## Index

acid gases: see emissions
aluminum
amount in MSW: 80, 83, 114, 153
beverage containers: $81,83,109,114,118,153-156$
energy consumption: $119,154,155$
markets: 155, 156, 196
pollutants from manufacturing: 192, 193
production technologies: 155
recovery, utilization rates: $28,136,153,154,202$
American Newspaper Publishers Association: 105
American Society of Mechanical Engineers: 40
American Society of Testing Materials: 30, 178, 182
ash: 37-39, 217, 222, 247-259
amounts, types: 37, 247
classification as hazardous: $37-39,224,252,258,259$
codisposal: 38-39, 249, 250, 259
composition: 247, 248
Europe, Japan: 222, 247,249, 250, 254,256,258
Extraction Procedure (EP): 250-259
general management: 247-250
household waste exclusion: 37,258
leachate: 250-255
leachate tests, results: 37,38,252-256,258-259
metals: 247, 248, 250-253
regulations: $36-38,224,250,252,254-256,258,259,299,310$
reuse and treatment: $38,39,249,256-258,310$
risks: 254-256
vitrification: 222, 249, 258
ASTSWMO: 290, 307-309
automotive batteries: 31, 157-161
amounts: 87, 157-160
hazardous waste regulations: 159,160
markets for lead: 102, 157, 160, 161, 202
recycling rates: 160,161
avoided costs: $30,31,223,224,351$
awards: see information flow
bans: see interstate transportation, local programs, packaging, plastics, prevention, State programs
batteries: see household or automotive batteries
beverage containers: also see deposit programs, specific materials
amounts, types: 35, 51, 319
Bureau of Mines: 19, 30, 102, 155,299
cadmium: a/so see plastics, household batteries, toxic substances
uses, amounts: 86, 101-104, 107, 156, 191,231,247,248-253, 255
Center for Plastics Recycling Research: 174, 176, 178, 183, 184
CERCLA: see Superfund
Chemical Specialties Manufacturers Association: 104
chlorofluorocarbons: 104, 117, 166, 315

Clean Air Act: also see emissions; 101,217,224,239,242, 243, 292,352
Clean Japan Center: 159,203, 345
Clean Water Act: 101, 172,353
Coalition on Resource Recovery \& the Environment: 249
comporting: also see yard wastes; 10, 81, 124, 184-190, 192, 321,340
backyard comporting: 7,97,98, 124, 126, 185
costs: 188, 189
decomposition process: 184-186
facilities, configurations: 186-189
markets, products: $184,186,187,189,190$
pollutants, operational problems: 187, 188, 192, 193
standards: 189-190
CONEG: 309, 316,317
Conservation Foundation: 50
consumer patterns: $21,49,98,110-112$
disposable income: 78, 111
offices, mailers: 126-128
purchasing choices: $7,18,97,98,107-108,110-112,116$, 122-128, 196, 197, 301
use of services: 111, 112
Consumer Products Safety Commission: 25, 310,311,352
containers: see aluminum, glass, packaging, plastics
costs of MSW management: 56-68
factors affecting: 59,62-68
in model scenarios: $18,57,59-68$
internalization: 20, 21, 33-35
survey: 56-59, 62, 64, 65
to communities: $5,18,38,39,42,54,56,58,59,62-65$, 302-304,322,335-337
decomposition/degradation
comporting: 184-186
in landfills: $85,86,275,275,283,288$
of plastics: 180-183,276
degradable plastics: $98,100,179-183.276,315$
Department of Agriculture: 29, 33, 200
Department of Commerce: 11, 18,24, 25,29, 30, 32, 33,310, $323,331,350$
Department of Education: 18
Department of Energy: 19,299, 333,334, 339, 351
Department of Health, Education, and Welfare: 345, 348
Department of Interior: 29, 33
Department of Transportation: 33
Department of Treasury: 299
deposit systems: 34-36,51,67, 176, 312, 313
benefits and costs: $35,36,51,67,318,319$
effects on litter, MSW, municipal programs: $34,35,51,67$, 318,319
Europe: 312,313, 318
refillable bottles: $118,119,312,313,318$
State programs: 35,36, 317-319
design: see manufacturing
diapers: $80,84,98,116,117,286,315$
dioxins and furans: 55, 192, 193,225-229,232,233, 239-242,
244,246-248,250,251, 254,255
catalysis on fly ash: 227, 229
risks: 55, 239, 239-242, 255
role of plastics: 227, 229, 230
disposable products: see prevention
education: $18,19,103,313,316,319,338,345,346$
emissions: 221-222,224-247
acid gases: 226-230, 234-235, 242, 244-246
BACT: 39,40,224,242-245,335, 352
baghouse/fabric filter: $39,221,232,235,238,239,241,245$
carbon monoxide: 226-228,239, 242,246
combustion controls: 39, 225, 226
concentrations: 226-228,232-235, 238.240
dioxins: see dioxins and furans
effect of source separation: 39, 221, 231, 232, 243, 244
ESPS: 39,221, 235, 236,238,239,241, 243
metals: 226-228, 230, 231, 238-240, 242, 245, 246
monitoring: 238,239
nitrogen oxides: $10,36,225,230,233,234,237,238,242$, 244,246
particulate matter: $226-228,230,235,238,245,246$
pollution controls: 221,231-239
regulations: $39,40,221,224,232,238,242-246,310,352$
risks: 217, 230, 231, 239-242
scrubbers: $39,221,232,234,235,241,243,246,249$
selective catalytic reduction: 233, 234, 236, 237
Thermal DeNOx: 234,237,244
enforcement: 6, 17, 350
Environmental Defense Fund: 19,252,253,256,258,259, 290, 292,310,352
EPA: 3-7,9-13, 15-19,22-26,29-32,36-42, 101, 103,104, 106, $113,172,175,178,186,191,193,224,226,227,238$, 241-246,249,252,254, 258,259,271-274,277, 279-281, 283-292,299,301,304-307, 309-311,331,333,335, 336, 342,348-350,352,353
Agenda for Action: 10, 12, 19
incineration regulations: see ash, emissions, incineration
landfill regulations: see landfills
Europe: 78,79, 104,108,113, 119, 145, 149-151,154-159, 162, $171,173,174,185,188,189,192,219-222,231,232,234$, $235,239,244-246,250, \quad 253,254,256,271,273,311-314$, 318
Export Trading Company Act: 33
Extraction Procedure: see ash
Federal Energy Regulatory Commission: 34,201,223,224.351
fees and funding mechanisms:
grants, loans: 19, 23, 24, 30, 329, 330
income tax: 20-21
product/packaging fees: $20,34,314,315,339$
rate of progress fee: 33
tax credits: see tax incentives
tipping fee set-asides: 40,42
waste-end fees: 20
FIFRA: 106
Food and Drug Administration: 104, 169, 172, 175, 182,310,

311,352
food waste: 28, 86, 109-111, 121, 185, 188
Forest Products Laboratory: 19,30
Franklin model
estimates: $4,73,79,80,109-111,114,115$
limitations: $73,75,109$
furans: see dioxins and furans
General Accounting Office: 182
General Services Administration: 310,350
glass
amount in MSW: 80-83, 110, 113-115, 150, 155
beneficiation, color sorting: 151-153
energy use: $119,151,152$
glassmaking technologies: 151, 152
markets for products: $152,153,196$
recovery, utilization rates: $28,136,150,151$
refillable containers: 118, 119, 150, 312, 318, 319
GRCDA: 42
Great Lakes Recycling Coalition: 53,309
hazardous wastes: 192-194,349
ash: see ash
disposal in landfills: $42,87,90,272,284,288,289$
effect on recycling: $31,159,160,165,168$
prevention: 21, 100, 101
small quantity generators: $42,87,90,258,272,284,337,350$
Hazardous and Solid Waste Amendments: 37,306, 309, 350
household batteries
amounts, types: 87, 106, 107, 156
collection, reprocessing: 157-159,337, 339
Japan, Sweden, West Germany: 157-159, 161,231,312
use of mercury, cadmium: $86,102,104-107,156,157,312$
household hazardous waste: 282,284,316,337-339
amounts, types: 54, 55, 86-89, 103, 104
lists: $88,89,103,108$
programs: 19,316,337-339
incineration: also see ash, emissions; 3, 6, 57, 62, 63, 217-267, 333-335
at sea: 220
benefits: 9, 36, 217
capacity, numbers: 36, 217, 220-225
combustion process: $225,226,243,244$
costs and financing: $36,62-64,217,219,223,224,235,246$, 247
energy recovery: 9, 217-219
Europe, Japan: 219-222,231-239,245-250, 253,254,256, 258
flow control: 334, 335
fluidized bed: $219,220,228,232,233,253$
mass bum: 217-219, 221, 225, 228, 232, 233
modular: 217-219, 221.224, 227
operator training: 40, 221, 243, 245
pollution controls: see emissions
public opposition: 3, 36,217,222-224, 333
pyrolysis: 220,222
RDF: 137, 138,217-219,221,225-228, 232,233,253
regulations: see ash, emissions; $6,36,299$
reliability, upsets: 219, 232
retrofitting: 243, 245-247
risks: 54-56, 217, 230, 231, 239-242
tax and bond issues: 201, 202, 223, 224
types of facilities: 217-220
information flow: 11, 17-19, 29, 108, 110. 124, 125, 304, 349, 350
advertising: 19, 111, 122, 123
awards: $24,29,118$
clearinghouse: $11,12,17,18,29$
education: 18, 19, 29, 103
labeling: 19,24-25,29-31, 311-314
Internal Revenue Service: 329, 352, 353
Interstate Commerce Commission: 299
interstate transportation
bans, Commerce Clause: 16, 274, 275, 340-342
compacts: 16,342
incidence: 3, 273-275, 341
market participation: 341, 342
iron and steel
amounts, types: $80,82,83,114,161,162$
beverage containers: 113,114
detinning: 163
electric arc furnace, minimills: 162, 163
energy use: 162.163
markets for scrap: $162,164,165,196$
pollutants from manufacturing: 192, 193
recovery rates: $28,162-164,202$
steel drums: 165
white goods: see white goods
Japan: 78,79, 136, 149, 150, 154, 155, 157, 159, 161, 171, 173, 203,204,219-221,231, 233-239,245-249,258, 271,273, 278, 311,322, 343,345
recycling rate: $136,203,204$
labeling: see information flow
landfills: also see interstate transportation; 271-295,335-337
capacity, numbers: $3,6,10,40,41,271-274.283,290$
closure \& post-closure requirements: 41, 42, 290, 292, 336
corrective action: 41, 42, 292
decomposition: 275, 276, 283, 288
design: 276-284
excavations: 4, 82-84, 275
gas production, collection: 275,276,282,286,287
Japan: 78,79,271,273,278
leachate collection: $38,41,271,277,281,289-291$
leachate composition, movement: 275,276,278-281,285, 286
liners and covers: 38,41,271,277-281,289-291
monitoring: 277, 283, 286-287, 291, 292
monofill: $38,250-252,254,255,258,259,271$
municipal liability: $42,271,288,292,304,352$
ownership status: 283,290
pollutants and risks: 42, 271,284-292
regulations: $36,41,42,258,259,271, \quad 272,281,289-292,299$, 309,336,337, 349,350
siting: 41, 271-274, 276, 277, 289, 342, 344
sources of contamination: 272, 284-289
Superfund sites: 42,271,284-286,288
Land-of-Sky Regional Council: 308
lead: see automotive batteries, toxic substances
in ash: 247-253, 255, 256, 258, 259
lead-based inks: $75,102,105,106$
maximum contaminant level: 38, 259
uses, amounts: $86,101-106,157,160$
liability: see Superfund
local programs: 10,52-54,56-59,62-65, 299-305,320-322, 344-346
costs: see avoided costs, costs
decisionmaking, planning: 3,9, 32, 73,301-305
product bans: $180,313,315,316$
recycling: $26,59,177,317,320-322$
relation to State programs: 304, 305
source separation: see recycling
Low-Level Radioactive Waste Policy Amendment Act: 16
manufacturing
pollution: 9, 10, 190-194, 197, 202, 353
product design: $7,10,11,18,26,29,34,49,50,97,104-107$, 113-116, 118, 121, 122
use of secondary materials: see specific materails, markets
Marin Sanitary Service: 52
markets: also see specific material
barriers: $27,28,145-148,152,153,194-202,300,332,333$
demand- and supply-limited: 27,32, 195-197
development: 32-36, 195
nature of commodities markets: 27, 194, 195
procurement: 32,310, 311, 331-333
subsidies for virgin materials: see subsidies
materials management: $5,6,8-10,12,13,18,19,26,36,39$, $41-43,299,301,304,306,335$
materials use, conservation: 5, 6, 9, 18, 26, 299, 345
previous OTA study: 345,347
mercury: also see household batteries, toxic substances
uses, amounts: $86,101,102,104-107,156,157,191,231,238$, 242,245-247,250,287
metals: see ash, cadmium, emissions, lead, mercury, plastics (additives)
microwave ovens: 115
MS W composition
chemical composition, combustibility: 85, 86
landfill excavations: 4, 82-84,275
materials categories: 4,5,79-81, 109-111
products categories: 4,5, 81, 82, 109-122
toxic substances: 86-90, 97, 101-107
MS W generation
factors affecting: 4,73, 74, 77, 78, 110-112
generation in other counties: 78,79,203
local and State data: 4, 74, 76, 77
methodology for estimating: 4, 75, 76
per-capita generation rates: $4,22,74,76,77$
research needs: 4, 25, 90,108
residential/commercial portions: 76, 77
U.S. generation rates: $3,4,73,97$
weight v. volume: 4, 79, 82-84, 109, 110
municipal solid waste (MSW): also see costs, MSW composition, MSW generation
definition: 4, 74,76
''system' 13, 15,49-54,300

National Association of Printing Ink Manufacturers: 105
National Association of Towns\& Townships: 321
National Electrical Manufacturers Association: 106-107
National Institute of Standards and Technology (National Bureau of Standards): $19,25,30,310,323,331$
National League of Cities: 42,334,352
National Recycling Coalition: 30,310
National Science Foundation: 30,53
National Solid Waste Management Association: 289,290
Natural Resources Defense Council: 352
newspapers: see paper and paperboard
nitrogen oxides: see emissions
North East Recycling Coalition: 53,308,309,332
OECD: 79, 107, 161
oil: 167-168, 196, 310, 339
ownership of facilities: 54, 224, 336
packaging: 21,75, 112-116, 121, 122,311
amounts, types in MSW: 20, 75,80-82,98, 108-116
bans, fees, taxes: $20,25,26,313,315,316$
defining excessive: 112,113
fast-food: $26,84,115$
functions: 98,112
multi-material: 82, 98, 113, 114, 315
review boards: $24,314,315$
paper and paperboard
amounts, types in MSW: 79-86, 109, 114, 140
corrugated cardboard: $80-84,109,113-115,121,146,147$, 149, 195
deinking: 142, 144-146, 192, 193
energy use: 142-144
exports: $140,141,148-150$
grades: 141-148
mail, telephone books: 81, 120, 126
markets, product prices: $140,141,143-150,195,196$
newspapers, newsprint: $34,80,81,83-86,141,143,145,146$, 149, 150, 195,317,327,328
paperboard: 146-148
pollutants from manufacturing: 142, 192, 193
printing and writing paper: 81, 143-145, 195, 196,332,333
recovery, utilization rates: $28,136,140-149,202$
structure of industry, number of mills: 140-146
technologies of papermaking: 142, 143
tissue: 143, 146
particulate matter: see emissions
planning and coordination: 13, 15
plastics: also see dioxins and furans, packaging; 168-184
additives: $86,101,102,172,174$
amounts, types produced: 168, 172, 173
amounts in MSW: 79-83, 100, 113, 114, 117, 156, 168
bans: $117,146,313,315,316$
barriers to recycling: 169, 175-179
costs of recycling: 174, 176, 178
degradable: $98,100,179-183,276,315$
energy consumption: 175-177
HDPE: 28, 121, 169-171, 173, 174, 176-178, 183, 184,279, 315
markets and products: 28, 168-171, 173, 178, 179, 183, 196
mixed plastics: $171,173,174,177,184$
packaging: $113,114,121,122,168,172,173,175,311$
PET: $28,121,169-171,173,174,176-179,183,184,193,313$, 315
pollutants from manufacturing: 100, 193, 194
polystyrene: 29, 117, 169, 170, 173, 174, 179, 182,315
PVC: 169, 170, 172, 174, 175, 177-179,228-231,311
recycling in Japan and Europe: 171-173, 175, 178
recycling rates: 28, 169-171, 183, 184
recycling technologies: 173-176, 178
weight v . volume: 83
pollutants: see specific pollutants, management methods, manufacturing, risks
prevention: $6,8,21-26,42,43,97-128,299-301, ~ 304,306$, 310-317
bans: $25-26,117,146,311,313,315,316$
benefits, constraints, tradeoffs: 7,21,22,97-100, 113
consumer opportunities: $7,98,107,108,122-128$
content to packaging ratio: $24,124,125$
definition: 7,97,98, 100
durability, repairability: 110, 116-118
examples: 104-107, 121-123
goals, incentives: 21-25
labeling: see information flow
measuring: $21,22,25,98,108,109$
product trends: 81, 82, 112-121
quantity reduction: $7,22,97,108-122$
reusable v. single-use products: 97-99, 116-120, 124
review boards: $24,314,315$
targeting: 22-26,97,98, 101-104, 108-122, 316
toxicity reduction: $7,22,23,97,99,100-108,156,316$
printing ink: see lead
procurement
extension to "reduction" products: 24
Federal: 32,310,350
State: 331-333
public opposition: $3,10,36,49,54,217,222-224,300,322,342$
public participation: 3, 16,223,271,321,342-345
PURPA: 33,34,201,202,219,222-224, 299,301,302,334,349, 351

RCRA: 9, 10, 11, 16-18,29,32,37,38,42, 299,302,304-306, $309,310,322,331,335,337,342,348-350$
specific regulations: see incineration, landfills, recycling
State plans: see State solid waste management plans
recycling: also see specific materials, markets; $3,6,9,26-32$, 135-212, 317-335
buy-back, dropoff: 50,51,321
collection constraints: 65, 169, 176-178
commingled recyclable: 66, 137-139, 321
costs: see avoided costs, costs
curbside: $66,176,177,318,319,321,322$
definitions: $30,31,135$
deposit legislation: see deposit programs
energy use: $9,26,142-144,150,151,154,155,162,163,197$
exports: $33,140,141,148-150,155,161,162$
goals: $26,27,33$
labeling: see information flow
market constraints: see markets
materials recovery facilities: 136-140, 192, 319, 322
pollutants from manufacturing: 9, 142, 190-194
preparing materials for recycling: 136-140, 162, 174, 185
rates of recycling: 5, 26, 28, 135-137, 143-148, 150-151, 153, 154, 160-1\&1
regulations: $6,9,31,32,159,160,165,166,190,191$
reverse vending machines: 177
source separation: 66, 137, 139, 140, 153, 185, 188, 189,221, $231,232,243,244,245,247,253,319$
technical constraints: $29,142,144,145,150-152,163,164$, 175, 195, 196
reduction: see prevention
refuse-derived fuel: see incineration
regulations: see each management method
research and development: 11, 19, 29, 30
Resources for the Future: 253,259
risks: 54-56, 156, 157, 166, 167, 172, 190-194, 239-242, 254, 255
ash: 56, 254, 255
batteries: 156, 157
dioxins: see dioxins and furans
food chain: $239-242,254,255$
incineration: 54-56, 217, 230, 231, 239-242, 254, 255
landfilling: 54-56, 271, 284-292
metals: 55, 172, 192, 239, 240, 242, 255
recycling, manufacturing: 54-56, 190-194
risk assessments: 55, 56, 239
siting: 222-224, 271, 274, 289, 334, 342-345
ensuring capacity: $6,13,15,16$
examples, model procedures: $6,16,17,273,274,342-345$
Society of Packaging and Handling Engineers: 30
Society of the Plastics Industry: 30, 178, 179
Solid Waste Disposal Act: 299, 306,348
source separation: see recycling
State MSW programs: 10,299-309,335-337,344
deposit systems: 317-319
education: $313,316,319,338,345$
financial incentives: 322-331
financial resources: 305, 307, 308, 338
household hazardous wastes: 316, 337-339
packaging review boards, taxes: 308, 313-315
planning: 304-309,348-350
prevention: 311-313
procurement: 310,331-333
product bans: $313,315,316$
recycling: 26,306-309,311,317-320, 323-327,330,331,335, 339,340
regional efforts: 50, 308, 309, 316, 317
regulations: 36, 41, 190, 191, 243-246, 254
State solid waste management plans: $10,11,13,16,304-307$, 348-350
capacity requirements: 13,16
relation to EPA: 11, 13
steel, steel drums: see iron and steel
subsidies: 32-35, 197-202, 329-331
effect on recycling: $32,33,34,197,200-202$
mineral depletion allowance: 33, 197-199, 201
timber income treatment: 197-202
waste-to-energy facilities: $34,35,201,202,351$
Superfund (CERCLA): 16, 101,352
liability: 31,42, 159, 197,224,271,288,290, 292,304,337, 339,352
NPL: 42,271,284-286,288
tax incentives: 30, 322-331
Economic Recovery Tax Act: 323, 324,329
Federal programs: 322, 323, 329
State programs: 323-327,330, 331
tax credits: 322-331, 352
Tax Reform Act: 199,201,223,224,323
testing: see ash, degradable plastics
tipping fee: $34,40,42,308,330,335,338$
tires: $118,166,167,196,310,339$
toxic substances: also see prevention, risks
identifying: 22, 55, 86-90, 97, 101-104
metals: see cadmium, lead, mercury
organic chemicals: also see ash, dioxins, emissions; 102-104, 106, 172
product sources: 101-104
substitutes: 23, 104-107
Toxic Substances Control Act: 26, 165, 352
U.S. Conference of Mayors: 304, 352
waste management industry
changing infrastructure: 50-54, 300, 301
financing: $54,201,202,223,224$
waste audits: 23
West Germany: 121-123, 149-151, 153, 158,159,161, 173-175, 188-189,311-314, 318
deposit, refillable bottle systems: 312, 313, 318
Environmental Angel: 25, 311, 313, 314
household batteries: 159, 312
incineration: 220-222, 236, 244-246
Section 14: 312,314
white goods: 31, 161, 162, 165, 166
PCBs: 31,165
World Health Organization: 106, 242
yard waste: also see comporting; 36,41, 86, 233, 315
amounts in MSW: 79-81, 84, 109-111, 185
leaf comporting: 185, 187, 188
programs: 188-189, 321,340
recycling rates: 28

