

Priority Sector Model (PriSM)

**A model to identify and prioritize manufacturing sectors for
pollution prevention (P2) programs**

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**New York State
Pollution Prevention Institute**

**Rochester Institute of Technology
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Overview

1. Context for the Model: What is the NYSP2I charged with doing?
2. The Priority Sector Model (PriSM)
3. Examples of Model Usage
 - a. Drill-down to identify specific companies
 - b. Regional or State-wide impact

New York State Pollution Prevention Institute (NYSP2I)

Vision & Mission

Vision:

The vision of the NYS P2I is to foster the transformation and development of sustainable businesses and organizations in New York State in a collaborative program committed to making the State a leader in environmental stewardship.

Mission:

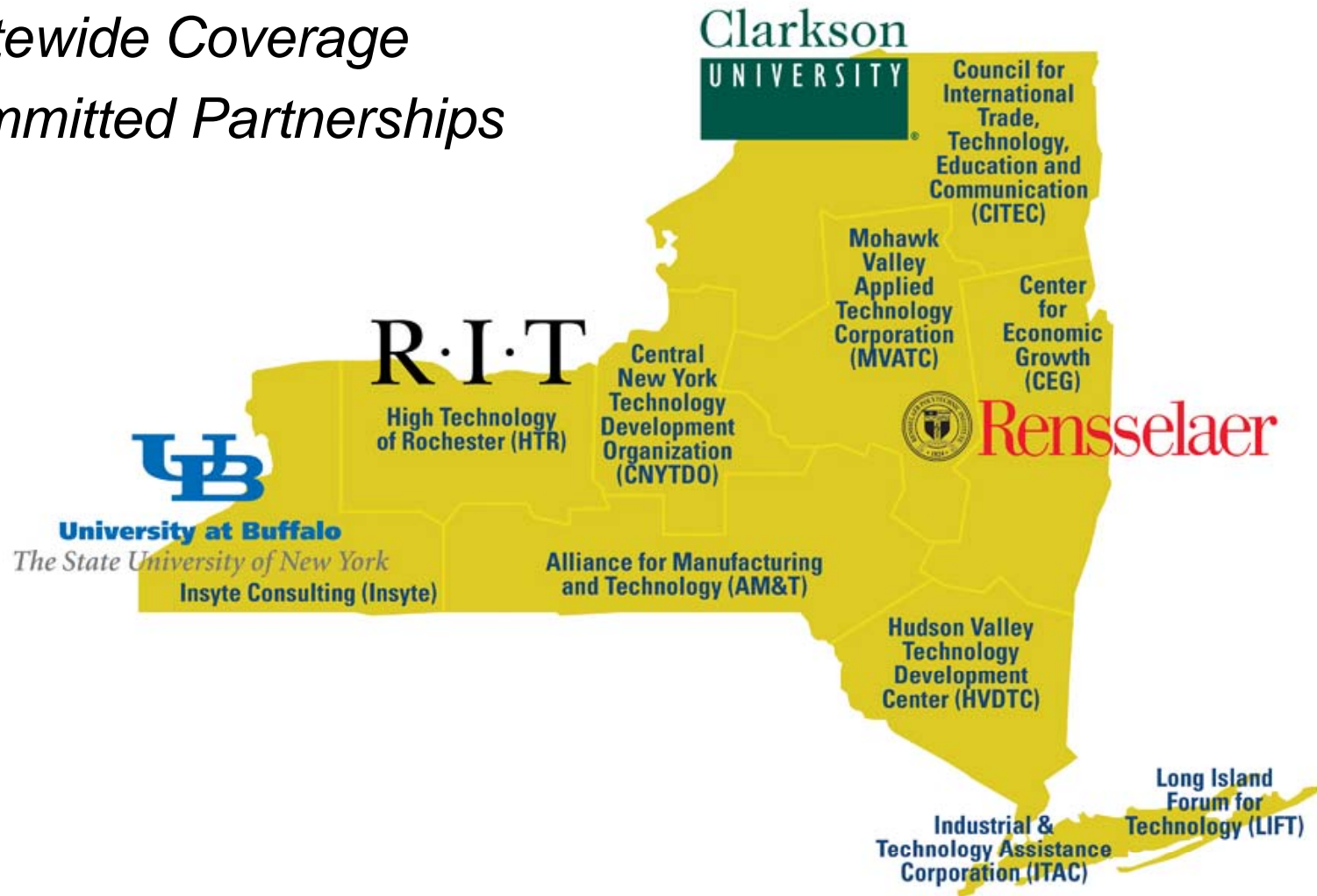
The mission of the Institute is to provide a high-impact, comprehensive and integrated program of technology research development and diffusion, outreach, training and education aimed at making New York State more sustainable for workers, the public, the environment and the economy through:

- reductions in toxic chemical use
- reductions in emissions to the environment and waste generation
- the efficient use of raw materials, energy and water



New York State Pollution Prevention Institute (NYSP2I)

- *Statewide Coverage*
- *Committed Partnerships*



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NYSP2I

Research & Development

- Led by Technical Advisory Committee (TAC)
- Four Partner Universities:
 - Clarkson
 - RIT
 - RPI
 - University at Buffalo
- Short & Long-term research

Direct Assistance

- Facilitate the use of P2 for solving environmental problems
 - Assessment & Implementation
 - LE2: Lean/Energy/Environment

Community Grants

- Provide financial & technical support to community organizations
 - Raise awareness & understanding of P2

Professional Training/ Outreach

- Workshops & Training conducted for clients
 - Areas of interest for stakeholders
 - Specific Training
 - Design for the Environment & Life-Cycle Assessment

Sector Projects

- Projects that have the potential to impact NYS on a high level
 - Dry Cleaning
 - Hospitality
 - E-waste
 - Auto body shops



Tangible results towards...

...a sustainable New York!



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So what is PriSM?

The Priority Sector Model (PriSM):

1. Is a data-based industry sector prioritizing mathematical model that utilizes environmental and economic data (for manufacturing sectors only)
2. Provides guidance on which industry sectors to focus Pollution Prevention (P2) and sustainability efforts
3. Is a low- to medium-complexity additive model (summation of environmental and economic data, scoring, and ranking)



What is PriSM?

Table I. Hierarchical Framework of Regional Impact Comparison Techniques in the Context of the Degree of Environmental Mechanism Representation

Complexity	Group	Technique description	Fate and exposure measures	Effect measure
Low ↓ High	1	Direct summation of emissions data	None	None
	2	Comparison in terms of effect	None	Selected toxicological measures and/or benchmarks
	3	Scoring and ranking	Selected parameters such as degradation half-life and bioaccumulation measures	Selected toxicological measures and/or benchmarks
	4	Model-based approaches	Integrated model predictions of fate and exposure (intake fractions)	Selected toxicological benchmarks and/or dose-response measures
	5	Site-specific risk assessment	Site-specific fate and exposure estimations using models and/or measurements	Generic or site-specific toxicological benchmarks and/or dose-response measures

Source: Adapted from Pennington and Yue.⁽⁴⁾

Source:

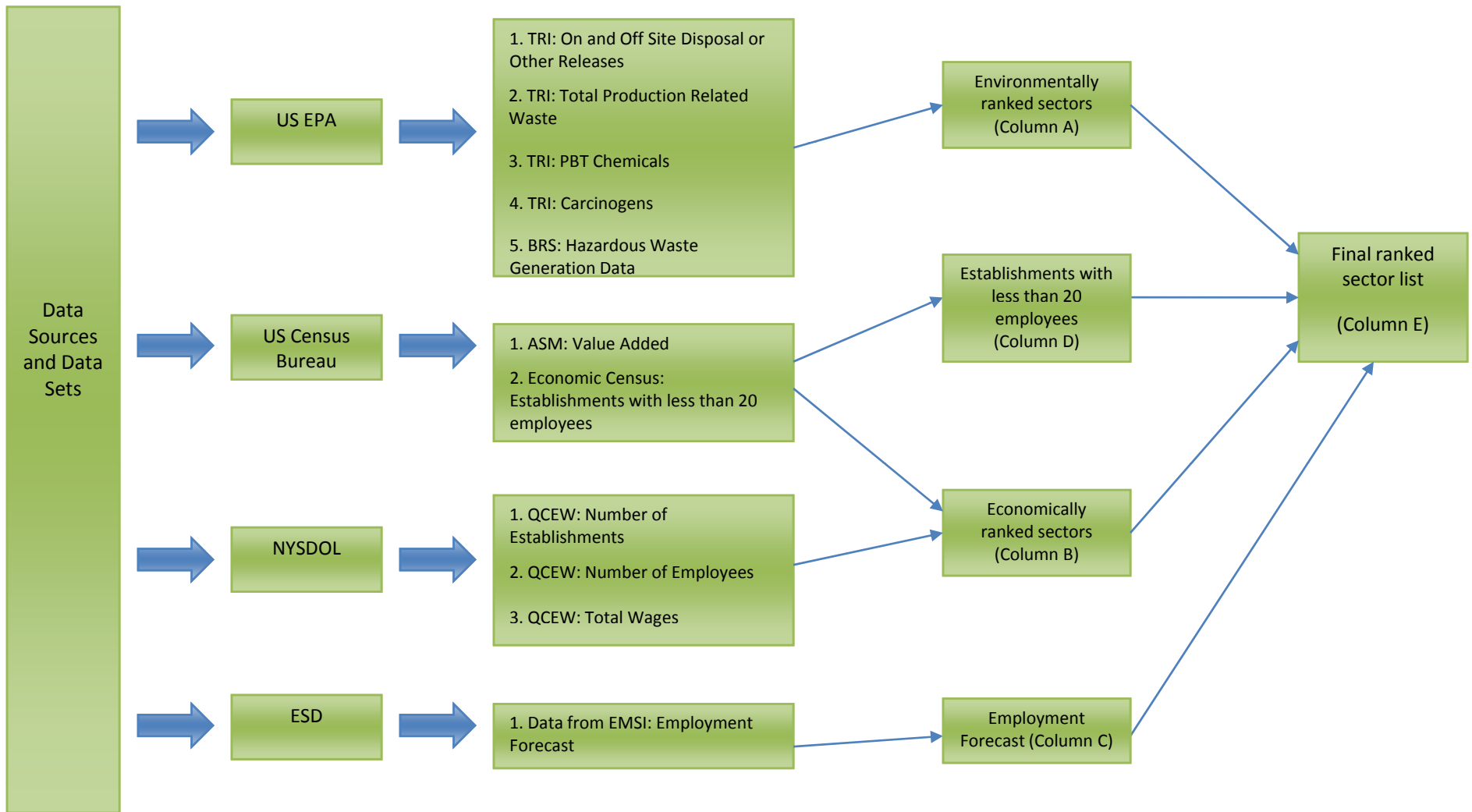
Pennington, D. W. and Bare, J. C. (2001), Comparison of Chemical Screening and Ranking Approaches: The Waste Minimization Prioritization Tool versus Toxic Equivalency Potentials. Risk Analysis, 21: 897. doi: 10.1111/0272-4332.215160

PriSM: Final Output

Rank	NAICS	Description	Environmental Ranking (A)	Economic Ranking (B)	Economic Forecast (C)	# of establishments with < 20 employees (D)	Total (E)
1	325	Chemical manufacturing	3.42	2.82	0.83	0.16	7.24
2	332	Fabricated metal product manufacturing	1.15	3.00	0.77	0.91	5.83
3	311/312	Food, Beverage and Tobacco manufacturing	0.65	2.72	1.00	0.83	5.20
4	334	Computer and electronic product manufacturing	1.73	2.48	0.69	0.25	5.15
5	331	Primary metal manufacturing	3.72	0.48	0.66	0.06	4.92
6	339	Miscellaneous manufacturing	0.10	2.40	0.63	1.00	4.14
7	333	Machinery manufacturing	0.23	2.09	0.86	0.32	3.49
8	323	Printing and related support activities	0.04	1.94	0.34	0.88	3.20
9	326	Plastics and rubber product manufacturing	1.36	1.06	0.46	0.15	3.03
10	327	Nonmetallic mineral product manufacturing	0.83	0.88	0.74	0.25	2.71
11	335	Electrical equipment and appliance manufacturing	1.06	0.76	0.57	0.10	2.49
12	322	Paper manufacturing	1.58	0.73	0.09	0.07	2.46
13	337	Furniture and related product manufacturing	0.02	1.12	0.72	0.52	2.38
14	315	Apparel manufacturing	0.00	1.03	0.57	0.49	2.10
15	324	Petroleum and coal products manufacturing	1.17	0.13	0.72	0.07	2.08
16	336	Transportation equipment manufacturing	0.32	1.35	0.23	0.12	2.03
17	321	Wood product manufacturing	0.00	0.48	0.72	0.21	1.41
18	314	Textile product mills	0.00	0.38	0.37	0.22	0.97
19	316	Leather and allied product manufacturing	0.01	0.11	0.60	0.06	0.78
20	313	Textile mills	0.03	0.20	0.00	0.10	0.32



PriSM Data Map



PriSM: How does it work?

TRI - Total On and Off Site Disposal and Releases

NAICS	Description	Total On and Off Site Disp. & Other Rel. (lbs)	Relative to largest
311	Food Manufacturing	1,222,214	0.2203
312	Beverage and Tobacco Product Manufacturing	2,224,069	0.4008
313	Textile Mills	129,428	0.0233
314	Textile Product Mills	461	0.0001
316	Leather and Allied Product Manufacturing	11,747	0.0021
321	Wood Product Manufacturing	39,592	0.0071
322	Paper Manufacturing	1,421,228	0.2561
323	Printing and Related Support Activities	316,648	0.0571
324	Petroleum and Coal Products Manufacturing	80,116	0.0144
325	Chemical Manufacturing	5,548,817	1.0000
326	Plastics and Rubber Products Manufacturing	601,424	0.1084
327	Nonmetallic Mineral Product Manufacturing	1,130,236	0.2037
331	Primary Metal Manufacturing	3,030,161	0.5461
332	Fabricated Metal Product Manufacturing	698,789	0.1259
333	Machinery Manufacturing	155,080	0.0279
334	Computer and Electronic Product Manufacturing	3,844,941	0.6929
335	Electrical Equipment, Appliance, and Component Manufacturing	526,085	0.0948
336	Transportation Equipment Manufacturing	145,335	0.0262
337	Furniture and Related Product Manufacturing	95,092	0.0171
339	Miscellaneous Manufacturing	501,756	0.0904



Environmental Rankings

NAICS	Description	Toxics Release Inventory (TRI)					Hazardous Waste Gen. (RCRA)	Total
		On and Off Site Releases	Toxicity Weighted On and Off Site Releases	Total Production Related Waste	Carcinogens	PBT's		
311	Food manufacturing	0.22	0.00	0.05	0.00	0.00	0.00	0.28
312	Beverage and tobacco product manufacturing	0.40	0.00	0.02	0.00	0.00	0.00	0.42
313	Textile mills	0.02	0.00	0.01	0.00	0.00	0.00	0.04
314	Textile product mills	0.00	0.00	0.00	0.00	0.00	0.00	0.00
315	Apparel manufacturing	0.00	0.00	0.00	0.00	0.00	0.00	0.00
316	Leather and allied product manufacturing	0.00	0.01	0.00	0.02	0.00	0.00	0.03
321	Wood product manufacturing	0.01	0.01	0.00	0.05	0.00	0.00	0.07
322	Paper manufacturing	0.26	0.26	0.10	0.22	0.03	0.00	0.87
323	Printing and related support activities	0.06	0.00	0.04	0.00	0.02	0.00	0.13
324	Petroleum and coal products manufacturing	0.01	0.02	0.00	0.12	0.30	0.00	0.46
325	Chemical manufacturing	1.00	0.23	0.48	1.00	0.27	0.08	3.06
326	Plastics and rubber products manufacturing	0.11	0.04	0.01	0.52	0.16	0.00	0.84
327	Nonmetallic mineral product manufacturing	0.20	0.16	0.06	0.07	1.00	0.00	1.50
331	Primary metal manufacturing	0.55	1.00	1.00	0.76	0.77	0.02	4.09



Example 1: Drill-down

Which company ranked highest in terms of ‘Total Releases’ in the Chemical Manufacturing Industry in NYS?

and

Which company ranked highest in terms of ‘Toxicity – weighted Total Releases’ in the Chemical Manufacturing Industry in NYS?

3 Digit NAICS	6 Digit NAICS	NAICS Definition	Chemical Name	Facility Name	Total On and Off site Releases
325		Chemical Manufacturing			
	325992	Photographic Film, Paper, Plate, and Chemical Manufacturing	NITRATE COMPOUNDS	EASTMAN KODAK CO KODAK PARK	1400000
				CHAMPION PHOTOCHEMISTRY INC	72
			HYDROCHLORIC ACID (1995 AND AFTER "ACID AEROSOLS" ONLY)	EASTMAN KODAK CO KODAK PARK	740000
			SULFURIC ACID (1994 AND AFTER "ACID AEROSOLS" ONLY)	EASTMAN KODAK CO KODAK PARK	370250
	325211	Plastics Material and Resin Manufacturing	CARBON DISULFIDE	3M CO - TONAWANDA	386604
			TOLUENE	GE NORLY LLC	111255
				SI GROUP INC	505
			PHENOL	SI GROUP INC	71205
				DUREZ NIAGARA	19543
				GE NORLY LLC	2550
				SAINT-GOBAIN NIAGARA FALLS	650
	325212	Synthetic Rubber Manufacturing	COPPER COMPOUNDS	MPM SILICONES LLC	104750
			NITRATE COMPOUNDS	MPM SILICONES LLC	100010
			ZINC COMPOUNDS	MPM SILICONES LLC	59800
			TOLUENE	MPM SILICONES LLC	52750
			CHLOROMETHANE	MPM SILICONES LLC	43660
			HYDROCHLORIC ACID (1995 AND AFTER "ACID AEROSOLS" ONLY)	MPM SILICONES LLC	30900
	325199	All Other Basic Organic Chemical Manufacturing	ZINC COMPOUNDS	ARCH CHEMICALS INC	140507
				ARKEMA INC.	178
			METHYL ISOBUTYL KETONE	EVANS CHEMETICS LP	59421
			MANGANESE COMPOUNDS	FLEURCHEM INC.	26000



3 Digit NAICS	6 Digit NAICS	NAICS Definition	Chemical Name	Facility Name	Toxicity Weighted
325					
	325992	Photographic Film, Paper, Plate, and Chemical Manufacturing	CHROMIUM COMPOUNDS(EXCEPT CHROMITE ORE MINED IN THE TRANSVAAL REGION)	EASTMAN KODAK CO KODAK PARK	1228396752
			SULFURIC ACID (1994 AND AFTER "ACID AEROSOLS" ONLY)	EASTMAN KODAK CO KODAK PARK	666450000
			LEAD COMPOUNDS	EASTMAN KODAK CO KODAK PARK	125232800
			CHLORINE	EASTMAN KODAK CO KODAK PARK	111546000
			HYDROCHLORIC ACID (1995 AND AFTER "ACID AEROSOLS" ONLY)	EASTMAN KODAK CO KODAK PARK	66600000
			HYDROGEN FLUORIDE	EASTMAN KODAK CO KODAK PARK	10920000
	325181	Alkalies and Chlorine Manufacturing	ASBESTOS (FRIABLE)	OCCIDENTAL CHEMICAL CORP NIAGARA PLANT	1000000000
			CHLORINE	OLIN CORP	14154750
				OCCIDENTAL CHEMICAL CORP NIAGARA PLANT	8586000
			HEXACHLOROCYCLOPENTADIENE	OCCIDENTAL CHEMICAL CORP NIAGARA PLANT	1521000
	325199	All Other Basic Organic Chemical Manufacturing	MANGANESE COMPOUNDS	FLEURCHEM INC.	936000000
			ANILINE	GOODYEAR TIRE & RUBBER CO	12033000
			CHLORINE	ARCH CHEMICALS INC	5247000
				NIACET CORP	2250000
				ISOCHEM INC	1746000
	325991	Custom Compounding of Purchased Resins	DIISOCYANATES	HENKEL CORP	180000000
			ANTIMONY COMPOUNDS	HENKEL CORP	88209000
			ZINC COMPOUNDS	HENKEL CORP	177459.6
			LEAD	HENKEL CORP	88484



Example 2: Regional or State-wide impact

What could the true impact be of metal finishing operations in New York State?

and

What does the geographic dispersion of these establishments in New York State look like?



Example 2: Regional or State-wide impact

Q. Companies belonging to which industries are most likely to represent the different types of releases seen in metal finishing operations?

332710 Machine Shops

332721 Precision Turned Product Manufacturing

332812 Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers

332813 Electroplating, Plating, Polishing, Anodizing, and Coloring



Example 2: Regional or State-wide impact

Q. Which chemicals were reported in these four sectors?

CHROMIUM	LEAD COMPOUNDS
CHROMIUM COMPOUNDS(EXCEPT CHROMITE ORE MINED IN THE TRANSVAAL REGION)	NICKEL
COPPER	NICKEL COMPOUNDS
COPPER COMPOUNDS	NITRATE COMPOUNDS
CYANIDE COMPOUNDS	NITRIC ACID
HYDROCHLORIC ACID (1995 AND AFTER ACID AEROSOLS ONLY)	SULFURIC ACID (1994 AND AFTER ACID AEROSOLS ONLY)
LEAD	TRICHLOROETHYLENE
<u>TOLUENE</u>	ZINC COMPOUNDS



Example 2: Regional or State-wide impact

Q. Using these 16 chemicals as a drag-net, which other manufacturing sectors also report these chemicals?

332116 Metal Stamping
332117 Powder Metallurgy Part Manufacturing
332211 Cutlery and Flatware (except Precious) Manufacturing
332312 Fabricated Structural Metal Manufacturing
332410 Power Boiler and Heat Exchanger Manufacturing
332431 Metal Can Manufacturing
332510 Hardware Manufacturing
332811 Metal Heat Treating
332812 Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers
332813 Electroplating, Plating, Polishing, Anodizing, and Coloring
332992 Small Arms Ammunition Manufacturing
332994 Small Arms Manufacturing
332999 All Other Miscellaneous Fabricated Metal Product Manufacturing
.....
.....
.....

A Lot More!

42 in total.



Example 2: Regional or State-wide impact

Q. Specifically looking at acids (hydrochloric, sulfuric and nitric) which manufacturing sectors are represented and what is the statewide dispersion of ALL companies in these sectors?

332431 Metal Can Manufacturing

332710 Machine Shops

332811 Metal Heat Treating

332812 Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers

332813 Electroplating, Plating, Polishing, Anodizing, and Coloring

332999 All Other Miscellaneous Fabricated Metal Product Manufacturing

333315 Photographic and Photocopying Equipment Manufacturing

333319 Other Commercial and Service Industry Machinery Manufacturing

334111 Electronic Computer Manufacturing

334411 Electron Tube Manufacturing

334412 Bare Printed Circuit Board Manufacturing

334413 Semiconductor and Related Device Manufacturing

334417 Electronic Connector Manufacturing

335999 All Other Miscellaneous Electrical Equipment and Component Manufacturing

336412 Aircraft Engine and Engine Parts Manufacturing

339914 Costume Jewelry and Novelty Manufacturing

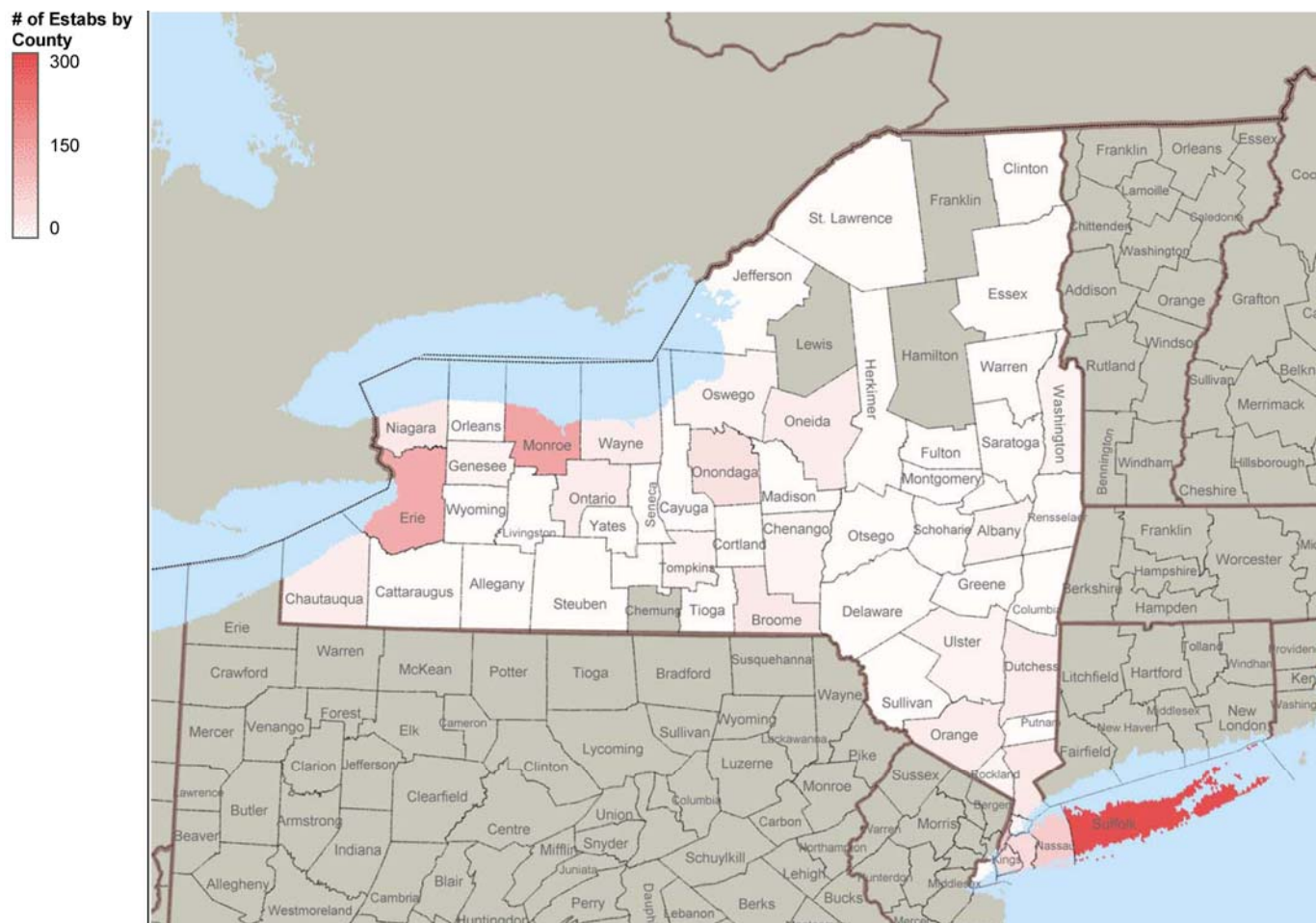


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Example 2: Regional or State-wide impact



Questions

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