The CAREless Carpet Industry:

A CRITIQUE OF THE CALIFORNIA

CARPET STEWARDSHIP PROGRAM'S RELIANCE ON INCINERATION

BURNING UP VALUABLE RESOURCES

Changing Markets

This report was published in April 2017 by GAIA and Changing Markets

To find out more, visit our websites:

www.no-burn.org
www.changingmarkets.org

Design: Pietro Bruni- helloo.org

Table of contents

Executive Summary

Carpet- A Vast Source of Plastic Waste. The planet is literally carpeted with carpet waste and it's mostly (99%) plastic. In 2014, the U.S. carpet industry produced 11.7 billion square feet of carpet, 45% of the total global production. Most carpet ends up in landfills and incinerators ("incineration" defined here, as in state law, as a form of transformation that combusts waste – it may or may not include energy recovery). Less than 5% of U.S. carpet waste is recycled and only 1% is recycled back into carpet, 89% is landfilled and about 6% is treated in some form of incinerator. In California, carpet is one of the top ten biggest products in landfill waste.

California's Carpet Stewardship Law- First of its Kind. In response, the California Legislature enacted AB 2398 (Perez) in 2010 - the Carpet Stewardship Act - the first and only law in the U.S. that placed responsibility for establishing a recycling infrastructure on carpet producers. The law established a producer-implemented / consumer-funded program to help alleviate the landfill burden and promote a circular economy of carpet waste being reduced (through reuse and optimization) and recycled.

CARE's Stewardship Program- Heavy on Incineration, Meager Recycling. Under the direction of the industry association, Carpet America Recovery Effort (CARE), California's carpet stewardship program in its first five years failed to meet the industry-established goal of 16% recycling. Instead, it moved the recycling rate in California from 8% to 10%. The 2% recycling increase was outpaced by vthe 5% increase in carpet waste incineration. CARE's program relies heavily on burning up valuable resources via incineration. In the recently revised five-year strategy, CARE projected carpet incineration would vastly outpace the quantity recycled. The CARE goal for recycling is 26% of discards by 2021. In comparison, the incineration rate would reach 34% through a combination of incineration types: Waste to Energy (WTE) and Carpet as Alternative Fuel-(CAAF) to burn in cement kilns and other facilities.

CalRecycle Should Send a Clear Regulatory Signal that Discourages Incineration. Allowing the carpet stewardship program to rely heavily on incineration contravenes the hierarchy of waste management set forth in Section 40051 of the California Public Resources Code that requires state and local government to "maximize use of all feasible source reduction, recycling, and composting options in order to reduce the amount of solid waste that must be disposed of by transformation and land disposal." A "transformation facility" is defined as, "a facility whose principal function is to convert, combust, or otherwise process solid waste by incineration, pvyrolysis, destructive distillation, or gasification..." WTE incineration is considered a form of transformation according to CalRecycle. To date, state regulators have not made it clear to the industry that incineration is on par with landfill as a last resort and that all feasible source reduction and recycling options must be exhausted prior to getting approval for burning carpet.

"Incineration" is a term that has been battered by many, especially those who believe that energy recovery from a facility that burns solid waste is a good thing and choose to consider "waste-to-energy" as something somehow better than incineration on the solid waste management hierarchy. California law and common sense make no such distinction. Incineration is included in the definition of "transformation" which means converting or combusting solid waste. WTE, CAAF, and Kiln as they all transform waste using some form of thermal treatment.

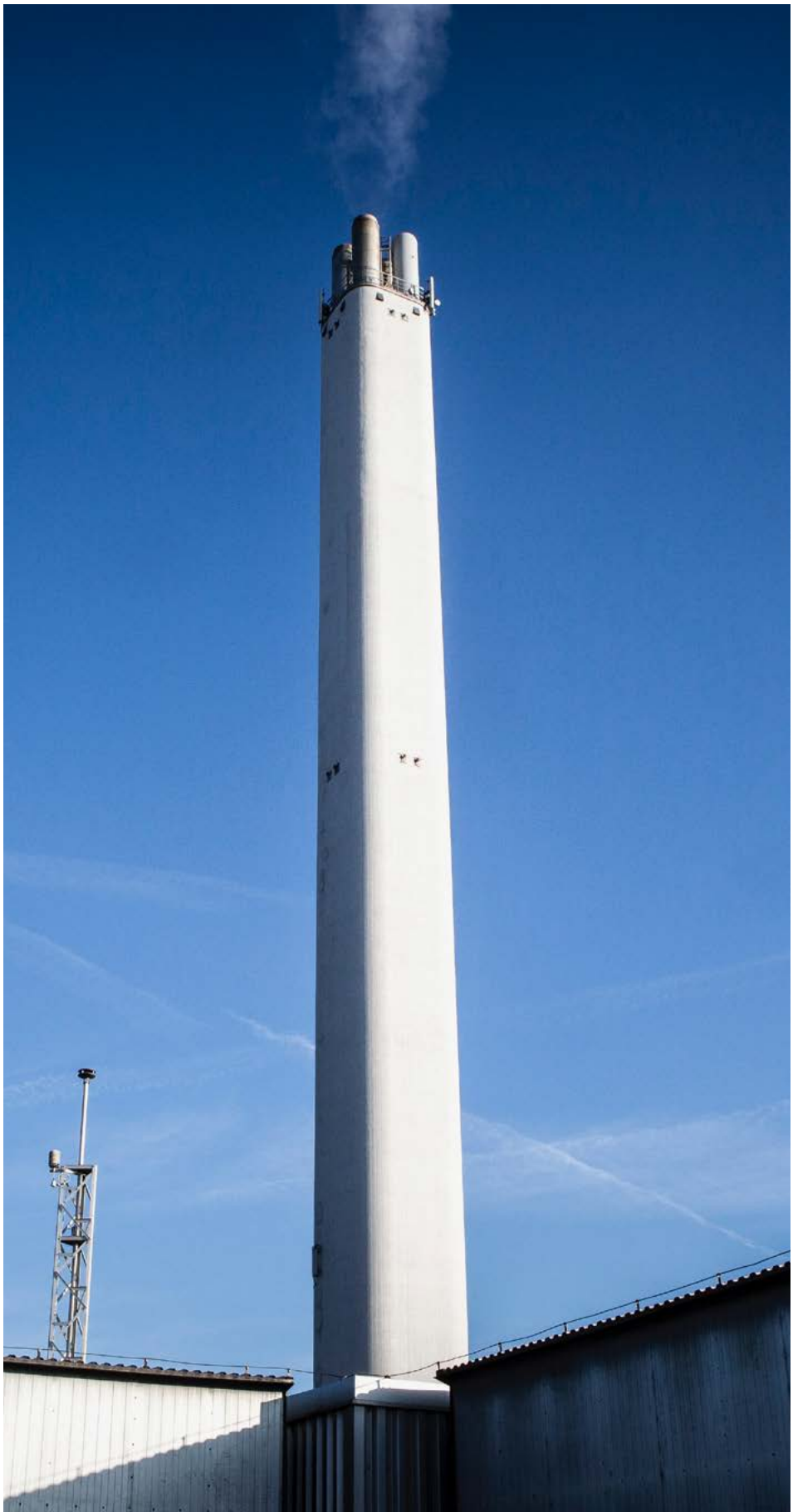
Recycling and Ruse are Better Economic Choices. Recycling creates 10-20 times as many jobs as incineration, while reuse creates anywhere from 28 - 300 times the jobs. Meanwhile, WTE incineration is the most expensive form of energy generation in the U.S. per unit of energy produced. Compared to renewables, coal, and nuclear, WTE has the highest capital costs, the highest operation and maintenance costs, and has the lowest capacity for energy output. The costs of building WTE incinerators are 60% higher than nuclear power and the operating costs are ten times higher than coal. The costs are typically borne by taxpayers who foot the bill via waste disposal fees and the debt service payments for construction costs. Numerous examples exist of incinerators that cost communities hundreds of millions in operations and upgrades, contributing to municipal bankruptcy in Harrisburg, Pennsylvania and Detroit, Michigan. In California, the Long Beach mass burn WTE incinerator is facing a shortfall in revenue to pay for rising operating costs. As a consequence, city officials have complained that carpet recycling directs solid waste away from transformation facilities- exhibiting a common problem with costly WTE facilities- the need to feed them.

Environmental Justice and Poor Regulation of Air Emissions. In California, as in many other states, incinerators are sited in low income communities and present environmental justice challenges. Carpets are mixed with a wide array of waste streams when burned in mass burn incinerators. These facilities typically release persistent organic pollutants, endocrine disrupters, and other hazardous chemicals such as dioxin, mercury and lead. Many carpets contain polyvinyl chloride (PVC) which creates dioxin when burned. Dioxin is among the most dangerous chemicals known and a proven carcinogen. Of particular concern are the ultra-fine particulates and nanoparticle emissions, which are **not regulated and go unmonitored** but pose significant health threats. There is a lack of continuous monitoring for dioxins and a variety of metals, which are usually monitored only once per year. They are usually not monitored during startup and shutdown when emissions are generally highest. Cement kilns that burn waste (including carpets) in the U.S. likely result in worse emissions than typical WTE treatment as they are not subject to the same monitoring and regulations.

> **Waste incinerators emit more uncontrolled pollution than coal fired power plants per unit of energy.** To make the same amount of energy as a coal power plant, mass burn incinerators release: 28 times as much dioxin, 2.5 times as much carbon monoxide, three times as much nitrogen oxides (NOx), 6-14 times as much mercury, nearly six times as much lead, and 70% more sulfur dioxides. Trash incineration releases 2.5 times as much CO2 than coal per unit of energy produced and WTE incineration of carpets creates a significant climate risk. CalRecycle found that burning of carpet waste poses far more climate risk than recycling. Net carpet recycling emissions save about 32,000 metric tons of CO2, while WTE incineration alone adds approximately 24,000 metric tons.

Change Needed in California's Stewardship Program. The dismal results of the CARE program result mainly from the originating law that allowed consumer fees to fund the program. It also erred in selecting a stewardship organization (CARE), which is controlled by industry giants, Shaw and Mohawk, who want to continue business as usual. The $27 million in collected fees means that the industry has no financial "skin in the game." California has implemented a program that fails to (1) properly incentivize recycling and the use of recycled content, (2) provide adequate subsidies for collection and recycling, and (3) implement the necessary industry and consumer education to support a serious carpet recycling program in California.

In the short term, CalRecycle should reject CARE as the stewardship organization and prohibit the sale of carpet in California by retailers and manufacturers that are not covered by a stewardship program. A strong law would require industry to spend its own money to achieve these targets and would prevent noncomplying companies from selling carpet in California. This type of program would create sufficient financial incentives to achieve the state's goals.



In the short term, CalRecycle should reject CARE as the stewardship organization and prohibit the sale of carpet in California by retailers and manufacturers that are not covered by a stewardship program. A legislative fix is needed that allows the state to set enforceable targets for recycling, requires it to seek the reduction of incineration, and mandates that the program is industry-funded.

Introduction

Carpet is Plastic and it is Difficult to Manage as Waste

World-wide, there is increased concern about plastics. They end up in the marine environment, chocking fish, birds and marine mammals, ultimately entering human food chains in the form of micro plastics. They litter streets, forests and nature, taking centuries to degrade and in certain forms they are very difficult to recycle. Increasingly, product policy programs are calling for a circular economy and resource efficiency in how we use and manage materials. Plastics are challenging when it comes to "the circular economy" (i.e. designing products that, at the end of their useful life, can be made effectively into new products). And carpet is largely made of plastic. 99% of carpet sales in the U.S. are synthetic fibers, mostly nylon and polyester, with some polypropylene and polyvinyl chloride.

The planet is literally carpeted with carpet waste. In 2014, the carpet industry in the United States (U.S.) produced 11.7 billion square feet of carpet and rugs. The U.S. carpet industry produces 45% of the world's carpet, representing a much larger share of both production and consumption than any other nation. U.S. carpet production is expected to grow at a rate of 4.5 percent annually to 14.6 billion square feet by 2019.[1]

Perhaps the most troubling waste management treatment for carpet waste is incineration. There are a variety of forms of thermal treatment that fall under the term "incineration." The taxonomy of incineration methods is discussed below. However, carpet burning or incineration in use today includes burning carpets in waste to energy mass burn incinerators, cement kilns, or using carpet as fuel. Thermal carpet treatment systems burn up valuable resources (i.e. carpet) that with proper design could be turned back into carpet. They also emit toxic air pollutants, particularly unregulated fine particulates and nanomaterials, as well as dioxins and other pollutants, and greenhouse gases.

Most carpet ends up in landfills and incinerators, a polluting end for products that have a 5 to15 year life-span. Carpet discards account for approximately 3.5% of all waste disposed of in U.S. landfills. Less than 5% of the U.S. carpet waste stream is recycled and only 1% of that is recycled back into carpet,[2] 89% is landfilled and about 6% is treated in some form of incinerator.[3] In California, carpet is one of the top ten biggest products in landfill waste.[4]

California's Carpet Stewardship Program is Failing

In response, the California Legislature passed a law in 2010 - AB 2398 (Perez)—the Carpet Stewardship Act, e.g. the first and only law in the U.S. that placed responsibility for establishing a recycling infrastructure on carpet producers- an effort that is funded by levying consumer fees on the sale of carpet in California. The California Carpet Stewardship Program was initiated in 2011 in response to the enactment of AB 2398 (Perez) in 2010.

AB 2398 specifically appointed the Carpet America Recovery Effort (CARE), a previously-existing carpet industry organization that was promoting voluntary carpet recycling efforts in the U.S., as the carpet stewardship organization (SO) for the first five years of the program-

2011-2016. The leadership of CARE is dominated by the two largest manufacturers, Mohawk and Shaw. They are the strongest voices and essential decision-makers in CARE governance.[5] CARE is under intense scrutiny by CalRecycle, the state agency charged with enforcing the Act.[6] CARE has failed to make meaningful progress in meeting its own recycling goals within the first five years, and was considered by CalRecycle to be out of compliance in the years 2013, 2014, and 2015, causing the state to take enforcement action that threatens over $3 million in penalties.[7] Nonetheless, CalRecycle invited CARE to propose a plan for its continued implementation of the program over the next five years (2017-2021). The plan submitted by CARE was rejected by CalRecycle on December 22, 2016 and Cal Recycle offered CARE an opportunity to provide a revised plan. The revised plan was submitted on February 20th and CalRecycle will be making a decision about the revision at its April 18, 2017 meeting.[8]

In the revised plan submitted by CARE very little has changed. CARE projected modest increases in performance goals,[9] but failed to provide the requested data and transparency that would lead to the conclusion that it will succeed in accomplishing these goals, especially since it is still far from accomplishing the goals set in its initial five years implementation period. The lack of progress toward meaningful recycling, the fact that CARE has been continually out of compliance, the fact that CARE is dominated by the two largest mills (Mohawk and Shaw) and does not entertain the input of smaller mills, recyclers, or outside stakeholders, provides good reasons for CalRecycle to disapprove the five year plan put forward by CARE and no longer approve CARE as the stewardship organization under AB 2398.

Carpet Incineration Needs to be Reconsidered as a Waste Management Option

However, despite all the public comment and criticism of the implementation of the CARE recycling program to date, neither CalRecycle nor any of the recyclers and manufacturers who speak earnestly about seeking a "circular economy" in the carpet industry point out that the industry is turning increasingly to burning carpet waste. In fact, the increase in burning is outpacing the gains made in the priority treatments- source reduction, reuse, and recycling.

Carpet waste is being burned (here, generally referred to as "incineration" to: 1) recover energy via Waste to Energy (WTE), 2) make cement in cement kilns ("Kiln"), and 3) provide fuel in a process known as Carpet as Alternative Fuel (CAAF).[10] The combined percentage of carpet burned, according to CARE's report of WTE and Kiln, increased from 4% to 9% of discards between 2011 and 2015- a 5% increase. Recycling, by comparison, increased from 8% to 10% of discards- a 2% increase. The first five years of CARE's program demonstrated the quantity of waste burned versus recycled was nearly equal by 2015, but there was a much greater ramping up of burning carpet waste than recycling, which goes against the purpose of the plan and represents a waste of precious resources.

CARE's revised five-year plan proposes to continue and increase this trend. It shows a performance goal for 2021 in which 60% of discards will be diverted from landfill for reuse, recycling, export, WTE, kiln and CAAF.[11] There is no estimate of how much waste will be treated through burning (i.e. WTE, kiln, CAAF), but by relying on other numbers provided in the report, one can deduce how much CARE anticipates it will rely on various forms of incineration. By subtracting the recycling goal of 26% (includes reuse) by 2021 from the 60% of discards that will be diverted, the remaining 34% of diversion is either exported or treated in WTE, Kiln and CAAF. CARE is supposed to eliminate exports over the next five years. Therefore, CARE

4-fold increase in burning is essentially hidden in these numbers (9% in 2015-34% in 2021).

proposes that the quantity of carpet waste burned will significantly outpace the quantity that is recycled, a 4-fold increase in burning is essentially hidden in these numbers (9% in 2015-34% in 2021). Whereas only a 2.5-fold increase in recycling predicted is (10%-26%). Since CARE failed to meet it's original goal of 16% recycling by 2015, and only accomplished a 10% recycling goal (up from 8% in 2011), it seems unrealistic that they will achieve a 26% recycling rate by 2021.

The following pages call into question the industry's use of carpet burning (i.e. incineration) and the state's condoning of this practice. The upcoming sections describe the various forms of incineration, where they fall in the state's hierarchy for waste management, how incineration of carpet wastes resources and defies the circular economy, the toxic impacts on communities and the environment, how burning carpet contravenes the state's greenhouse gas reduction goals, and the financial burdens these facilities place on local jurisdictions.

This paper calls for a review of the carpet stewardship program's proposed reliance on incineration as the primary waste management method and a tougher regulatory approach regarding incineration. Furthermore, we recommend that the industry as a whole, not just in California, eliminate the burning of carpet in any form and focus instead on redesigning their product with reuse and closed-loop recycling as the ultimate goals. As our previous studies have shown, opportunities exist and the carpet industry could become a true leader in circular economy.

Chapter 1

CARE and CALRECYCLE are failing to adhere to state law with respect to incineration

Incineration and its Place on the Waste Management Hierarchy

The California Carpet Stewardship Act requires that post-consumer carpet be diverted from landfills and managed according to the state's hierarchy of waste management.[12] The California Public Resources Code §40051 is the statute that defines the state solid waste management hierarchy, directing state and local government to:

> (a) Promote the following waste management practices in order of priority:
> (1) Source reduction.
> (2) Recycling and composting.
> (3) Environmentally safe transformation and environmentally safe land disposal, at the discretion of the city or county.
> (b) Maximize the use of all feasible source reduction, recycling, and composting options in order to reduce the amount of solid waste that must be disposed of by transformation and land disposal. For wastes that cannot feasibly be reduced at their source, recycled, or composted, the local agency may use environmentally safe transformation or environmentally safe land disposal, or both of those practices.

Section 40201 of the Public Resources Code defines "transformation" as:

> ...incineration, pyrolysis, distillation, or biological conversion other than composting. "Transformation" does not include composting, gasification, EMSW[13] conversion, or biomass conversion.

A "transformation facility" is defined in California regulations[14] as:

> ...a facility whose principal function is to convert, combust, or otherwise process solid waste by incineration, pyrolysis, destructive distillation, or gasification, or to chemically or biologically process solid wastes, for the purpose of volume reduction, synthetic fuel production, or energy recovery. Transformation facility does not include a composting facility.

State and local regulators are specifically instructed by state statute to pursue policies that maximize all feasible source reduction, recycling, and composting options to reduce the quantity of waste treated via landfill and incineration.

While there appears to be some contradiction between the regulations and the statute as to whether gasification, conversion, or EMSW are considered transformation, incineration is considered a form of transformation according to CalRecycle.[15] As noted above, with respect to the state's hierarchy of integrated waste management, incineration and landfill are the least preferred options and they are on equal footing. **State and local regulators are specifically instructed by state statute to pursue policies that maximize all feasible source reduction, recycling, and composting options to reduce the quantity of waste treated via landfill and incineration.**

In the current California carpet stewardship program, CalRecycle has not sent a clear signal to

GLOSSARY*

CAAF is defined in California Code of Regulations (CCR) §18941 as "fuel that has been produced from source-separated and sorted post-consumer carpet and processed, including (1) extraction of components for recycling if at all possible and (2) size reduction, shredding, and/or blending with coal fines, etc.."

Conversion technologies
This blanket term encompasses non-combustion processes that convert solid waste into useful products. For the purposes of this article, the term refers specifically to gasification, plasma gasification, and pyrolysis, but other conversion technologies include depolymerization, anaerobic digestion, and fermentation.

Gasification
Gasification is a process that converts any material containing carbon—such as coal, biomass, or MSW—into syngas. In the controlled presence of oxygen, temperatures of 900–3,000°F (480–1,650°C) break the feedstock molecules apart and recombine them into syngas.

Kiln or Cement Kiln is defined by CARE as cement production facility that may use CAAF as a source of energy and/or as an additive for cement production.

Mass-burn incineration
Mass-burn combustion of MSW occurs in an oxygen-rich setting with minimal prior sorting or preparation. The resulting heat is used to produce steam and electricity.

CARE or the carpet industry that WTE, kiln, and CAAF, the three thermal treatment methods that the industry uses for carpet waste management, are on par with landfill as a last resort. In fact, there has been no regulatory signal that all feasible source reduction and recycling options must be exhausted prior to getting approval for burning carpet waste. In order to comply with the regulatory mandate, future stewardship plans must focus more on designing carpet to be reused and recycled and to include recyclable materials if source reduction and recycling are to be pursued to the maximum extent feasible.

The Taxonomy of Incineration

"Incineration" is a term that has been battered by many, especially those who believe that energy recovery from a facility that burns solid waste is a good thing and choose to consider "waste-to-energy" (when solid waste is burned) as something other than incineration. Here, as in California law cited above, we make no such distinction. Incineration includes WTE, CAAF, and Kiln as all of these are a form of transformation according to the definition: *a facility whose principal function is to convert, combust, or otherwise process solid waste by incineration, pyrolysis, destructive distillation, or gasification, or to chemically or biologically process solid wastes, for the purpose of volume reduction, synthetic fuel production, or energy recovery.* The carpet industry seeks to carve out exceptions from incineration for processes that include energy recovery, like WTE, or use waste to create fuels, like cement kilns and CAAF. While they say that *incineration* is not a form of waste management that is supported in the California stewardship program,[16] the current CARE carpet stewardship program relies heavily on WTE, and somewhat on kiln and CAAF as forms of diversion of carpet from landfill.

Waste-to-Energy (WTE) describes a variety of technologies that convert garbage and other municipal solid waste (MSW) into either heat or electricity. Mass-burn incineration is the most common WTE technology. A "mass burn" waste incinerator is a facility that burns garbage and other wastes at high temperature. The process creates heat, which is used to boil water and produce steam which is then fed through a turbine to generate electricity. There are some mass-burn incinerators in the U.S. that simply burn garbage and provide no energy recovery. CARE appears to make a distinction considering these to be "incinerators" and WTE not. The

Municipal solid waste (MSW)
MSW is the term for common mixed trash collected from homes, businesses, and institutions, including packaging, food waste, yard waste, and both durable and nondurable goods.

Plasma gasification
Plasma gasification uses a plasma torch to provide supplemental heat for the gasification process. Temperatures can reach 5,000–20,000°F (2,760–11,000°C).

Pyrolysis
Pyrolysis is a form of gasification that occurs at relatively low temperatures of 600–1,400°F (300–760°C) in the absence of oxygen.

Synthesis gas (syngas)
Syngas, composed mainly of hydrogen and carbon monoxide, is produced by conversion technology processes. It can be used as fuel for electricity or converted into other salable products such as liquid fuels.

Waste-to-energy (WTE) technologies
The full suite of WTE technologies includes thermal processes like mass-burn incineration and gasification as well as nonthermal processes like anaerobic digestion and landfill-gas recovery.

* Adapted from: Stringfellow T. An independent engineering evaluation of waste-to-energy technologies. RenewableEnergyWorld.com (13 January 2014).

important point is that California regulations consider WTE a form of "transformation"[17] that is at the bottom of the waste management hierarchy, on par with landfill.

Of the 87 WTE incinerators currently operating in the U.S., two companies, Covanta Energy and Wheelebrator (a subsidiary of Waste Management), control over two-thirds of the facilities and over three quarters of the total waste burned. Covanta runs 44 of these incinerators and is trying to establish a global presence through incinerator projects in Canada, China, Mauritius and the EU.[18] There are three mass-burn WTE facilities in California. Collectively, these facilities processed approximately 790,000 tons of MSW in 2008, which was 2%of the total post-recycled waste generated in the state (36,376,00 tons). The other 98% was disposed of in landfills.[19] The three California facilities include:

- **The Southeast Resource Recovery Facility (SERRF) in Long Beach**
  - COST: $108,000,000
  - FINANCIAL: $142,800,000 in lease revenue bonds sold by the SERRF authority. The City leases the facility and makes rental payments totaling $12,700,000 per year.
  - DAILY CAPACITY: 1380 tons per day of solid waste. Gross electrical generating capacity of 36 megawatts.
  - ASH RESIDUE: Treated combustion ash is non-hazardous under federal and state test procedures. SERRF ash is treated and used at a local landfill as road base material.[20]

- **The Commerce Refuse to Energy Facility (CREF) in Commerce[21]**
  - DAILY CAPACITY: 350 tons per day. Gross electrical generating capacity of 12 MW
  - ASH RESIDUE: the ash is reused as road base material for constructing landfill roads.

- **The Stanislaus County Resource Recovery Facility (SRRF) in Crow's Landing**
  - DAILY CAPACITY- 800 tons per day. Gross electrical generating capacity of 22.4 MW.

Conversion technologies is a term covering a variety of types of technologies that rely on thermal, chemical, or mechanical conversion of waste to energy or other feedstocks, such as ethanol or gas. Gasification and pyrolysis are the most common forms of conversion, followed by plasma arc. There are no commercial scale conversion facilities in the U.S. The problem is that these systems don't appear to scale up to real world application. Numerous plants across the globe have been built and closed because they were not economically viable or because they could not meet air emissions standards outside the laboratory.[22]

Gasification treats solid waste at high heat (generally above 600C) in a starved oxygen environment, to prevent immediate combustion and turn the carbon-based portion of the waste into synthetic gas ("syngas"), leaving a residue known as "slag," "ash," or "char." Syngas is primarily composed of carbon monoxide, hydrogen, and carbon dioxide, and leftover contaminants. There are several drawbacks associated with gasification. The syngas can be a source of energy, but requires advanced pollution control systems. Operations have frequently failed to produce enough energy to be financially successful, and the waste (i.e. the slag and the fly ash from the air pollution control equipment) require special handling due to their toxicity. Furthermore, there are polluting air emissions and discharges of wastewater.[23]

Gasification, plasma gasification, and pyrolysis (typically referred to as "conversion technologies") involve the super-heating of a feedstock—such as MSW, coal, or agricultural residues—in an oxygen-controlled environment to avoid combustion. The primary differences among them relate to heat source, oxygen level, and temperature, from as low as about 600°F (300°C) for pyrolysis to as high as 20,000°F (11,000°C) for plasma gasification.[24] Theoretically, in these low-oxygen environments, the production of dioxins and furans from waste can be significantly reduced compared with incineration On paper, conversion technologies sound cleaner than mass-burn incineration. But the technologies have not to date performed as advertised.

In a recent report, "Waste Gasification & Pyrolysis: High Risk, Low Yield Processes for Waste Management," GAIA reviewed ten facilities that proposed to use conversion technologies to treat MSW in the last few years. Over $2 billion was invested in these projects, all of which closed or were canceled before commencing operations. The projects closed due to technical and financial challenges with most of them failing to meet projected energy generation, revenue generation, and emission targets. Gasification plants have historically sought public subsidies to be profitable.[25]

There are several reasons for the disconnect between the projections of efficiency, energy production, and clean emissions put forward in industry funded studies versus reality. Industry projections typically assume the facility will be run at maximum temperature in a steady state. In the real world, however, start-up, cool down, and loading feedstock into the reactors are times when performance is not highest and greater emissions occur. Furthermore, the cleaning of contaminants and impurities from the syngas produced during conversion is expensive and may not be performed frequently enough. In addition, the newer systems require more uniform, pre-sorted feedstock than mass-burn incinerators, which is both expensive and not necessarily how things operate.[26]

Chapter 2
Incineration Means Wasting Resources

Carpet is stuck in the present-day linear economy of Take-Make-Use-Dispose. A transformation to the circular economy of Produce-Use-Recycle- reduces the environmental impacts associated with extraction of oil, emissions of CO2 and other toxics. For example, recycling 1,000 square feet of carpet and pad diverts 500 pounds of waste from landfills, eliminates the extraction of 48 gallons of petroleum, and prevents 913 pounds of CO2 emissions.[27] Burning waste destroys materials from finite resource bases (paper, wood, plastic, glass, metals, and food discards) that could be recycled into the economy, creating much needed local jobs in communities across the country.

The carpet industry is a prime sector in which circular economy model could be scaled up, if carpets were made to be fully recyclable from the design phase. A carpet is fully recyclable back into carpet (closed loop/ circular economy) when the fibers can be easily separated from the backing and recycled back to carpet, and the backing is also recycled. Often the way carpets are glued together makes it difficult to remove the face fiber for recycling. Nylon fibers are fully recyclable back into face fiber, while polyester (PET) backing can be recycling back into backing. Pure PET carpet fiber can be recycled into PET carpet fiber technically but for the moment it is not economical to recycle them, as there is almost no pure PET carpet on the market- most of it is mixed with other materials used in fillers and backing. This demonstrates again the need for re-design. Carpet that is designed for recycling saves resources, like petroleum, chemicals, and energy. When it is not, then carpet ends up in landfill or incinerators.

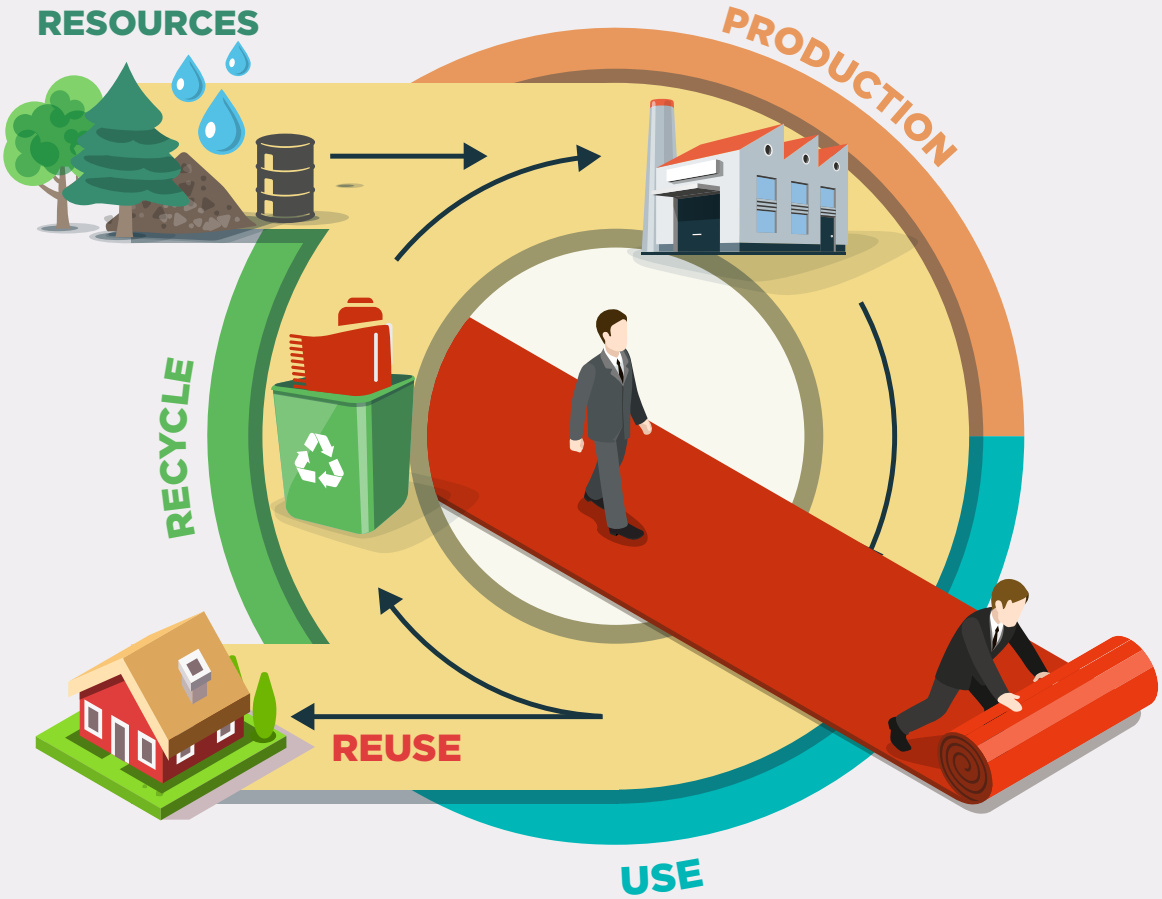
In the U.S., currently about 6% of carpet was incinerated in conventional municipal solid waste incinerators and cement kilns- 206 million pounds in 2015.[28] We do not know where carpet is being incinerated specifically and in what quantities. Carpet waste incinerated in California goes to the three municipal trash incinerators listed in this report. Outside of California, carpet waste is reportedly being shipped to the Shaw Ringgold facility in Georgia and other facilities which receive subsidies under the CARE program, but these are largely unidentified due to the lack of transparency in the CARE program. Staff at CalRecycle do not know how much carpet is sent to each of the California incinerators or out of state,[29] although CARE clearly has this information as it was used to report on quantities sent to WTE, CAAF and Kiln each year to CalRecycle.

Research suggests that more than 90% of materials currently disposed of in incinerators and landfills can be recycled or reused.[30] Which means that incineration facilities essentially compete with recycling and reuse facilities for materials.[31] Moreover, recycling conserves three to five times as much energy as incinerator facilities after factoring in that manufacturing new products from recycled materials uses less energy than products using virgin raw materials.[32] Recycling, including collecting, processing, and transporting recyclables to their end market, consumes less energy and has overall lower environmental impact than disposing of solid waste via landfilling or incineration, even after accounting for energy that may be recovered from waste materials at either type disposal facility.[3]

CIRCULAR ECONOMY VS. LINEAR ECONOMY

LINEAR ECONOMY

CIRCULAR ECONOMY



Chapter 3
Incinerators are Plagued by Financial and Operational issues

Incineration is the most expensive form of energy generation in the U.S. per unit of electricity produced. The U.S. Energy Information Administration determined that the costs of building WTE incinerators are 60% higher than nuclear power and the operating costs are ten times higher than coal.[34] The costs are typically borne by taxpayers who foot the bill for the waste disposal fees (i.e. tipping fees) charged to municipalities. The local communities don't just assume the costs of disposal at these facilities, which can exceed $500 million for a large waste incinerator, they also frequently assume the risk associated with debt service payments for the facilities.[35] Waste incineration, compared to renewables, coal, and nuclear, has the highest capital costs, the highest operation and maintenance costs, and has the lowest capacity for energy output.

Table 2, Capital Cost Estimated for Electicity Generation Plants for Selected Technologies

Technology/Fuel	Nominal Facility Capacity (KW)	Capital Cost ($/KW)	Fixed O&M ($/KW-yr)	Variable O&M ($/MWh)
Advanced Pulverized Coal	**650,000**	**3,167**	**35.97**	**4.25**
Advanced	**2,236,000**	**5,339**	**88.75**	**2.04**
Nuclear/Uranium Waste Incineration	**50,000**	**8,232**	**373.76**	**2.04**
Photovoltaic/Solar	150,000	4,755	16.70	0
Onshore Wind	100,000	2,438	28.07	0

Table from U.S. Energy informations Admi nistration (Department of Energy), Updated capital Cost Estimates for Electricity Generation PLants, November 2010. http://www.eia.gov/oiaf/beck_plantcosts/pdf/updatedplantcosts.pdf

Incinerators are risky investments for municipalities. One facility in Detroit, for example, cost the city over $1.2 billion in costs and debt servicing their WTE incinerator over a twenty-year period. The city came close to bankruptcy on three different occasions in that time-period. While the city's bankruptcy cannot be attributed fully to the incinerator, it likely contributed.[36] In October 2011, Harrisburg Pennsylvania became one of the largest cities in the U.S. to declare bankruptcy due to the $300 million debt arising from fixing and upgrading a WTE incinerator operated by Covanta.[37]

SERRF in the near term could face shortfall of revenue to pay for all of its rising operating costs. The revenue shortfall is attributed to the ending of the power purchase agreement with Southern California Edison (SCE) in 2017. The potential rising of operational cost is mainly due to the need to purchase emissions credit under AB32, future cost for equipment maintenance and upgrades and MSW tonnages being disposed at landfills for having lower tipping fees than the rates charged by SERRF. It is estimated that SERRF by 2017 will need to increase its gate fees in order to generate enough revenue to cover its operating cost while securing a waste

stream of MSW to continue normal operations.[38] Staff of CARB are recommending that the Commerce and Long Beach incinerators, which have enjoyed an exemption from purchasing AB32 emissions credits under the cap and trade program, continue to be exempt until 2018. In response, the City of Long Beach supported the staff recommendation, citing financial challenges the facility is facing as the primary reason that that the exemption should be extended.[39]

One of the problems with incinerators is that to be financially solvent, they need to operate constantly and require a constant waste stream. **The "need to feed" an existing incinerator has already positioned California cities that are financially obligated to maintaining the solvency of a facility as opponents of recycling and source reduction in the world of carpet stewardship.** For example, in a letter sent to CalRecycle by the L.A. County Department of Sanitation in 2011, the County argued against the agency limiting "transformation" of carpet "in favor of reduction, reuse or recycling." They wrote "the proposed regulations will direct solid waste away from transformation" and said that CalRecycle should avoid preferences with respect to the solid waste management hierarchy.[40] This is proof of the disincentive for recycling and source reduction that is created once an incinerator is built to treat waste. Recycling and reuse have a more positive economic impact than incineration. Recycling creates ten times as many jobs as incineration, while reuse operations create anywhere from twenty-eight to nearly three hundred times the number of jobs.[41] Since only 10% of carpet is recycled in California, recycling provides huge potential for job increases. Recycling jobs can be good quality, local jobs that help to support families and create resilient host communities. The Tellus Institute also reported that recycling creates 10- 20 times as many jobs as incineration.[42] Research for the state of Massachusetts suggested that reducing solid waste disposal by 2 million tons per year by 2020 would result in an annual savings of $120 - $160 million in disposal costs for residents and local communities.[43]

The Fight for Qualification of WTE Incinerators Under the Renewable Portfolio Standard- (RPS) California's renewable portfolio standards (RPS) is part of the regulatory program implementing the Global Warming Solutions Act, and the state's commitment to reducing greenhouse gas emissions by 40% below 1990 levels by 2030 under SB 32. The RPS requires utilities to get 50% of their electricity from renewables by 2030. Taxpayer and ratepayer subsidies make it possible for the mandate to be fulfilled by providing the funding to build and operate new renewable energy generating sources. The RPS is one of the biggest drivers of alternative energy. Compliance with these standards takes various forms, but in general there are legal requirements that a certain percentage of electricity produced in a state be from "renewable" sources. State programs define qualifying technologies differently, or in varying classes.

Waste incineration qualifies in the California RPS in a limited way. The RPS arbitrarily includes only one of the three WTE incinerators in the state- the Stanislaus SRRF in Crow's Landing. The state RPS also allows waste gasification, but only if the facility has no emissions of any kind, including greenhouse gases. To date this has precluded any gasification facilities from obtaining formal status under the California state RPS. Between state RPS goals of 50% renewable electricity by 2030, and the cap and trade mechanism that came out of AB 32, it remains to be seen whether the state will keep its commitment to the development of a just and resilient recycling/zero waste economy, or whether these laws will instead serve to expand burn and bury practices. Currently, there is a bill introduced in the 2017 session to allow all MSW incinerators to qualify as renewable energy sources within the RPS (AB 655).

Chapter 4
Emissions from Incinerators Where Carpets are Burned are Poorly regulated

Typical Emissions from Trash Incinerators

Burning wastes releases persistent organic pollutants, endocrine disrupters, and other hazardous chemicals such as dioxin, mercury and lead. During the combustion process, numerous pollutants and products of incomplete combustion are formed at different stages. The most common pollutants released from waste incineration include acid gases such as hydrogen chloride (HCl) and sulfur dioxide (SO_2); nitrogen oxides (NO*x*); heavy metals such as mercury, lead, and cadmium; particulate matter (PM); polycyclic aromatic hydrocarbons (PAH) and other semi-volatiles; and polychlorinated dibenzo-*p*-dioxins and dibenzofurans (PCDD/F). Many carpets contain polyvinyl chloride (PVC) which creates dioxin when burned. Dioxin is among the most dangerous chemicals knowns and a proven carcinogen.[44]

Incinerators typically operate at high temperatures to facilitate the destruction of pollutants, but some zones in the combustion region, as well as in the post-combustion region, facilitate pollutant formation. Thermal NO*x* is formed at higher temperatures (>1450 °C) in the combustion zone. At lower temperatures (150 °C to 400 °C), PCDD/F are formed, primarily from wastes containing chlorine, like PVC carpet. Metals present in wastes, depending upon volatility, can be contained in the bottom ash or emitted as PM where they can catalyze the formation of other pollutants such as PAH and PCDD/F. Emissions of most of these pollutants are regulated to minimize their adverse environmental and health effects. Most modern incinerators are equipped with advanced air pollution control devices: fabric filters (baghouses), scrubbers, electrostatic precipitators.[45]

Emissions from California Trash Incinerators

CARB's Toxic Hot Spot facility finder shows reported emissions for two of the three mass-burn WTE trash incinerators in California. Here's some of the emissions data from the facility finder.

Data from 2015	Pvollutant	Emissions	Unit
Download CSV file	TOG	11.3	Tons/Yr
	ROG	2.6	Tons/Yr
	CO	27.7	Tons/Yr
	NOX	110.1	Tons/Yr
	SOX	8.1	Tons/Yr
	PM	6.9	Tons/Yr
	PM10	2.1	Tons/Yr
	PM2.5		

Commerce Facility- [46]

Data from 2015	Pollutant	Emissions	Unit
Download CSV file	TOG	11.3	Tons/Yr
	ROG	2.4	Tons/Yr
	CO	58.4	Tons/Yr
	NOX	301.6	Tons/Yr
	SOX	27.5	Tons/Yr
	PM	19.4	Tons/Yr
	PM10	6.3	Tons/Yr
	PM2.5	4.5	Tons/Yr

SERRF, Long Beach[47]

Annual Average Emissions (Tons/Day)

STATEWIDE
WASTE DISPOSAL
130-INCINERATOR[48]

EMISSIONS INVENTORY CATEGORY	TOG	ROG	CO	NOX	SOX	PM	PM10	
130-130-0240-0000 130-INCINERATION 0240-SOLID WASTE (UNSPECIFIED) 0000-SUB-CATEGORY UNSPECIFIED	0.22	0.04	0.40	1.19	0.13	0.16	0.05	0.03

Regulation- Size Matters

In the U.S., non-hazardous incinerators are regulated on the basis of facility size and waste source. Incinerator categories are small MSW (35–250 tons per day, large MSW (>250 tons per day), sewage sludge, [9]medical, infectious, and hospital wastes, commercial and industrial wastes, and other solid wastes (e.g. very small MSW incinerators and institutional waste incinerators). The same pollutants are regulated for all incinerators: PM, CO, NO_x, SO_2, HCl, Pb, Cd, Hg, PCDD/F, and opacity. The limits for each of these pollutants vary by category, incinerator type, size, and in some instances location (*i.e.*, distance to urban center).[49]

The Federal Clean Air Act (42 U.S.C. §§ 7401-7671q) require states to adopt national ambient air quality standards (NAAQS) to protect the public health and welfare from the effects of air pollution. Current federal standards are set for SO2, CO, NO2, O3, PM10, PM2.5, and Pb. At the state level, air contaminants are regulated via State Implementation Plans (SIP) and similar approved plans in areas that are designated as nonattainment. The State of California Air Resources Board (CARB) has established additional standards which are generally more stringent than the NAAQS. CARB regulates PM10 and PM2.5 in ambient air quality, but for stationary sources, there is no regulation with respect to trash incinerators. These pollutants are regulated in geographic regions, called "attainment districts." In 2016, four areas in California were designated as not meeting the annual PM2.5 standard - South Coast Air Basin, San Joaquin Valley Air Basin, and portions of Imperial and Plumas Counties.[50]

- **Respirable Particulate Matter (PM10).** Refers to particulates equal to or less than 10 microns in diameter -- those which can be inhaled and cause health effects. Particulates in the atmosphere result from many kinds of dust- and fume-producing industrial and agricultural operations, combustion, atmospheric photochemical reactions, demolition, construction, and vehicular traffic.

- **Fine Particulate Matter (PM2.5).** Defined as fine particulate matter equal to or less than 2.5 microns in size. The sources and health effects of PM2.5 are similar to those of PM10. PM2.5, including PCBs, dioxins, and furans that are produced from burning waste, are smaller in size that what is currently regulated under the Clean Air Act. Hundreds of studies have suggested that breathing fine particles spewed by vehicles, factories, and power plants can trigger heart attacks and worsen respiratory disease in vulnerable people, leading to perhaps 60,000 premature deaths a year in the United States.[51]

- **Ultra-fine particles and Nanoparticle Emissions.** Concern over nanoparticle emissions from incinerators has grown significantly as the quantity of nanomaterials used in manufacturing is increasing exponentially. Nanoparticles, sometimes referred to as

ultrafine particles, are particles of less than one micron in diameter. There are very serious health concerns with nanoparticles particularly because these very tiny particles can easily cross cell membranes. The normal defense mechanisms in fish, animal, and human bodies that prevent particle entry to organs and tissues do not stop the migration of nanoparticles which can get into the bloodstream and then travel to every tissue in the body and enter these as well. They can even cross the blood-brain barrier.[52]

Even the most expensive and advanced air pollution control technologies for incinerators do not prevent the release of hazardous air emissions, such as ultra-fine particles and nanoparticles.[53] EPA concluded that a portion of nanomaterials may persist in the combustion zone and may impact the formation of other pollutants. The use of best available control technologies (i.e. fabric filters, ionizing wet scrubbers or wet electrostatic precipitators, is expected to remove a majority of nanoparticles from incinerator effluence, but they may concentrate in bottom ash and also be released in fly ash and the effectiveness of control technology at removing nanoparticles needs to be thoroughly assessed. This is important not only for preventing the release of engineered nanoparticles but also for controlling those generated during incineration. [54]

Understanding what happens to nanomaterials during the incineration process is imperative because physical and chemical transformations of nanomaterials could drastically affect their transport and toxicity in the environment. Not only may the nanomaterials themselves be modified, but they may catalyze the formation and destruction of other pollutants (*e.g.*, dioxins). The lack of adequate tools and methods to measure emission of nanoparticles accurately and significant gaps in data, monitoring, and technology create challenges in regulating nanoparticle emissions. This is particularly true for emissions from incineration since combustion can produce incidental nanoparticles that may be difficult to distinguish from nanoparticles derived from nanotechnology-based products.[55] Currently, there is no regulation or required control of the emissions of nanoparticles from incineration.

It is hard to know the full extent of nanotechnology being used in carpet as there are many uses in textiles, but reporting on carpeting per se is more limited. In the U.S. in 2010, it was estimated that 250 m tons of waste was generated, 13% were plastics 30% was paper and packaging, and 9% were metals. Although plastics are a small part of the waste stream they have potential to be big source of nanomaterials. Nanomaterials are frequently incorporated into polymer matrices to form nanocomposite plastics. The volume of nanomaterials is expected to increase dramatically in the future. All kind of materials can be incorporated into polymers (Clay, SiO_2, and TiO2 nanoparticles as well as carbon nanotubes (CNT) are used as fillers to improve the mechanical, electrical, magnetic, and thermal properties of polymers.) In addition to nanomaterial use in carpet polymers, carpeting can be treated with anti-static nanomaterials to reduce adsorption of particles and absorption of water as well as to exclude oil, making the carpet dirt-proof. For example, Mohawk introduced SmartStrand featuring Forever Clean technology in 2014. Forever Clean is a fiber protection treatment that uses nanotechnology to protect fiber against spills. It uses ultra-fine nanoparticles that bond together on a molecular level to encapsulate the fiber and repel soil. [56]

Lack of Continuous Monitoring

Strong regulations, scientific monitoring, and rigorous enforcement of regulations are needed to protect the public from toxic air emissions related to incineration. The weak link for incinerators in the U.S. and many other countries is how infrequently toxic metal and dioxin air emissions are monitored. During start-up and shut down of facilities are not monitored- these

are the times when toxic emissions are greatest. Promoters of incineration tout environmental monitoring (CEM) for their facilities. However, CEM is not possible for toxic metals (with the possible exception of mercury) and dioxin-related compounds. Monitoring for these pollutants requires inserting a probe into the flue gas and collecting a sample on filters that then are sent to a laboratory for analysis, which can take several months. There are not many labs equipped with the very expensive equipment to do this testing or the subsequent analysis.[57]

Cement Kilns Exempt from Monitoring and Emissions Controls

Cement kilns that burn waste (including carpets) in the U.S. likely result in worse emissions than typical WTE treatment as they are not subject to the same monitoring and regulations as traditional incinerators. Fenceline communities may not even know that a cement kiln is burning waste in their midst. The environmental law group, Earthjustice, revealed that there is no requirement of public notice to burn waste at more than 1.5 million boilers and other facilities nationwide, and ninety-nine percent of industrial power plants are not subject to any emissions testing.[58] In 2015, the EPA prevailed in this lawsuit, which preserves the exemption for cement plants, chemical plants, and paper mills to burn tires and a wide array of industrial wastes without controlling, monitoring, or reporting the emissions that result.[59]

Chapter 5
Toxic Burden on Communities

Covanta and other incinerator companies continue to have problems with dioxin, mercury, and other contaminants. Covanta operates a total of 44 WTE facilities nation-wide. They are notorious for emissions of dioxins particulates, furans, and other dangerous air pollutants as evidenced in the case studies referenced here. Typically, trash incinerators are sited in low income communities and communities of color who bear a disproportional amount of impact to their health as a result of air emissions from these facilities.

Case Studies- Trash Incineration and Community Impacts

Detroit. One example is the Detroit trash incinerator operated by Detroit Renewable Power, which has been repeatedly cited for violating the Clean Air Act. In 2016, the Great Lakes Environmental Law Center filed a citizen suit for over 40 violations of the Clean Air Act dating back to 2015. In 2015, over 650,000 tons of household garbage was burned at the incinerator. Over 80% of the garbage burned at the incinerator is from outside of Detroit while only 19% originates from Wayne County (the county in which Detroit is located). Household garbage from Ohio, Illinois, and Canada is also burned at the incinerator. As Detroiters move toward city-wide recycling and reducing the amount of their waste that goes to the incinerator, they are subject to poor air quality and respiratory health issues due to waste from other communities and Detroit Renewable Power's (DRP's) repeated failure to control its air pollution.

The incinerator places a substantial environmental and public health burden on Detroit residents. According to the EPA, 7,280 residents live within 1-mile of the incinerator, 87% being people of color. The surrounding neighborhood is an asthma hotspot, with rates much higher than the Michigan average.[60] DRP violated federal air pollution laws 379 times. In response, the Michigan Department of Environmental Quality has proposed to fine the company for only 6 violations, totaling $149,000. Sixty-four continuous days of emitting excess particulate matter—a known cause and trigger of asthma—were counted as one single violation. Over 300 violations of carbon monoxide (CO) releases were excused because they occurred during start up, shut down, or a malfunction of the facility.[61]

Florida- Pinellas and Miami-Dade Counties. Florida leads the nation in trash burning. It has 12 WTE facilities. The waste-to-energy facilities in Pinellas and Miami-Dade counties are two of the largest in the state. The Pinellas County Resource Recovery Facility is one of the nation's largest waste-to-energy trash incinerators, burning 3,000 tons of garbage every day. Concerned about excessive emissions at the plant, the US EPA added it to the EPA Facility Watch List, which names "high-priority violators" of the Clean Air Act whose violations have gone unresolved for more than 270 days. State officials in 2010 cited and fined Pinellas County $50,000 for hazardous air emissions. In Doral, the Miami-Dade County Resource Recovery Facility burns 1.2 million tons of garbage annually. State environmental regulators cited the Miami-Dade waste-to-energy facility after documenting 129 health, pollution and safety violations in 1990 and failing to report several explosions, including one that badly burned a worker. State inspectors found that the plant emitted toxic heavy metal contaminants into the air.

The state Department of Environmental Protection issued a record $640,000 fine. Despite facility upgrades, the plant continued to have violations and was cited in 2003, 2006, and 2007 for continued violations and issued fines. In 2008, the state fined the facility $485,000_ for failure to operate a system intended to reduce mercury and dioxin emissions. Once operated by Montenay Power Corporation, the Miami-Dade County Resource Recovery Facility was taken over by Covanta in February 2010.[62]

Connecticut. In 2011, the Connecticut Attorney General sued Covanta for its second set of violations of dioxin air emissions standards. The suit followed a settlement reached a year earlier for a similar violation in which Covanta agreed to pay $400,000 to the state for unpermitted dioxin emissions.[63]

Newark, New Jersey. Local community groups sued Covanta alleging that a facility in Newark, New Jersey had on hundreds of occasions emitted sulfur dioxide, carbon monoxide and fine particulate matter exceeding federal regulations. The incinerator has the capacity to burn up to 2,800 tons of municipal waste each day. It accepts garbage from most of Essex County and much of Manhattan. According to the New Jersey Department of Environmental Protection in 2010, the incinerator emits more mercury, a potent neurotoxin, than any other facility burning trash in the state.[64]

Ontario, Canada. Recently, the detection of an alarming amount of toxic emissions from a Covanta-run incinerator in the Durham Region of Ontario, Canada, prompted the region's chief medical officer to push for more vigilant testing and note that sustained excessive emissions of dioxins and furans threatened public health, primarily by entering the food chain because of the many fruit and vegetable farms in the area. The emissions exceeded Canadian Ministry of Environment standards for dioxins and furans by almost 12 times. This was based on the required one test per year.[65]

Trash incinerators emit more uncontrolled pollution that coal fired power plants per unit of energy. To make the same amount of energy as a coal power plant, trash incinerators release:

- 28 times as much dioxin
- 2.5 times as much carbon monoxide,
- three times as much nitrogen oxides (NOx),
- 6-14 times as much mercury,
- nearly six times as much lead, and
- 70% more sulfur dioxides.[66]

Operators of trash incinerators are frequently fined for exceeding federal emissions limits, although testing for compliance is generally performed only once per year. In 2010, a South Baltimore incinerator operated by Wheelabrator paid a $77,500 fine for failure to control toxic mercury air emissions.[67] Meanwhile research in 2011 by the New York Department of Conservation found that the state's incinerators (operated by both Covanta and Wheelabrator) emit 14 times more mercury per unit of energy than the state's coal plants.

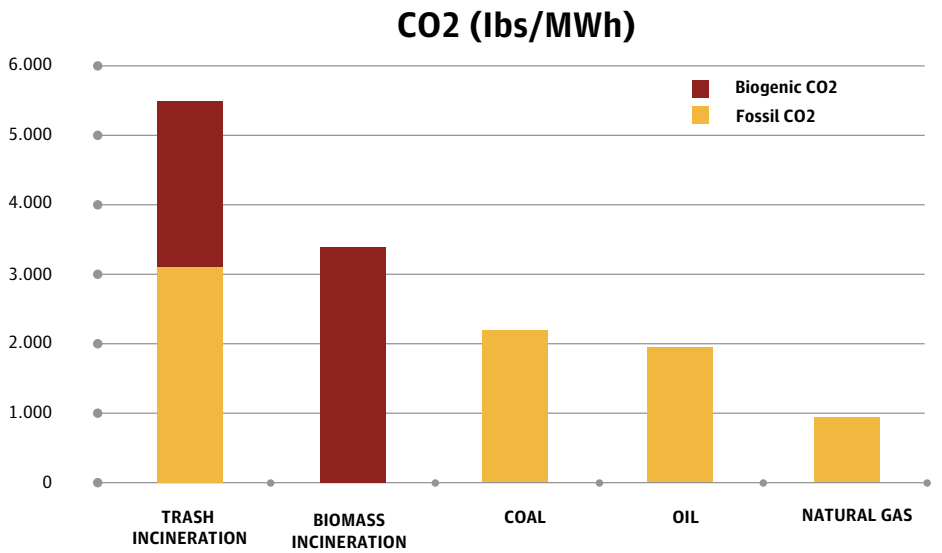
Trash incinerators emit more uncontrolled pollution that coal fired power plants per unit of energy

Incinerators are supposed to solve the landfill problem, but about 25% of the weight of incoming trash remains as residual ash that still requires landfilling or disposal.[69] Air pollutants,

such as mercury and dioxin and other contaminants concentrated in fly ash, bottom ash, boiler ash,/ slag, and wastewater treatment sludge.[70] Ash management is a problem for incinerators, and serious cases of mismanagement have occurred in recent years. Covanta was linked to the open dumping of a football-sized field of ash in Butte County, California, as well as on local farms. Tests of the ash found high levels of dioxin, and it must be relocated to a hazardous waste landfill.[71] Covanta shut down the incinerator in late 2012. Covanta is not the only incinerator company implicated in ash mismanagement. Wheelabrator (formerly Waste Management) paid a record settlement of $7.5 million to the Massachusetts Department of Environmental Protection for failing to properly treat and dispose of toxic ash, as well as for releasing 8,000 gallons of contaminated water and ash sludge into local waterways and surrounding wetlands.[72]

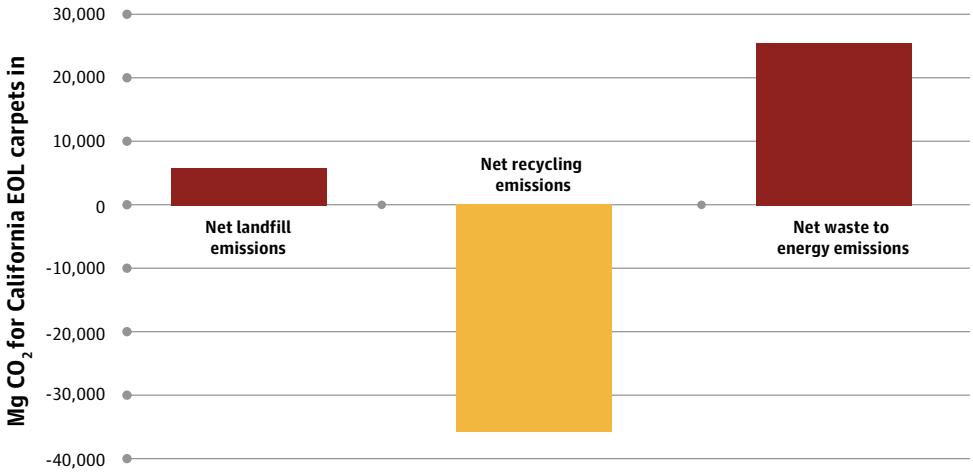
Chapter 6
Burning carpet creates significant climate risk

While industry representatives argue otherwise, WTE incinerators are major climate polluters. One analysis states that WTE incinerators are not a viable alternative to fossil fuels because they emit more carbon dioxide (CO2) per unit of energy (2,988 lbs/MWh) than coal fired power plants (2,249 lbs./MWh).[73] A more striking indictment was provided in an analysis of 2010 EPA eGRID data, which showed that trash incineration releases 2.5 times as much CO2 than coal per unit of energy produced. Even if you discount the "biogenic" fraction, burning garbage is still 50% worse than coal for CO2 emissions.[74]



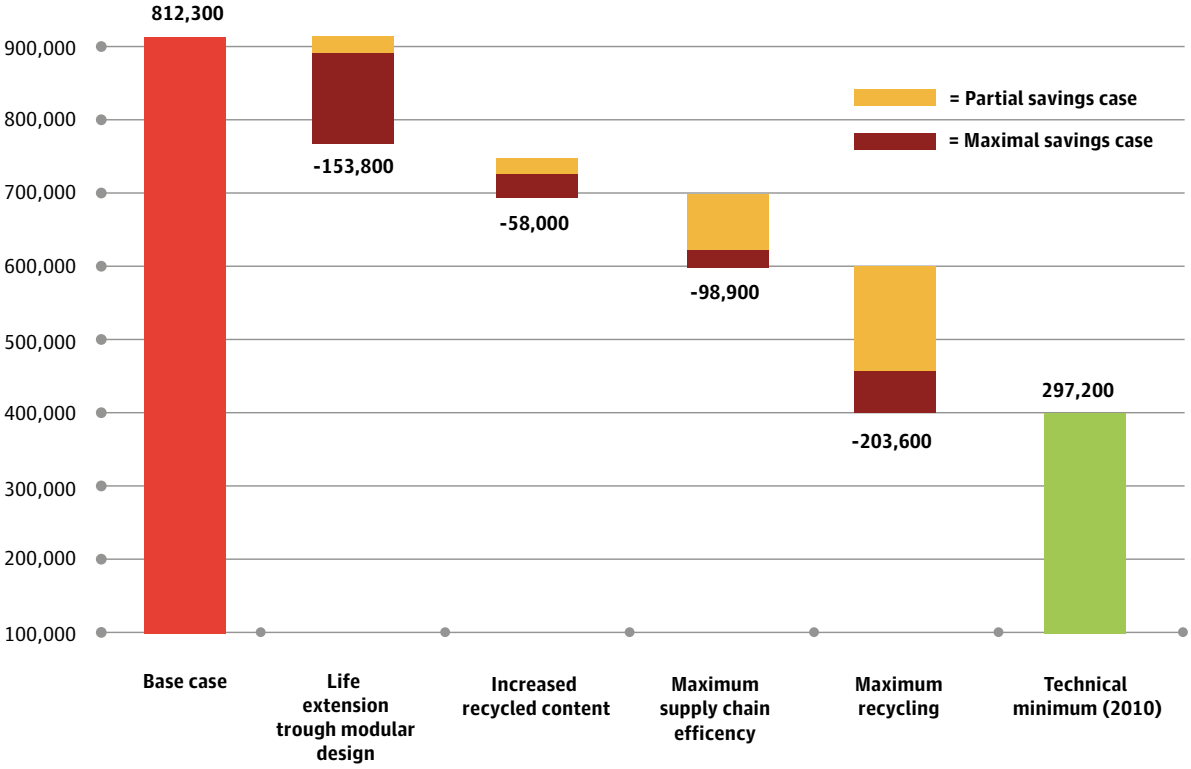
Source: Energy Justice- eGRID

In terms of carpet, CalRecycle published a report on greenhouse gas emissions associated with various end-of-life management options for carpet, based on 2010 mass flows. Comparing landfill, to recycling, to WTE emissions of greenhouse gases, using publicly available data from U.S. EPA's WARM model, the differences are dramatic and WTE is clearly the most climate-threatening option. Net recycling emissions save about 36,000 metric tons of CO2, while WTE incineration alone adds approximately 26,000 metric tons.



SOURCE: CalRecycle (May 2012), "Residential and Commercial Carpet Case Study- The Potential Impacts of Extended Producer Responsibility (EPR) in California on Global Greenhouse Gas (GHG) Emissions- p.11

The report provided useful information in comparing the opportunities for life-cycle emissions reductions. Opportunities to reduce greenhouse gas emissions are significant when combining recycling with use of carpet tiles, increased recycled content, and maximizing supply chain efficiency. Recycling and extending the life-time of carpet through carpet tiles (e.g. modular design).



Chapter 7
Conclusion

Since incineration through WTE, CAAF, and Kiln all fall within the category of "transformation" that is supposed to be treated, along with landfill, as the last option in end-of-life management, CalRecycle should take a hard look at CARE's history and its proposed plan for the next five years. The first five years, CARE increased incineration by 7% and in the next five years it proposes an increase in incineration from 9% to 34%, whereas only a 2.5-fold increase in recycling predicted (10%-26%) and more carpet will be incinerated than recycled.

Given the climate impacts, community impacts, and the financial burden to communities of supporting incineration, the state should be requiring the carpet industry to reduce its reliance on incineration to the same extent that it demands a decrease in landfill. CalRecycle should set the recycling targets and targets for the reduction of incineration and landfill of carpet waste.

The dismal results of the CARE program result mainly from the originating law that allowed consumer fees to fund the program. It also erred in selecting a stewardship organization (CARE), which is controlled by industry giants, Shaw and Mohawk, who want to continue business as usual. The $27 million in collected fees means that the industry has no financial "skin in the game." California has implemented a program that fails to (1) properly incentivize recycling and the use of recycled content, (2) provide adequate subsidies for collection and recycling, and (3) implement the necessary industry and consumer education to support a serious carpet recycling program in California. In the short term, CalRecycle should reject CARE as the stewardship organization and prohibit the sale of carpet in California by retailers and manufacturers that are not covered by a stewardship program. A legislative fix is needed that allows the state to set enforceable targets for recycling, requires it to seek the reduction of incineration, and mandates that the program is industry-funded. A strong law would require industry to spend its own money to achieve these targets and would prevent noncomplying companies from selling carpet in California. This type of program would create sufficient financial incentives to achieve the state's goals.

1. Freedonia, 2015, "U.S. Carpet and Rugs"
2. GAIA and Changing Markets, "Swept Under the Carpet: Exposing the Greenwash of the Carpet Industry," December 2016, p. 14- http://www.no-burn.org/wp-content/uploads/SWEPT-UNDER-THE-CARPET_high-res-DECEMBER-2016.pdf
3. CARE, 2015. "CARE 2015 Annual Report": hhttps://carpetrecovery.org/wp-content/uploads/2014/04/CARE-2015-Annual-Report-FINAL-9-2-18-1.pdf Here, we mean that WTE, CAAF, and Kiln are all forms of incineration.
4. Stated in AB 2398 bill text: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200920100AB2398
5. Changing markets and GAIA, "Swept Under the Carpet: Exposing the Greenwash of the U.S> Carpet Industry," December 2016- http://www.no-burn.org/carpet-industry-attempt-to-undermine-california-recycling-scheme-revealed/
6. California consumers have paid fees that increased from 5 to 25 cents per square yard to CARE.
7. On March 10, 2017, CalRecycle issued an accusation notifying CARE of its intent to levy penalties for non-compliance in 2013, 2014, and 2105 totaling $3,285,000.
8. CalRecycle's Director disapproved CARE's Carpet Stewardship Plan 2017-2021 on December 22, 2016 for reasons explained in CalRecycle's Request for Approval (RFA)- http://www.calrecycle.ca.gov/Carpet/Program.htm; furthermore, in advance of the April 18th meeting, staff have recommended that the Director disapprove the plan and find that all manufacturers, wholesalers, and retailers currently covered by CARE are no longer covered by a stewardship program and therefore not legally able to sell carpet in California until such time as they are covered by a state-approved stewardship plan. http://www.calrecycle.ca.gov/Actions/PublicNoticeDetail.aspx?id=2067&aiid=1885
9. Recyclability went from 50% to 60% goal, no change in goal for market growth of secondary products, same goal for reuse, no change in recycling goal (26% by 2021), a decrease in diversion from landfill rate, no increase in the goal of one drop off location per county, and no change in the source reduction goal.
10. CAAF is defined in California Code of Regulations (CCR) §18941 as "fuel that has been produced from source- separated and sorted post- consumer carpet and processed, including (1) extraction of components for recycling if at all possible and (2) size reduction, shredding, and/or blending with coal fines, etc.." Kiln or Cement Kiln is defined by CARE in its revised 2017 Plan as cement production facility that may use CAAF as a source of energy and/or as an additive for cement production. Waste to Energy (WTE) is defined by CARE in its revised 2017 Plan as process of recovering thermal energy from solid waste through combustion.
11. "kiln" means sent to a cement kiln to be burned in the production of cement.
12. Section 42970 Chapter 20, Part 3 of Division 30 of the CA Public Resources Code
13. Engineered Municipal Solid Waste
14. Title 14, California Code of Regulations, section 18720.
15. CalRecycle also considers the 3 WTE, mass-burn incinerators operating in California as a form of transformation. http://www.calrecycle.ca.gov/actions/Documents%5C77%5C20132013%5C935%5CMSW%20Thermal%20Technologies%20FINAL.pdf
16. In both of CARE's five year strategies, they state: "Landfilling, incineration, and other forms of disposal are considered the lowest level on California's solid waste management hierarchy, and the Plan does not support their use for disposal of post- consumer carpet." See the 2017-2021 CARE Plan from Oct. and Feb. 2017 http://www.calrecycle.ca.gov/Carpet/Plans/default.htm
17. CalRecycle also considers the 3 WTE, mass-burn incinerators operating in California as a form of transformation. http://www.calrecycle.ca.gov/actions/Documents%5C77%5C20132013%5C935%5CMSW%20Thermal%20Technologies%20FINAL.pdf
18. GAIA, "Burning Public Money," 2011, p. 25.
19. Helou et al, Recovery from Municipal Solid Waste in California: Needs and Challenges,
20. http://www.lacsd.org/solidwaste/swfacilities/rtefac/serrf/brochure.asp
21. http://www.lacsd.org/civicax/filebank/blobdload.aspx?blobid=9974
22. GAIA, "Waste Gasification & Pyrolysis: High Risk, Low Yield Processes for Waste Management," 2017.
23. Id.
24. Stringfellow T. An independent engineering evaluation of waste-to-energy technologies. RenewableEnergyWorld.com (13 January 2014). Available: http://www.renewableenergyworld.com/articles/2014/01/an-independent-engineering-evaluation-of-waste-to-energy-technologies.html
25. Wilson, M. and Tangri, N., "Waste Gasification: & Pyrolysis: High Risk, Low Yield Processes for Waste Management," GAIA, March 2017. http://www.no-burn.org/wp-content/uploads/Waste-Gasification-and-Pyrolysis-high-risk-low-yield-processes-march-2017.pdf
26. Seltenrich, N., Emerging Waste-to-Energy Technologies: Solid Waste Solution or Dead End? Environmental health Perspectives, Vol. 124, No. 6- https://ehp.niehs.nih.gov/124-a106/
27. Greenwaste 2015, "Why recycle your carpet and padding?": http://www.greenwaste.com/carpet-recycling
28. 2015 CARE Annual Report prepared for CalRecycle. http://www.calrecycle.ca.gov/Carpet/Program.htm
29. Based on in person meeting February 2, 2017 with Cal Recycle staff.
30. Platt, Brenda et al, Stop Trashing the Climate, ILSR, Eco-Cycle & GAIA, 2008
31. Eco-Cycle, Waste-of-Energy, 7-8; Friends of the Earth (United Kingdom), "Pyrolysis, Gasification and Plasma," Briefing (Sept. 2009), GAIA, "An Industry Blowing Smoke: 10 Reasons Why Gasification, Pyrolysis & Plasma Incineration Are Not "Green Solutions"
32. Energy generation potential (in kilowatt hours per ton of solid waste): recycling (2,250 kWh / per ton; gasification and pyrolysis (660); incineration (585); landfilling 105. The Tellus Institute, Assessment of Materials Management Options 1-9; Eco-Cycle, Waste-of-Energy, at 2.
33. Sound Resource Management Group, Inc., Comparison of Environmental Burdens: Recycling, Disposal with Energy Recovery from Landfill Gases, and Disposal via Hypothetical Waste-to-Energy Incineration, prepared for San Louis Obispo County Integrated Waste Management Authority, San Luis Obispo, California (Seattle, WA: Sound Resource Management Group, Inc., 2004), http://www.zerowaste.com/graphs/rr/comparative_lcas-final.pdf (accessed March 28, 2013). This report is the basis for the widely-cited article by Jeffrey Morris, "Comparative LCAs for Curbside Recycling, Versus Either Landfilling or Incineration With Energy Recovery," International Journal of Life Cycle Assessment 13, no. 3 (2005): 226-234
34. U.S. Energy Information Administration (Department of Energy), Updated Capital Cost Estimates for Electricity Generation Plants, November 2010. http://www.eia.gov/oiaf/beck_plantcosts/pdf/updatedplantcosts.pdf
35. GAIA, Burning Public Money, 2011, p. 6
36. GAIA, Burning Public Money, 2011, p. 6
37. The Economist, Money Up in Smoke, October 29, 2011
38. Letter to Mayor Eric Garcetti, April 29, 2016, from LA County Sanitation District recommending an end to negotiations for a partnership agreement with the Cities of Long Beach and LACSD of the ownership and operation of SERRF- http://clkrep.lacity.org/onlinedocs/2014/14-1206_rpt_MAYOR_05-04-2016.pdf
39. https://www.arb.ca.gov/lists/com-attach/151-capandtrade16-VyVWNVQzAyUAdVA1.pdf
40. Letter dated August 26, 2011 to Howard Levinson of CalRecycle, from Charles Boehmke, Facilities Planning Department, LA County Office of Sanitation.
41. Massachusetts DEP. Executive Office of Energy and Environmental Affairs, Pathway to Zero Waste, 4.

42. Tellus Institute, 2011. "More Jobs, Less Pollution: Growing the Recycling Economy in the U.S." http://www.no-burn.org/wp-content/uploads/MoreJobsLessPollutionFinal.pdf
43. Massachusetts DEP.
44. World Health Organization (WHO), 2016. "Dioxins and their effects on human health"- http://www.who.int/mediacentre/factsheets/fs225/en/
45. Holder, A., et al, US EPA- National Risk Management Research Laboratory- July 2013 http://pubs.rsc.org/en/content/articlehtml/2013/em/c3em00224a
46. Hot Spots Portal CARB- Accessed April 2017- https://www.arb.ca.gov/app/emsinv/facinfo/facinfo.php
47. Hot Spots Portal CARB- Accessed April 2017- https://www.arb.ca.gov/app/emsinv/facinfo/facinfo.php
48. https://www.arb.ca.gov/app/emsinv/2013/emseic_query.php?F_YR=2012&F_DIV=-4&F_SEASON=A&SP=2013&SPN=2013_Almanac&F_AREA=CA&F_EICSUM=130 Accessed April 12, 2017
49. Id.
50. https://www.arb.ca.gov/research/apr/reports/pm25-monitoring-2016.pdf
51. "Mounting Evidence Indicts Fine Particle Pollution, SCIENCE Vol 37 March 205 at 1858- http://www.precaution.org/lib/evidence_indicts_fine_particles.science.050326.pdf
52. Id.
53. Howard, C.Vyvyan 2009. Statement of Evidence, Particulate Emissions and Health, Proposed Ringaskiddy Waste-to-Energy Facility": http://www.durhamenvironmentwatch. org/Incinerator%20Health/CVHRingaskiddyEvidenceFinal1.pdf
54. Holder, A., et al, US EPA- National Risk Management Research Laboratory- July 2013 http://pubs.rsc.org/en/content/articlehtml/2013/em/c3em00224a
55. US EPA- National Risk Management Research Laoratory- Holder, A., et al July 2013 http://pubs.rsc.org/en/content/articlehtml/2013/em/c3em00224a
56. https://www.thespruce.com/mohawk-introduces-forever-clean-to-smartstrand-2908761
57. Paul Connett, http://www.earthisland.org/journal/index.php/elist/eListRead/incineration_the_biggest_obstacle_to_zero_waste/
58. Earthjustice 2014. "EPA Faces Court Challenges Over Solid Waste Loophole." http://earthjustice.org/news/press/2014/epa-faces-court-challenge-over-solid-waste-loophole
59. https://www.eenews.net/greenwire/stories/1060019677/
60. Press release, October 17, 2016, "Great Lakes Environmental Law CenterGives Notice of Intent to Sue Regarding Incinerator Violations.
61. http://www.ecocenter.org/breathe-free-detroit
62. Florida Center for Investigative Reporting- cir.org/2011/11/07/florida-home-to-seven-air-polluters-on-epa-watch-list/
63. http://www.bbc.co.uk/news/uk-wales-14981456
64. http://www.njspotlight.com/stories/10/1003/1512/
65. https://www.thestar.com/news/gta/2016/06/14/durham-grapples-with-incinerators-alarming-emissions.html
66. http://www.energyjustice.net/incineration/worsethancoal
67. http://www.bizjournals.com/baltimore/news/2011/12/13/maryland-fines-wheelabrator-baltimore.html
68. Steven C. Russo, Esq., et al., Comments of the New York State Department of Environmental Conservation Regarding the Verified Petition of Covanta Energy Corporation, In the Matter of the Application of Covanta Energy Corporation for Modification of the List of Eligible Resources Included in the Main Tier of New York's Renewable Portfolio Standard Program to Include Energy From Waste Technology, State of New York Public Service Commission, Case 03-E-0188, August 19th, 2011. The DEC analysis also showed that on a per megawatt hour basis, garbage incinerators release fourteen times as much mercury as coal-fired power plants
69. http://www.earthisland.org/journal/index.php/elist/eListRead/incineration_the_biggest_obstacle_to_zero_waste/
70. Rombke, J. et al, Ecotoxicological characterization of 12 incinerator ashes using 6 laboratory tests, *Waste Management,* 2009; Zhang, H., "Toxicity Analysis of Municipal Solid Waste Incineration (MSWI) Fly Ash," Bioinformatics and Biomedical Engineering , 2009.
71. https://www.newsreview.com/chico/fly-in-the-ashes/content?oid=6579788
72. Dom Nicastro, "UPDATE: Wheelabrator Saugus Settles Lawsuit Amid Alleged Environmental Violations," The Saugus Advertiser, www.wickedlocal.com/saugus/news/x527526627/UPDATE-Wheelabrator-Saugus-settleslawsuit-amid- alleged-environmental-violations#axzz2YOZcLKUK (accessed 6/15/2013)
73. Morris, Jeffrey, Bury or Burn North America MSW? LCAs Provide Answers for Climate Impacts & Carbon Neutral Power Potential, Environmental Science & Technology, Volume 44, NO. 20, September, 2010
74. http://www.energyjustice.net/egrid

gaia

Changing Markets