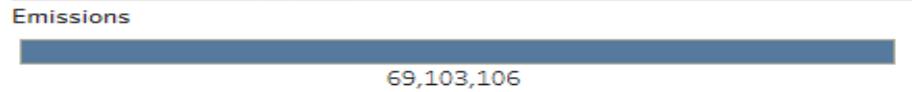
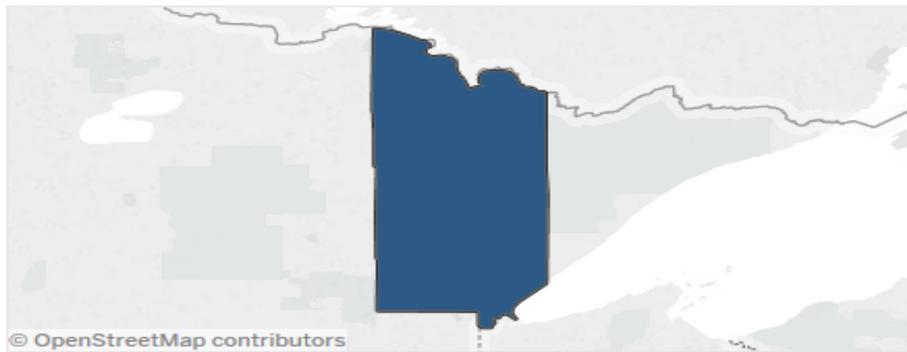
Source Type

(All) ▼

Emissions by source type in pounds (LB), NOX
(Click to filter by source type. Click again to show all values).



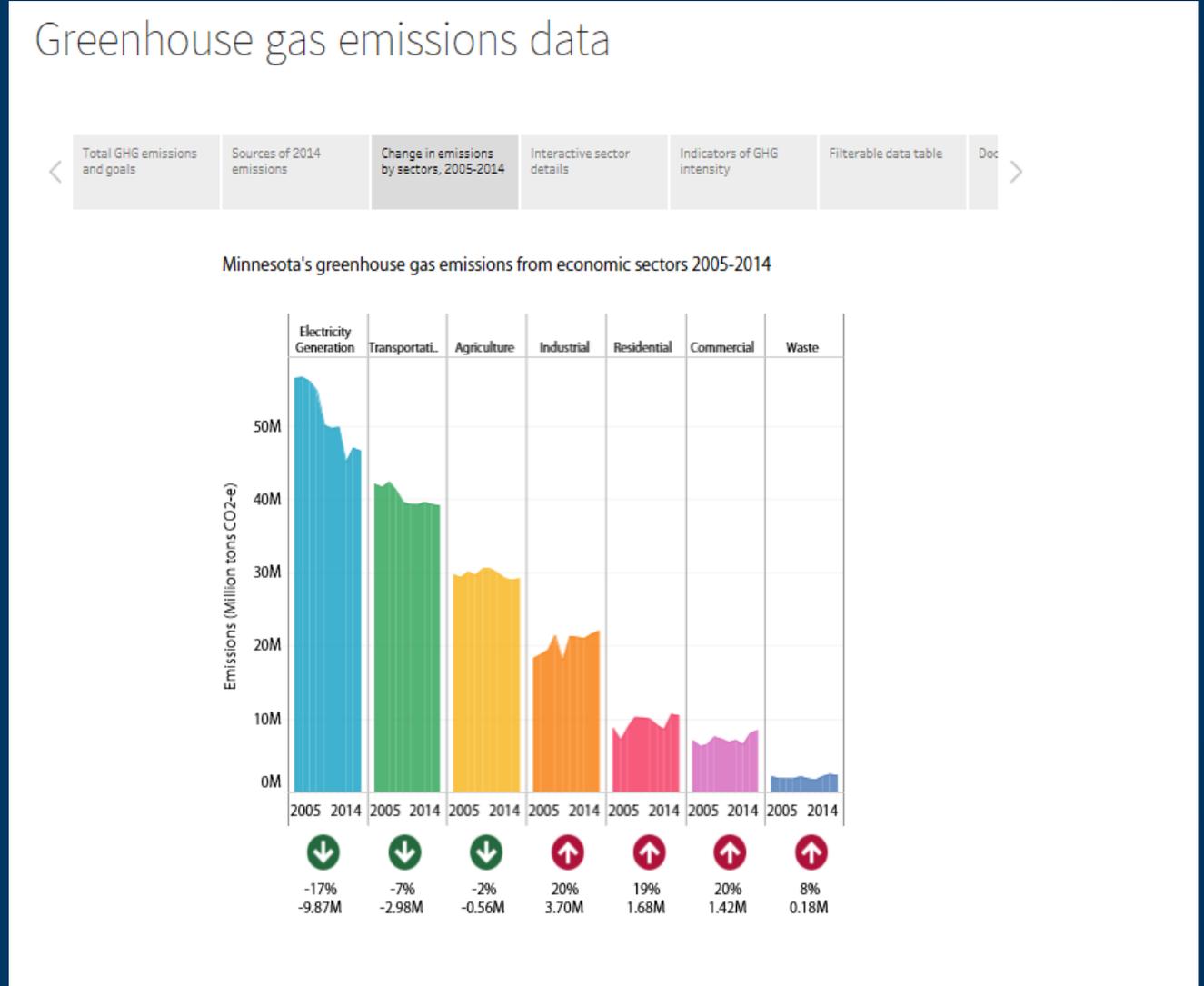
Map
Select a county to filter the bar chart and data table. Click again to show all values.



Statewide or counties	Source Type	Category	Emissions (LB)
Onroad		Airports	81,443
		Commercial Marine	806,759
		Commerical Equipment	147,120
		Construction	546,486
		Industrial Equipment	163,891
		Lawn & Garden Equipment	73,800
		Locomotives	4,639,985
		Logging Equipment	93,850
		Pleasure Craft	716,492
		Recreational Equipment	139,191
		Bus - CNG	7,790
		Bus - Diesel	109,106
		Bus - Gasoline	888
		Heavy Duty Trucks - Diesel	3,041,555
		Heavy Duty Trucks - Gasoline	59,538
		Motor Home - Diesel	41,093
Motor Home - Gasoline	50,894		
Motorcycles	21,192		
Passenger Cars - Diesel	11,749		
Passenger Cars - Gasoline	2,113,640		
Passenger/Light Duty Trucks - Diesel	182,386		
Passenger/Light Duty Trucks - Gasoline	4,006,820		
Point		Commercial	73,513
		Electric Generation	4,670,581
		Industrial	477,113
		Industrial Processes	44,585,473
		Other	5,942

Greenhouse gas emissions

- Greenhouse gas workbook provides a summary of statewide greenhouse gas emissions in MN
- Emissions data trends are available from 1990 to 2014
- Emissions are estimated for electric generation, transportation, agriculture, industrial, residential, commercial and waste sectors



Data download option



Point source air emissions by pollutant

Compare the total amount of a single air pollutant emitted by a facility (also referred to as a "point source") across multiple years. Use the filters below to access air emissions data for criteria air pollutants, air toxics and greenhouse gases released in Minnesota.

[Download the data](#)

Choose a pollutant: NOX

Year: (All) Facility name: (All)

County: (All) Facility ID: (All)

Annual emission totals, NOX

Map (Select point on map to filter bar chart. Click again to show all values.)

Industry type (Click to filter by industry type. Click again to show all values.)

- Administrative and Support and Waste Management and Remediation Services
- Agriculture, Forestry, Fishing and Hunting

- Each workbook has 'data download' option
 - Raw data
 - SCC (source classification code) level data for detailed analysis

YEAR	FACILITY_ID	FACILITY_NAME	INDUSTRY_TYPE	POLLUTANT	COUNTY	ZIP	EMISSIONS (LB)	EMISSIONS (TONS)
2015	00100007	ISD 002 - Hill City School	Educational Services	CO	AITKIN	55748	25.08	0.01254
2015	00100007	ISD 002 - Hill City School	Educational Services	NOX	AITKIN	55748	43.48	0.02174
2015	00100007	ISD 002 - Hill City School	Educational Services	PM-PRI	AITKIN	55748	0.1639	0.00008195
2015	00100007	ISD 002 - Hill City School	Educational Services	PM25-PRI	AITKIN	55748	0.1338	0.0000669
2015	00100007	ISD 002 - Hill City School	Educational Services	PM10-PRI	AITKIN	55748	0.1639	0.00008195
2015	00100007	ISD 002 - Hill City School	Educational Services	SO2	AITKIN	55748	0.0669	0.00003345
2015	00100007	ISD 002 - Hill City School	Educational Services	VOC	AITKIN	55748	3.346	0.001673
2015	00100007	ISD 002 - Hill City School	Educational Services	AMMONIA	AITKIN	55748	0	0
2015	00100007	ISD 002 - Hill City School	Educational Services	LEAD	AITKIN	55748	0	0
2015	00100007	ISD 002 - Hill City School	Educational Services	CO2-e	AITKIN	55748	42,129.08	21
2015	00100021	Timberland LSL	Manufacturing	CO	CROW WING	56431	0	0
2015	00100021	Timberland LSL	Manufacturing	NOX	CROW WING	56431	0	0
2015	00100021	Timberland LSL	Manufacturing	PM-PRI	CROW WING	56431	23200	11.6
2015	00100021	Timberland LSL	Manufacturing	PM25-PRI	CROW WING	56431	19252	9.626
2015	00100021	Timberland LSL	Manufacturing	PM10-PRI	CROW WING	56431	23200	11.6
2015	00100021	Timberland LSL	Manufacturing	SO2	CROW WING	56431	0	0
2015	00100021	Timberland LSL	Manufacturing	VOC	CROW WING	56431	12100	6.05
2015	00100021	Timberland LSL	Manufacturing	AMMONIA	CROW WING	56431	0	0
2015	00100021	Timberland LSL	Manufacturing	LEAD	CROW WING	56431	0	0
2015	00100021	Timberland LSL	Manufacturing	CO2-e	CROW WING	56431	2,000.00	1
2015	00100022	Rocon Paving	Manufacturing	CO	AITKIN	56350	2811.64	1.40582
2015	00100022	Rocon Paving	Manufacturing	NOX	AITKIN	56350	2417.98	1.20899
2015	00100022	Rocon Paving	Manufacturing	PM-PRI	AITKIN	56350	245.386	0.122695
2015	00100022	Rocon Paving	Manufacturing	PM25-PRI	AITKIN	56350	49.4876	0.0247438
2015	00100022	Rocon Paving	Manufacturing	PM10-PRI	AITKIN	56350	274.676	0.137338
2015	00100022	Rocon Paving	Manufacturing	SO2	AITKIN	56350	3217.2	1.6086

Tableau limitations

- No statistical capabilities
- No predictive capabilities
- Individual license
- Limitations with data download, it leaves data interpretation to the individual user which may differ than the original intent
- Off the shelf product, limitations to customizing it to the exact needs of user
- Learning curve

Thank you!

Azra Kovacevic

azra.kovacevic@state.mn.us

651-757-2505