ENERGY VISION

Food Waste Erased

Reduce, Redistribute, Recycle & Refuel

A SPECIAL REPORT BY ENERGY VISION

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Energy Vision is a national 501 (c) (3) organization based in New York City whose goal is to promote — through research and outreach — a swift transition to pollution-free, renewable energy sources. Energy Vision informs and engages with policy, business, and environmental leaders, to support the shift toward a sustainable energy and transportation future.

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Foreword

Food waste is increasingly in the news, because it's an increasingly intolerable drag on food security, sustainable resource use, the economy, and, as this report will discuss, on energy generation and the fight against climate change.

Food production is a huge business in the US. There are more than 2.2 million farms across the country, covering 922 million acres — a land area nine times the size of California. 23% of the food produced on this land is destined for export; the rest – 180 million tons of produce a year – is grown for domestic consumption. But what happens to much of that food is senseless and tragic. Americans now throw away almost as much food as they eat. A staggering 30-40% of food in the US goes to waste, costing us about $220 billion each year, according to the US Department of Agriculture (USDA), and recently reported in *USA Today*.

The waste includes vast quantities of fresh produce – some 10 million tons a year – left in the field to rot, or hauled directly to landfills because of the unrealistic and unyielding cosmetic standards for foods sold in supermarkets. Another 53 million tons thrown out each year by consumers or businesses ends up either in incinerators or landfills, where they emit methane, a powerful greenhouse gas that accelerates climate change.

The problem is especially acute in the U.S., but we are not alone. A third of global food production goes uneaten, and global food loss and waste account for $940 billion/year in economic losses, as well as 8 percent of greenhouse gas emissions. The UN Sustainable Development Goals (SDGs) call for all nations to halve their food waste by 2030.

In this report we look at the staggering flow of food treated as waste — both domestically and globally. But our primary focus is on the US, and how to make the best and fullest use of food produced here.

The solutions fall into two basic categories. First, there are measures we need to implement to reduce the amount of edible food that is wasted. We need to get the maximum possible proportion of the food we produce to the people who need it. Consumers should buy what they need and will eat, either fresh or as leftovers. We should change our wasteful aesthetics to embrace the occasional irregularity or blemish in otherwise perfectly good produce — the so-called "ugly food" movement. And we should donate unneeded fresh or canned foods from homes and businesses for redistribution to families in need.

Some leading companies have taken on edible food waste in a big way. IKEA, the world's largest furniture retailer, serves food in its stores and has about 650 million restaurant visits a year. It recently pledged to voluntarily cut its food waste in half, not by 2030 as envisioned in the SDGs, but by 2020. With the measures it has implemented in just six months, it has eliminated more than 173,000 pounds and saved close to $1 million.

The US Environmental Protection Agency and USDA have also set an ambitious goal of cutting food waste by 50%, through more careful consumer and business practices like the ones IKEA is implementing. But even achieving this goal would still leave the other 50 percent to manage.

Municipal and state governments are also supporting food waste reduction. Cities including Seattle, San Francisco, Austin and New York, and states including Vermont, Massachusetts

and Connecticut, have implemented organic waste recycling policies to prevent food from ending up in landfills or incinerators.

But no matter how much food waste we avoid, we need to recognize that some portion of waste will always be endemic, including some edible food waste, plus a large stream of inedible food. The question is, since we may not be able to avoid those wastes, what do we do with them?

That leads us to the second category of solutions, which involve treating food "waste" not as waste at all but as a valuable resource, and putting it to good use. For example, in aerobic systems that let the air get to it, food waste can be converted into compost for use in growing more food. In "anaerobic" systems that deprive it of oxygen, food waste can be broken down into compost or other fertilizers, while the methane-rich biogases emitted as organics decompose are captured and refined into renewable natural gas (RNG) fuel. Such operations are springing up across the country. Construction recently started on the first anaerobic digester facility in Utah, which will process food waste into enough RNG to power a city of 40,000.

RNG is nearly identical chemically to geologic natural gas, and can be used in all the ways geologic natural gas is used: to generate electricity, heat buildings or power vehicles. But, where RNG is used as a transportation fuel it can do the most to reduce GHG emissions and other harmful air pollution. Since producing RNG involves capturing and using methane that would otherwise escape into the atmosphere as organic waste rots, if it is made from food waste in an anaerobic digester and used as a transportation fuel – displacing diesel and gasoline – RNG is actually "net-carbon-negative." That means it prevents more GHGs from getting into the atmosphere than burning it in vehicles emits.

That's remarkable. RNG as a transportation fuel is a net gain for the climate and it's economical, so it's not surprising that it's growing fast. As Matthew Tipper, Vice President of Future Fuels for Shell, just wrote in Politico, until 2030 sustainable biofuels including renewable natural gas, combined with more efficient engines, "will provide the most cost-effective means of decarbonizing the transport sector."

Government has an important role to play. In addition to municipal and state programs, the US EPA's Renewable Fuel Standard provides strong financial incentives to convert organic waste including inedible food into RNG for ultra-low-carbon transportation fuel. The pending Agriculture Environmental Stewardship Act would promote fuller use of organic waste from farms for its inherent soil nutrient and energy value.

So there's a wide range of strategies available today that could transform food waste into food and sustainable energy. They involve both eliminating edible food from the waste stream on the demand side, and recognizing the value of inedible food by using it optimally on the "supply" side. This report gives a current overview of both sides. We hope "Food Waste Erased" will have value for political, business, and environmental leaders, encouraging them to tackle the food waste challenge by putting all these strategies to work.

Joanna D. Underwood
Chair, Energy Vision

Food Waste Erased: Reduce, Redistribute, Recycle & Refuel

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Food Waste: A Multilayered Issue

The Global Challenge

More than seven billion people now share this small planet. Of these, 795 million – one person out of every nine – live in a state of food insecurity. This means, according to the latest edition of the UN hunger report, that they cannot always meet their basic food needs[i]. With the world's population slated to rise to nine billion by 2035, the amount of food needed to feed people will grow from approximately 20 trillion calories per day to 25 trillion calories per day[ii]. How we provide adequate food has emerged as one of the greatest challenges the global community faces.

Even the United States, a nation endowed with rich natural resources and bountiful agriculture, has not been immune from the "food insecurity" challenge. Of the 795 million suffering from food insecurity, nearly 50 million live in the United States[iii]. Reducing food waste by 40% and distributing "excess" edible food effectively would provide enough food to feed them all[iv].

Yet the shocking fact is that every year, consumers in North America and Europe waste almost as much food as the entire net food production of sub-Saharan Africa (230 million tons)[v].

Discarded fruits and vegetables

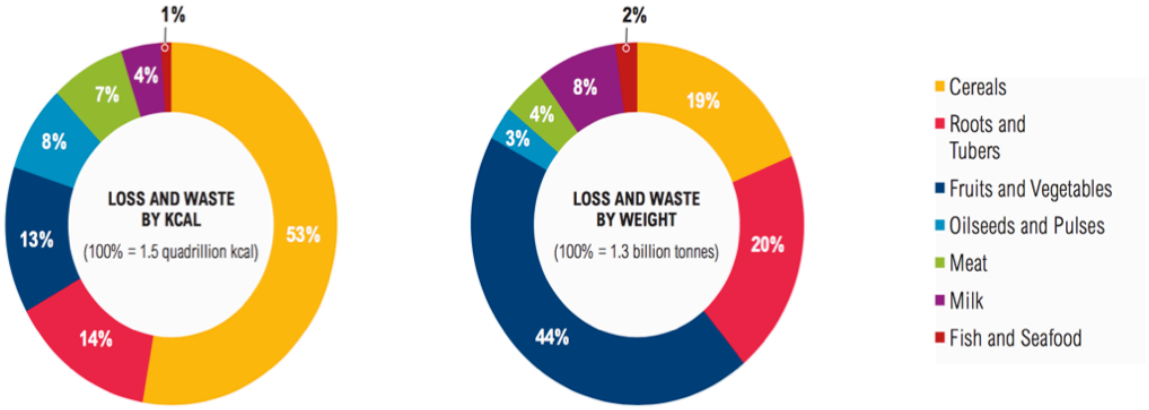
Source: United Nations Food and Agriculture Organization (UN FAO)

Hunger stands as one of the most critical development challenges for countries around the world – despite more than enough food being produced globally. The vast amount of food loss and waste raises other serious concerns. Squandered food is a wasted economic resource, with a high price being paid by individual families and countries as a whole. Further, food waste, whether left lying on farm fields or being thrown into landfills, is now recognized as a growing contributor to climate change, since decomposing organic matter emits methane gas, a potent greenhouse gas.

To combat these challenges, the UN has set a global target under its sustainable development goals of halving food loss and waste by 2030[vi]. The US has also adopted this goal. Fortunately, along with recognition of the many dimensions of the food waste problem, there are strategies and technologies available for addressing it. With political will and local action, great progress can be made addressing the health, environmental and economic impacts of food waste.

The following charts provide important perspectives on the food waste challenge; the first summarizes food loss and waste globally by type, the second food loss and waste by region.

Share of Global Food Loss and Waste by Commodity, 2009[vii]



Source: UN FAO

Food Lost or Wasted by Region, 2009

Unit of Energy per Thousand Calories/capita/day

Source: UN FAO

The High Cost of Food Waste

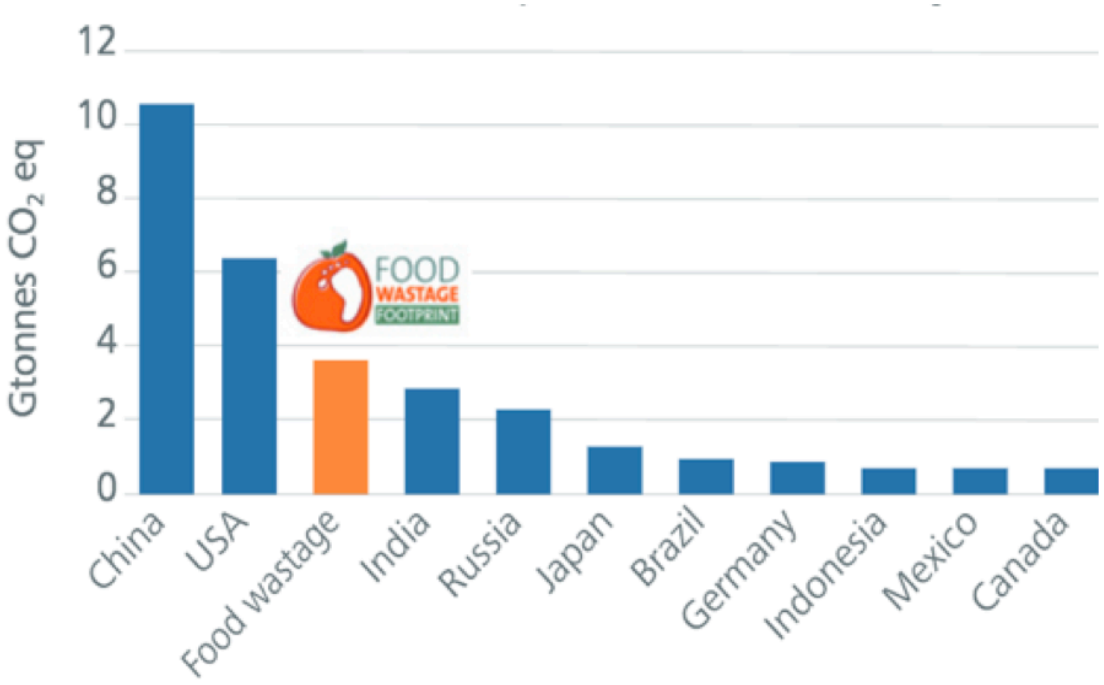
Food loss and waste globally, according to the FAO, cost the world $2.6 trillion every year. This includes approximately $750 billion in direct economic costs, $700 billion in environmental costs and $900 billion in social costs[viii]. In the United States alone, around 40 percent of food produced (approximately 63 million tons) goes to waste at a cost of $165 billion, or close to $600 per average family of four every year[ix].

Food waste also has an impact on companies' bottom lines. The purchase, transport, handling, preparation and disposal of food that *never gets eaten* costs food-based businesses like restaurants, grocery stores and food manufacturers approximately $57 billion per year[x].

A Major Source of Greenhouse Gases

In addition to the economic loss associated with food waste, there are major climate impacts. Globally, food loss and waste (all food that is produced but never consumed) accounts for nearly 8 percent of overall greenhouse gas emissions; if it were a country, food loss and waste would be the third-largest greenhouse gas emitter behind China and the United States[xi]. The methane generated as food waste breaks down is 21 times more potent than CO_2 as a greenhouse gas[xii]. And every ton of food waste results in approximately 3.8 tons of GHG emissions[xiii].

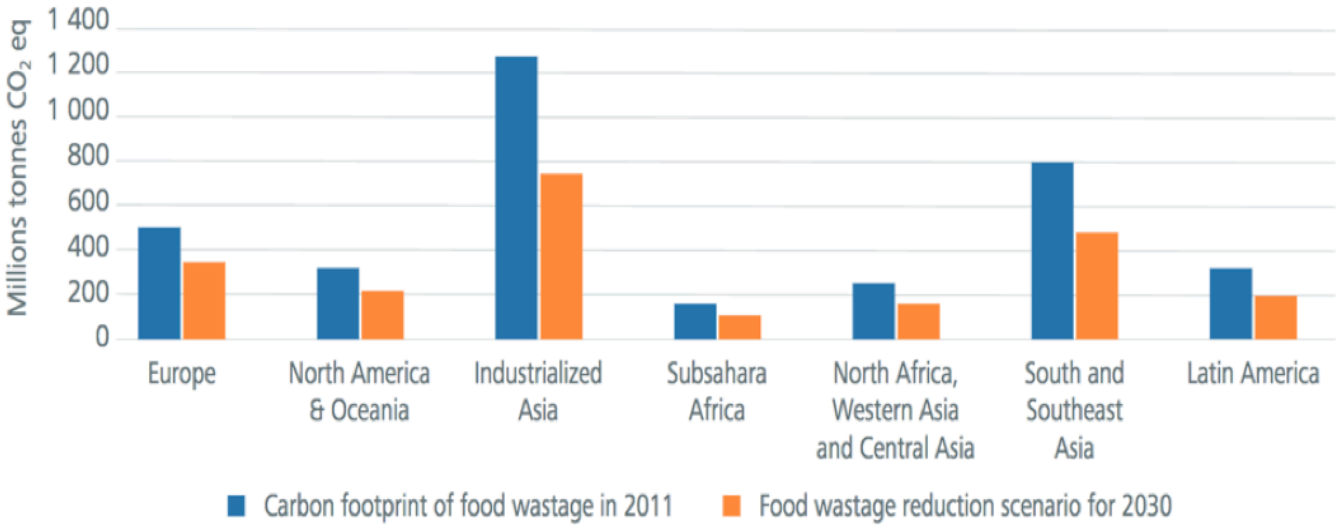
Total Greenhouse Gas Emissions by Country vs. Food Waste



Source: UN FAO (2011)

The carbon footprint associated with food waste is estimated to be approximately 3.3 billion tons of CO_2 equivalent released into the atmosphere annually[xiv]. Consequently, there are huge benefits to be gained by reducing the amount of wasted food. In the US for example, food waste is the second largest component of municipal solid waste sent to landfills, accounting for 18% of the total waste stream[xv]. Overall, landfills generate 20% of US methane emissions[xvi].

Climate Change Mitigation Potential of 50% Food Waste Reduction (2011 vs. 2030)



Source: UN FAO

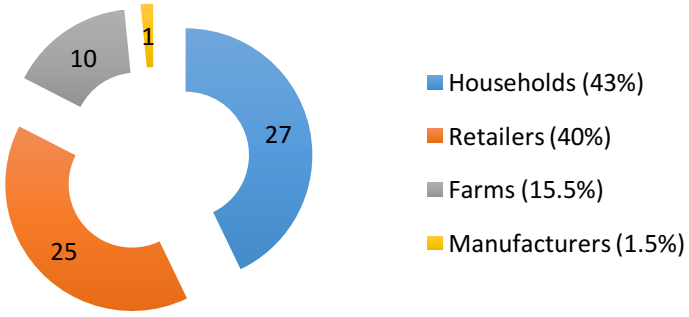
In accordance with the **2015 Paris Climate Agreement**, 191 countries have committed to investing in cleaner forms of energy and promoting energy efficiency and zero-emission transportation, in an effort to keep warming under two degrees Celsius above pre-industrial levels. As highlighted above, tackling food waste is one such strategy. Such efforts are not just environmentally sound; according to a recent **International Renewable Energy Agency (IREA)** report, climate change mitigation strategies represent a potential $19 trillion boost to the global economy over the next three decades.[xviixviii]

A Focus on the United States

The US Food Waste Challenge

Of the approximately 63 million tons of total food wasted in the US each year, close to 53 million tons end up in landfills, and another 10 million tons is discarded or left unharvested on farms[xix]. Waste takes place throughout the supply chain – manufactures, retailers, and consumers are responsible for 85% of the food sent to landfills annually.

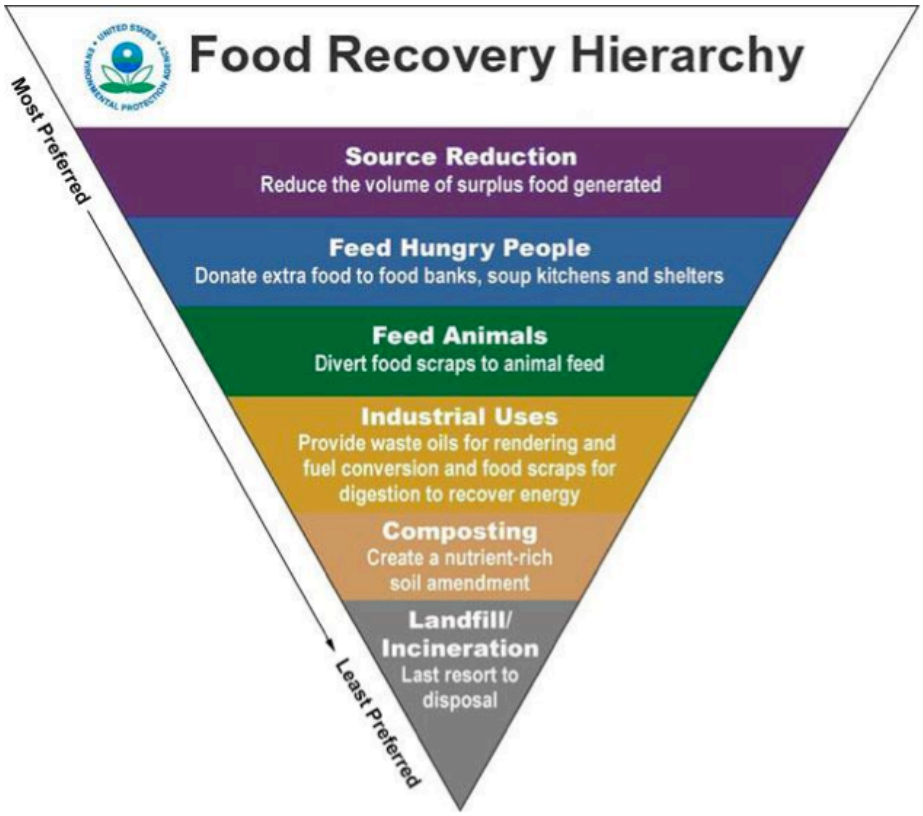
Food Wasted by Weight (Million Tons/Year) Throughout the U.S. Supply Chain (2016)



Source: ReFED.com

The US Goal: Reducing Food Waste 50% by 2030

On September 16, 2015, the **US Environmental Protection Agency (EPA)** and the **US Department of Agriculture (USDA)** jointly set a national goal of reducing food waste in the US 50% by 2030[xx]. The EPA also established its **"Food Recovery Hierarchy,"** prioritizing food waste reduction, recovery, redistribution and recycling measures that the various segments of the food supply chain could use to help achieve this ambitious goal.



Source: U.S. EPA

- **Source Reduction –** Businesses and individuals should buy only what is needed, and carefully store and use leftovers.

- **Feed Hungry People –** Donating unspoiled, edible food to people in need is a great way to prevent food from being landfilled while simultaneously combating hunger. Food banks and local community groups likely provide this option in your area. Anyone can be a donor – from wholesalers, to farmers, to civic groups, student groups or regular individuals who organize food drives. Some food banks even pick up food donations free of charge, which helps avoid storage and disposal costs.

- **Feed Animals –** With proper and safe handling, food scraps can be fed to animals, saving farmers and companies money. Companies can also donate extra food to zoos or producers of animal or pet food. The EPA recommends contacting your local solid waste, county agricultural extension office or public health agency for more information.

- **Industrial Uses –** Food that cannot be recovered or redistributed for consumption can be collected separately by municipalities and taken to facilities known as "anaerobic digesters," tanks specifically designed to handle the organic portion of municipal solid waste. In these tanks, microorganisms break down organic materials, such as food scraps, manure, and sewage sludge in the absence of oxygen. The biogases emitted by decomposing organics can be captured and utilized for power generation, for cooking/heating, or for fueling vehicles. The remaining bio-solids are used to generate nutrient-rich soil amendments (see graphic on p. 8).

- **Composting –** Inedible food as well as yard/green waste can be composted. Composting these materials creates a product that can be used to help enhance soils, boost crop yields, and improve water quality. Composting, like anaerobic digestion significantly reduces greenhouse gas emissions associated with landfills or incinerators, but unlike anaerobic digestion, composting is a process that yields no renewable energy.

- **Landfilling or Incineration –** The least preferred waste management strategies are, unfortunately, the most commonly used at present. While some energy or material recovery can occur, the inherent nutrient value of food and other organics is lost when landfilled or incinerated, and the greenhouse gas emissions are significant.

Corporate Food Waste Reduction Initiatives

To combat food waste, feed hungry people and reduce costs, many businesses are now implementing various measures in alignment with the EPA's Food Waste Hierarchy. Here are a few examples, which should inspire replication:

In December 2016, furniture retailer **Ikea** launched their *Food is Precious* initiative that aims to slash the company's food waste by 50 percent by 2020[xxi] as a cost savings measure and as a way to reduce its environmental footprint. So far, over 20 percent of Ikea's almost 400 stores have implemented the measure, which has already eliminated more than 173,000 pounds of food waste and saved $980,000[xxii]. The company was also recently recognized as a member of Champions 12.3, the global coalition for food waste hosted by the World Resources Institute.

Albertsons Companies (acquired by **Safeway** in 2011) began their 'Fresh Rescue' program in 2004, making them the first grocer to donate food. The program is now in place at all 354 Albertsons, Vons and Pavilions stores in Southern California so that excess perishable and non-perishable food is distributed throughout a network of major food bank partners[xxiii].

Blue Apron, the US-based meal delivery service, provides customers with pre-portioned ingredients for specific recipes. This strategy is estimated to reduce consumer food waste by nearly 70% and grocery level waste by 50%[xxiv].

Major American retailer **Kroger** donated 56 million pounds of fresh food to local food banks in 2015. This was done working in tandem with its internal food safety experts[xxv].

In 2015 the non-profit **Food Forward** recovered 8.8 million pounds of produce and diverted it to 300 hunger relief agencies across Southern California[xxvi].

General Mills donated nearly $50 million worth of food worldwide in 2015.[xxvii]

Baldor Specialty Foods donates fresh produce, sells trimmings and diverts unusable fruits and vegetables for animal feed[xxviii]. It also keeps food scraps — which they call "sparcs", or scraps spelled backwards — out of landfills through off-site composting and anaerobic digestion. Baldor also dehydrates its clean food scraps so that they can be resold for use in soups and other cooking applications, creating a new revenue stream by reducing waste.

In 2016, **Stop & Shop** in Massachusetts installed a 95-ton-per-day anaerobic digester that uses inedible food to generate up to 40 percent of the energy needed for the 1.1 million-square-foot distribution center where it's located[xxix].

Economic Benefits of Source Reduction & Redistribution

Business Incentives – In addition to the corporate social responsibility goals of businesses to implement sustainable practices, there is a clear financial incentive for them to reduce food waste. According to research by the World Resources Institute, for every $1 spent by a company to reduce food waste and loss, they recoup $14 in net economic benefit. From an analysis of more than 1,200 business sites across 17 countries and more than 700 multi-sectoral companies, 99% of the business sites received a positive return on their investment. Additional benefits to companies include reducing the need to buy food; increasing the share of purchased food that is then sold to consumers; and decreasing food-waste management costs[xxx].

The New York Example – Using New York State as an example, some 3.9 million tons of food waste is generated annually from residential, commercial and public sector sources. Only 3% of that is currently diverted from landfills or combustion facilities; as a result, large environmental

and economic costs are incurred. But according to a recent study by the **New York Energy Research and Development Authority (NYSERDA)**, if the 1,700 largest generators of food waste in the state redistributed edible food or sent food scraps to organic recycling centers (composting or anaerobic digesters), it would create a net-benefit of $22 million annually in the State. Doing so would also lead to significant reductions in greenhouse gas emissions[xxxi].

Inedible Food Waste: A Renewable Resource

Food waste reduction and redistribution are the highest priorities, so that food is consumed by people, first and foremost, followed by animals. However, food that cannot be safely or cost-effectively consumed is, nonetheless, a valuable resource.

The millions of tons of food and other organic waste already decomposing in landfills represent a major climate liability when the methane biogases they emit are allowed to escape into the atmosphere. But *if captured and utilized*, those biogases represent a huge renewable energy resource; this is now happening with gas capture at many American landfills. Even better, if inedible food and other organic wastes are collected separately and processed in **anaerobic digesters**, they can produce not one but two valuable products: a clean fuel from the biogases called "Renewable Natural Gas" or "RNG", and nutrient-rich soil amendments and compost from the biosolids. All of these products have great economic, environmental and energy security benefits.

Source: Energy Vision

The Growth of a New Industry

In recent years, a burgeoning industry has emerged that captures waste-based methane from the vast amount of food and other organic materials we generate — from agricultural operations, landfills, wastewater treatment plants and food processing facilities— and turns them into a fully sustainable source of energy and fuel.

RNG is chemically almost identical to geologic natural gas, as it is made up of four hydrogen atoms and one carbon atom (CH_4). RNG is clean burning, can be distributed via the same pipeline network as geologic gas, and can be used to generate electricity, heat or cool homes and businesses, and power vehicles that are equipped with advanced natural gas engines. But RNG is not a fossil fuel. Its production requires no drilling, and it has far fewer greenhouse gas emissions than geologic natural gas. RNG can even be "net-carbon-negative" when made from food or yard waste in anaerobic digesters. That's because more greenhouse gases are captured (methane) in producing the fuel than are ever emitted by its combustion (carbon dioxide) in vehicles. RNG fuel is the lowest carbon fuel commercially available today[xxxii].

The RNG industry has grown rapidly in just the last decade, with more than 50 operational projects in the US creating thousands of permanent, non-exportable jobs in both urban and rural areas. Of these projects, 43 inject the RNG they produce into existing gas pipelines, 37 deliver RNG to fueling stations to displace diesel and gasoline in heavy-duty vehicles, and 16 produce RNG for heat and power generation. (There are also more than 250 anaerobic digestion facilities operating across the US today producing renewable electricity.)

RNG production is also rapidly increasing – from the equivalent of 20 million gallons of petroleum fuel in 2013 to almost 150 million gallons in 2016. RNG is on pace to displace approximately 250 million gallons in 2018.

Investment in the industry over the past five years has surpassed $368 million and is expected to double by the end of 2018. Since 2014, RNG has been responsible for creating 4,000 direct and indirect jobs. With an additional 40 RNG transportation projects slated to come on-line by 2020, investment of $640 million and another 7,000 direct and indirect jobs will result[xxxiii].

Environmental/Climate Benefits of Waste-Based Fuel

Some 38 billion gallons of diesel fuel is consumed annually by the 10 million trucks and buses in the US. That's almost a quarter of all on-road fuel made from crude oil, which costs the US $80 million a day. Using proven, commercial anaerobic digestion technology, food and other organic waste that is unsuitable for human or animal consumption could produce enough ultra-low-carbon RNG fuel to displace more than 10 billion gallons – over 25% – of diesel fuel annually.

RNG's carbon footprint, measured over the "life cycle" of the fuel's production, transport and use, is the lowest of any vehicle fuel currently commercially available. Its use as a vehicle fuel represents a **60%** or more reduction in GHG emissions compared to diesel vehicles when

derived from landfill gas, and as much as **120%** reduction when produced via anaerobic digestion of food and green (yard) waste.

What You as Individuals Can Do

Since households contribute 43% of all food waste – some 27 million tons a year, the largest part of the food waste stream – it is important that they take steps to be part of the solution.

Buy Only What You Need: Planning and prepping meals for the day or week is one important source reduction strategy. By buying no more food than you need for a given time frame, your food is much more likely to stay fresh and be eaten, thus reducing food waste.

A small basket of groceries

Source: Leonie Wise/Unsplash

Buy 'Ugly' Fruits and Vegetables: Some fruits and vegetables never make it to grocery shelves because they aren't aesthetically pleasing, even though they are perfectly good to consume. Luckily, they can be found and purchased at farmers' markets and some supermarkets rather than being thrown away.

Blemished or "ugly" Fruit

Source: Sergey Zolkin/Unsplash

Redistribute Food that You Don't Need: Instead of throwing away excess wholesome food or leaving canned foods on your shelves, you can develop a food share program or donate excess to a foodbank. This helps divert food waste from landfills and feed those who are food insecure. To find or contact your local food bank, visit: feedingamerica.org/find-your-local-foodbank

Contact your Local Leaders: Tell your Mayor or municipal officials that you are concerned about the issue of food waste and would like to see food redistribution systems set up (if they don't exist already) from restaurants, businesses, and government cafeterias. The USDA's Food Waste Resources is a good place to start. In addition, let your local leaders know that towns and cities in the US are now collecting food waste (and organics from local factories or farms) separately, putting them in tanks called "anaerobic digesters" and making two valuable products (see graphic on p. 8): clean, carbon-free energy/fuel, and nutrient-rich compost from the biosolids that remain after digestion. To explore this option in your area, contact Energy Vision, or visit: www.energy-vision.org.

Encourage Student-led Initiatives: If you are a student, teacher, staff member or administrator, propose the launch of a student-led initiative to quantify the organic wastes generated on your campus. Encourage the development of strategies for collecting this waste separately, so these materials can be contributed to a local organics recycling program, or explore processing them into fuel and compost in "micro-digesters" on-site. Energy Vision is guiding such an initiative at Hunter College in NYC, and students there have found through their "Food Waste Erased" campaign that more than a quarter-ton of food waste is generated on campus every week.

Energy Vision's 'Food Waste Erased' Initiative at Hunter College, NYC (2016)

Five Students with Kyle Jeremiah, Project Coordinator and Joanna Underwood, EV Chair

Source: Energy Vision

Invest: Identify organizations working on food waste reduction issues and contribute your time and money to advance the important work they continue to do. From schools to community gardens, there are many groups working to combat the food waste challenge. Now you can too!

Food Waste Resources

To continue exploring the topic of food waste, here are some useful agency and non-profit resources:

Energy Vision – is a nonprofit environmental organization that researches, analyzes and promotes the technologies and strategies required to transition toward a sustainable, low-carbon energy and transportation future. Food and other organic waste is just one of several areas of interest for Energy Vision, as organic waste is the direct link to a more sustainable energy future.

Feeding America – The Feeding America network is the nation's largest domestic hunger-relief organization. They work to get nourishing food — from farmers, manufacturers, and retailers — to people in need.

The Food and Agricultural Organization – is a United Nations agency that leads international efforts to defeat hunger. Their website has a comprehensive list of key facts and publications related to food waste and loss.

Food Cowboy – uses mobile technology to connect for-profit food distributors who have large amounts of rejected fresh food — which typically ends up in the trash — with charities and food banks that desperately need that food.

Food Waste Reduction Alliance – is a cross-industry initiative that includes more than 30 manufacturing, retailing and foodservice companies, along with expert partners from the anti-hunger community and waste management sector. The group seeks to address the root causes of food waste within their own operations, and securing pathways to donate or recycle unavoidable food waste.

Further With Food – is a virtual resource center that provides comprehensive information about food loss and waste in the US and about solutions dedicated to reducing it.

Harvard Food Law and Policy Clinic – is a division of the Center for Health Law and Policy Innovation that engages a strong policy orientation as well as substantive expertise in the food system to assist a range of federal, state, and local clients around the world in understanding the legal and policy regimes that apply to food production and sales.

Ikea -

Institute for Local Self-Reliance – is a nonprofit organization and advocacy group that works with citizens, activists, policymakers and entrepreneurs to design systems, policies and enterprises that meet local or regional needs.

LeanPath – is a company that develops software intended to reduce food waste by recording everything that is being discarded, monitoring the composition of the waste, and using that data to empower organizations to make more informed purchasing/production/portioning decisions.

Natural Resources Defense Council – is a non-profit environmental advocacy group that focuses on food waste among many other issues.

New York City Food Policy Center at Hunter College – develops intersectoral, innovative and evidence-based solutions to preventing diet-related diseases and promoting food security in New York and other cities.

ReFED – takes a data-driven approach to reducing food waste. It is a multi-stakeholder nonprofit, powered by an influential network of the nation's leading business, nonprofit, foundation, and government leaders committed to reducing U.S. food waste.

US EPA – the US agency that writes and enforces regulations based on laws passed in Congress. They have an entire section of their website dedicated to food waste prevention, reduction and diversion efforts.

US Department of Agriculture (USDA) – develops and executes federal laws related to farming, agriculture, forestry, and food. Be sure to check out their website for helpful food waste facts.

World Wildlife Fund – combines global reach with a foundation in science, involves action at every level from local to global, and ensures the delivery of innovative solutions that meet the needs of both people and nature. The organization has a new initiative dedicated to combating food waste in the hotel industry.

World Resources Institute – is a global research organization that spans more than 60 countries. The organization seeks to turn big ideas into action at the nexus of environment, economic opportunity and human well-being.

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