

# Materials Management and Climate Change Presentation Talking Points

*Final 4/17 /18*

## Slide 1.

The presenter should introduce themselves.

## Slide 2.

I'd like to give you an overview of what we'll be discussing today. We'll start by looking at patterns of materials consumption in the United States and then we'll connect the environmental impacts of that consumption to greenhouse gas production, which causes climate change impacts. We'll define "materials management" and then discuss a variety of ways materials management can help reduce greenhouse gas production. Strategies discussed will include recycling, reuse and reduction, climate friendly purchasing and consuming less. We will also discuss climate action plans and share some case studies.

Finally, this presentation is not meant to be an exhaustive list of all material-related greenhouse gas strategies, so I'll leave you with some resources that provide practical advice and examples.

## Slide 3.

Here is a working definition of materials management. [READ definition] *"Materials management is an approach to using and reusing resources most efficiently and sustainably throughout their lifecycles. It seeks to minimize materials used and all associated environmental impacts."*

## Slide 4.

What do I mean by materials? The term *materials* includes everything from raw materials to products consumed by individuals, businesses, and governments. Materials include, for example, cell phones, food, office supplies, packaging, and building materials like concrete.

## Slide 5.

Over time, we have dramatically increased our use of materials. **The orange line in the graph is global use of materials measured in thousand metric tons (fossil fuels, biomass, ores, and non-metallic [construction] minerals) - from 1900 to 2009.** Mining and producing materials takes energy, which primarily comes from fossil fuels. Since we know that burning fossil fuels produces greenhouse gases and contributes to climate change it follows that burning fossil fuels to produce materials also contributes to climate change. And from this graph you can see that they do. **The blue line is global carbon emissions in million metric tons** over that same time period, showing a very similar upward trend as that of material use.

Now let's take a closer look at greenhouse gas emissions and **try to find where the materials are.**

### **Resources and Sources:**

- *Materials data: Krausmann, F., Gingrich, S., Eisenmenger, N., Erb, K.-H., Haberl, H. and Fischer-Kowalski, M., 2009, 'Growth in global materials use, GDP and population during the 20th century', Ecological Economics 68(10), pp. 2696–2705. Alpen Adria Universität Klagenfurt (Austria); <http://www.uni-klu.ac.at/socec/inhalt/3133.htm>*
- <http://css.snre.umich.edu/factsheets/us-material-use-factsheet>; <https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data>
- <http://www.materialspolicy.org/sustainable-materials-policy>; <https://www.epa.gov/smm>

# Materials Management and Climate Change Presentation Talking Points

*Final 4/17 /18*

## Slide 6.

Here is the 2006 inventory of U.S. greenhouse gases, which was compiled by the US Environmental Protection Agency. Though it is from 2006, it is still representative of emissions today\*. You can see that the generation of electrical power, transportation, and the industry sector contribute the vast majority of the nation's GHG emissions. But where are materials in this chart? We can see that once our materials (or products) become "waste" they comprise 2% of the nation's greenhouse gas emissions. But this 2% doesn't account for the impact of producing products. Where is the impact of producing furniture, electronics, or food?

*\*Hidden slide at end with 2015 emissions, if needed*

## Slide 7.

Well, it turns out that the full greenhouse gas impact of materials are spread throughout every category of this chart. This makes it very difficult to understand the environmental implications of our material consumption patterns. So, EPA decided to take another look at how they categorize these emissions and found some surprising conclusions.

## Slide 8.

This slide shows the same exact emissions as the previous slide but categorized differently. You'll notice in this chart that the provision of goods and food contributes to 42% of the nation's GHG emissions. Finally, we found the materials! You'll see that the transportation of people and energy use in our buildings still contributes about half of the nation's emissions, but the significance of our material consumption dramatically changes from one chart to another. Let's break down this pie chart a little further to understand how material consumption impacts climate change.

## Slide 9.

Here is the same chart but the provision of goods and food (**the 42% of the pie that are materials, in red**) are broken down into the stages of a materials' lifecycle when the emissions occur. We see that about 33% of the nation's emissions are a direct result of producing the materials we all use. This includes everything from mining the raw materials to manufacturing the final product. 7% is from distribution and shipping and only 2% is a result of disposing materials in landfills. So, it's pretty clear that the production of materials is where the vast majority of impacts occur over a material's lifecycle.

*(Optional addition: Also, this pie chart doesn't tell us the whole story. It only shows the greenhouse gas emissions that physically originate within our country's borders. But many of the materials used here in the US are made in other countries. We import more than we export, and so the carbon footprint of the materials we use is even larger than this graph would suggest.)*

So, if we want to reduce the impacts of material consumption, and really focus on materials management as we defined it a few slide back, this is the chart we should use as a guide for prioritizing our actions. This begs the question: "where are we focusing our efforts today?" Let's take a look.

# Materials Management and Climate Change Presentation Talking Points

*Final 4/17 /18*

## **Slide 10.**

This is a simple chart that shows the lifecycle of a product. All products follow this lifecycle: resource extraction, processing, manufacturing, distribution, use, and finally recovery or disposal. Traditionally, programs focused on “waste management” at the end of a product’s lifecycle, **[click to animate small circle]** which is represented by the small circle. End of life management includes recycling, burning for energy recovery, composting, and landfill disposal.

However, materials management looks at the full lifecycle of a product **[click to animate large circle]**. And it is what we call the “upstream” parts of the lifecycle, the consumption and use and even more so the production part of the life cycle, with resource extraction, that has by far the biggest impact on the greenhouse gas emissions – and other environmental impacts as well.

## **Slide 11.**

All materials follow a similar lifecycle. Here we can see each stage of concrete’s lifecycle. As we learned, the impacts of producing materials is the largest contributor to GHGs over the lifecycle. So, materials management is an effort to shift the focus to the entire lifecycle of materials in order to achieve the largest environmental benefits. For concrete, this could mean using less concrete in construction and using supplementary cementitious materials such as fly ash, designing for disassembly and reuse, and purchasing recycled aggregate for concrete mixes.

Concrete is one of the high impact materials featured in the West Coast Climate Forum’s\* Climate Friendly Purchasing Toolkit which is noted by the icon in the bottom left corner. You can learn more about how to reduce the greenhouse gas emissions from concrete and other high impact materials using this resource, which we will discuss more later.

*\*The West Coast Climate and Materials Management Forum is a collaboration of state and local governments that are developing ways to advance sustainable materials management practices.*

## **Slide 12.**

Now that we’ve learned what materials are and the impact they have on our greenhouse gas emissions, let’s talk about what materials management strategies there are to reduce these impacts. We will start with some of the more familiar end-of-life management strategies like recycling and then discuss more of the upstream strategies associated with the production of materials which is where the majority of greenhouse gas emissions are coming from.

## **Slide 13.**

Recycling is a well-known and important materials management strategy at end-of-life. Governments typically have responsibility over recycling and composting programs.

Recycling reduces greenhouse gas emissions when recycled materials are used in manufacturing, which conserves the energy associated with using virgin materials. This is why it’s so beneficial. This chart shows that making a product from recycled material uses significantly less energy than using new “virgin” resources. On this chart you see Aluminum saves by far the most energy, and that is due to a very resource-intensive process to mine for virgin materials (bauxite) and smelt aluminum. However, there are energy savings to be found by using all these recycled commodities in place of virgin materials.

# Materials Management and Climate Change Presentation Talking Points

*Final 4/17 /18*

Recycling is also a very cost effective way of reducing greenhouse gases. Curbside recycling and pay-as-you-throw programs, which charge you proportionally to how much waste you generate, are inexpensive ways to achieve greenhouse gas reductions compared to other strategies such as upgrading residential energy efficiency or producing wind power.

## **Slide 14.**

In 2011, the West Coast Climate Forum analyzed what the most important materials to recycle and compost are in order to reduce GHGs. The analysis used the U.S. EPA's Waste Reduction Model (WARM) Calculator, which calculates greenhouse gas emissions attributable to different materials and disposal options, along with waste stream data from California, Oregon, and Washington. This analysis found the most important materials to focus on for recycling and composting are Carpet, Core Recyclables (cans, bottles, and papers), Dimensional Lumber, and Food Scraps. These materials have the most lifecycle greenhouse gas impacts and greatest emission reduction potential by being diverted from landfill to be recycled or composted. Therefore, efforts should be prioritized to focus on these materials for recycling and composting programs.

You can learn more about this research and analysis in more detail by reading the report, "Reducing Greenhouse Gas Emissions through Recycling and Composting" as pictured here on this slide.

## **Slide 15.**

While recycling is a very important strategy, and an action we all can take, this chart, based on EPA national data, shows we are still only recycling a small percent of the waste we generate. And in recent years, recycling appears to have plateaued at about a 35% recycling rate, nationally. On the west coast, that rate is higher, closer to 50%, but still seems to have plateaued. Recycling, while important, is not enough.

## **Slide 16.**

Here's another reason why recycling is not enough, using the graphs of GHG emissions we saw earlier. Even if we recycled and composted everything (which we just saw we are a long way from doing), this chart shows that we'd only reduce the nation's GHG emissions by about 6%. Again, this is good, but it doesn't get us very far. How else can we start reducing the impact of the remaining 36% of the nation's GHG emissions associated with our material use?

Let's look at some options -- the other "R's" -- reuse and reduction.

## **Slide 17.**

Reuse is a key strategy. The Oregon Dept. of Environmental Quality commissioned a study investigating the most environmentally responsible way to drink water. They found that if you drink bottled water, and recycle the bottle, you'll reduce GHGs by 16% compared to disposing of the bottle. That's the difference between the blue bar and orange bar on this graph.

However, drinking water from the tap, using a durable, **reusable** glass, **[click to animate circle]** (shown in the tiny little gray bar), reduced GHGs by 79-98% compared to recycling or disposal. This example illustrates how reuse can be a lot more beneficial than recycling. And this is the kind of information that can be helpful to people trying to make the right choice.

Source: <http://www.oregon.gov/deq/FilterDocs/wprLCycleAssessDW.pdf>

# Materials Management and Climate Change Presentation Talking Points

*Final 4/17 /18*

## Slide 18.

Reduction is another key strategy. This includes reducing the amount of materials that are used in a product or packaging. Another study done by Oregon DEQ and others found that light-weight plastic shipping bags (shown by the red bars) – even if made from virgin resources and not recycled – have fewer greenhouse gas emissions across their life-cycle than heavier cardboard boxes (the blue bars). This is true even if the boxes contain high levels of recycled content. Recyclability is considered a desirable attribute of a product or package. But just because something is recyclable doesn't necessarily mean that its environmental burden is less than a non-recyclable alternative. **It seems to be far more important to use fewer materials, than to use recyclable materials.** Again, materials management allows us to look at the full picture and not just waste management to inform procurement decisions. There is an order to reduce, reuse, recycle for a reason - reduction and reuse have larger environmental benefits than recycling.

Source: <http://www.oregon.gov/deq/FilterDocs/wprLifeCycleInventory.pdf>

## Slide 19.

As we already saw, food is one of the four key materials to prioritize for composting or anaerobic digestion. However, reducing food waste in the first place is best! In the U.S., from farm to fork, we waste up to 40% of the food produced. One study found that growing and making food contributes 83% of total GHG emissions.\*

As you can see here, composting is better than sending food to the landfill. **[click to animate small circle]** Landfilling food creates GHGs, while composting food waste reduces them slightly. However source reduction - or not wasting food in the first place - is far more impactful, **[click to animate small circle]** with significantly more GHG reduction potential.

Food is another high impact materials that is featured in the Forum's Climate Friendly Purchasing Toolkit.

*\*Source: National Resource Defense Council's "Wasted" report*

## Slide 20.

Because food waste is so impactful, the Forum collaborated with more than 25 state and local government partners to develop the "Food: Too Good to Waste" toolkit, which addresses reducing wasted food in households. This has now been adopted by EPA's Sustainable Management of Food program.

This toolkit uses Community Based Social Marketing to incorporate small behavior changes to reduce the wasting of food. It targets the top of the EPA's Food Recovery Hierarchy, source reduction **[click to animate circle]**. It includes a comprehensive implementation guide to assist a local government or community group to reduce wasted food.

Based on data, it's possible for a household to reduce preventable food waste by 20% of total waste, and to save money at the same time. Many state and local governments are encouraging residents to waste less food using this toolkit.

# Materials Management and Climate Change Presentation Talking Points

*Final 4/17 /18*

## **Slide 21. - Case Study: Use or skip – Presenter preference**

Here's a case study of the power of reducing food waste in a Medical center:

The Gunderson Health System in Lacrosse, WI is a 325-bed medical center serves about 400 patient meals and 2,300 staff and guest meals every day.

They tracked food waste daily and found they were throwing out an average of half a ton of food every week—approximately 24 tons every year. Staff made changes to how vegetables were prepared to encourage less scrap waste, started heating soup in smaller portions, and made many other simple changes that had a dramatic impact on food waste reduction. This resulted in a 50% reduction in wasted food and \$25,000/year in savings.

[http://www.leanpath.com/wp-content/themes/weaver-ii-pro/docs/LeanPath\\_Case\\_Study\\_GundersenHealthSystem.pdf](http://www.leanpath.com/wp-content/themes/weaver-ii-pro/docs/LeanPath_Case_Study_GundersenHealthSystem.pdf)

## **Slide 22.**

Buildings are responsible for a huge part of the materials we all use. 534 million tons of construction and demolition debris were generated in the United States, in 2014—more than twice the amount of generated municipal solid waste.\* There are two key strategies to reduce the impact of building materials.

The first strategy is to use less. In another study commissioned by Oregon DEQ, they looked at the best ways to reduce the impacts of building material use over the lifecycle of residential homes. They found that building a smaller home - or using less - reduces both material and energy use over time and it is the most significant leverage point for creating greener buildings. After all, as this chart shows, the average home size in the United States has almost tripled over the last 60 years and at the same time, we're putting fewer people into our homes. These kinds of results make us think more about HOW we're USING materials instead of just focusing on how to MANAGE the waste. Zoning for Accessory Dwelling Units and tiny houses are current ways to put the idea of using less building materials into action.

The second strategy is to reuse building materials. Policies requiring deconstruction of buildings, like the Deconstruction Ordinance in Portland and designing for deconstruction, helps reduce GHGs from new construction materials and puts reusable materials back into the building materials marketplace

*(\*EPA's Advancing Sustainable Materials Management: 2014 Fact Sheet).*

## **Slide 23.**

Another important way to reduce climate impacts through materials management is by using “purchasing power.” Specifying goods based on their environmental performance is often called Environmentally Preferable Purchasing – and in addition to affecting GHG emissions, also can impact energy efficiency, water consumption, toxics in products, and promote the use of recycled content. We all have to use certain things to do our work and meet our basic needs. But when we have the option, we can consider our purchasing decisions in light of what products can help reduce GHG emissions (and other negative impacts).

# Materials Management and Climate Change Presentation Talking Points

*Final 4/17 /18*

Public agencies and institutions have big opportunities with purchasing. Research shows the supply chain, or the production of goods and services, accounts for 35-55% of greenhouse gas (GHG) emissions associated with Government operations.

The West Coast Climate Forum developed the **Climate Friendly Purchasing Toolkit** to help public institutions and others target their purchasing to reduce greenhouse gas emissions. The Climate Friendly Purchasing toolkit has tools to help you do an inventory of your purchasing GHG impacts, as well as purchasing guidance for key areas.

## **Slide 24.**

The toolkit is composed of six modules that address high carbon intensity categories. Each of the modules include strategies to reduce GHG emissions.

### **Let's take a minute to talk about why each of these materials is important:**

- Asphalt and Concrete: Construction and maintenance work for government, higher education and utilities is the highest source of GHG in the supply chain - at 38% to 55%. Asphalt and concrete make up much of this material.
- Food: If discarded food were a country, it would be the world's third largest source of greenhouse gas emissions.
- Fuels: A public institution's fuel use contributes from 5-23% of their total construction emissions, which are often up to 50% of total emissions.
- Information & Communication Technology: The aggregate electricity demand of the cloud in 2011 was 684 billion kWh. If compared with the electricity demand of countries in the same year, the cloud would rank 6th in the world
- Professional Services: This is a consistently significant impact area for public agencies – up to 25%.

The CFPT provide strategies for reducing impacts from purchasing all of these materials. It also has modules on conducting a supply chain GHG inventory and a trends analysis.

## **Slide 25. Case Study: Use or Skip – Presenter preference**

Here's a case study from the Climate Friendly Purchasing toolkit:

In 2008, the City of Eugene tested 8,000 tons of Warm-mix Asphalt Concrete (WMA) on an existing multi-year paving project. WMA reduces mix temperatures by approximately 50 degrees Fahrenheit. Preliminary measurements by Eugene Sand and Gravel showed energy savings of approximately 15% during WMA production.

Between 2009 and 2014, the City of Eugene specified the placement of approximately 361,000 tons of WMA, reducing greenhouse gas emissions by approximately 8,700 Metric Tons CO<sub>2</sub>e. The use of WMA in Eugene is now the standard practice for all City paving projects. This has resulted in: ~15% energy savings and the reduction of 8,700 Metric tons CO<sub>2</sub>e

<https://westcoastclimateforum.com/cfpt/asphalt/casestudy/Eugene>

# Materials Management and Climate Change Presentation Talking Points

*Final 4/17 /18*

## **Slide 26. Case Study: Use or Skip – Presenter preference**

Here's another case study from the Climate Friendly Purchasing toolkit:

Cleveland State University entered a managed print services contract to meet the state's mandate to reduce energy expenditures (by 20%, which they exceeded). But they also found in addition to saving energy (which reduces GHGs) they also saved a lot of money.

In the first year of a 10-year agreement, they reduced kilowatt use by more than 50 percent. In addition, by handing over the management of malfunctioning printers, replacement of ink cartridges and oversight of the printer help desk to Xerox, the school's IT department was freed to focus more time on priority projects.

These changes resulted in a 50% Energy reduction, and \$685,000 savings in first year by using Managed Print Services.

<https://drive.google.com/file/d/0B8PCOv2vyPifTVlhUWRNa2dZY0E/view?pref=2&pli=1>

## **Slide 27.**

The strategies I've mentioned are all helpful in reducing our materials related emissions, but if we are going to be successful in significantly reducing emissions, we simply need to consume less – or use less stuff. The production and consumption of material goods is the cornerstone of our economy. Yet it is also a fundamental driver of resource depletion, climate change, pollution and ecological degradation. Consumerism dominates our popular culture, reinforced by the constant bombardment of advertising enticing us to buy more.

The proliferation of new products, many designed for obsolescence, don't bring us a lot of happiness after the thrill of buying them is gone. In fact, studies show once we meet our basic needs, more stuff contributes less and less to our sense of well-being. We keep spending money we don't have for things we don't need to impress people we don't know.

Have we reached "peak stuff?"

## **Slide 28.**

**Maybe.** Some current trends suggest what could be the beginning of a shift in consumption patterns:

- Millennials are owning fewer cars and driving less
- People are sharing goods and services through tool-sharing libraries, online ride-sharing and other innovative ventures.
- New reuse, repair and rental options are emerging that provide alternatives to buying and owning more stuff: people can extend the life of their favorite items through repair cafes or iFixit videos, take advantage of short-term rental options for cars, clothes or equipment, or seek out reused items through Craigslist, local thrift shops or neighborhood exchange.
- Some businesses are emphasizing durable, repairable products like Patagonia through its "Don't Buy This Jacket" and "Worn Wear" campaigns

These are a few examples of how consumption habits are changing. Many local governments are supporting these efforts through local investments, active partnerships and community engagement to promote solutions for better living with less stuff.



# Materials Management and Climate Change Presentation Talking Points

*Final 4/17 /18*

## **Slide 29.**

The West Coast Climate Forum has a Climate Action Toolkit – which is a great resource for more information, tools, and examples of what local governments and others are doing for Materials Management and Climate Mitigation. On this website you can find links to the examples we've mentioned and sample language to incorporate into your materials and climate planning.

## **Slide 30.**

Here is one example from the Climate Action toolkit of a new approach to GHG inventories: This is a consumption-based GHG inventory. Understanding how consumption patterns drive greenhouse gas emissions points us to new solutions for materials management. Consumption-based emission inventories complement traditional sector based inventories, and build on the example from EPA we discussed earlier (*note: slides 8 & 9*).

Both traditional and consumption based inventories tell an important story about how communities contribute to emissions. While the traditional approach focuses on a community's use of fossil fuels and electricity, the consumption inventory also includes the embodied emissions in the goods and services used by the community. Looking at emissions through this consumption lens tells us a lot more about the climate impact of goods and food, which are typically produced in other areas.

This example from Portland revealed something very important about a community's carbon footprint: global emissions as a result of local consumer demand (the emissions depicted in the chart on the right) are more than twice the volume of emissions produced locally (depicted in the chart on the left).

Considering consumption-based emissions uncovers a larger carbon footprint and with it, more opportunities to reduce emissions.

## **Slide 31.**

Another example from The Climate Action Toolkit is a Climate Action Plan.

King County's Strategic Climate Action Plan outlines actions to reduce their 42% of greenhouse gases that comes from materials by preventing waste and recycling more. Their Action Plan includes strategies to achieve a 70% recycling rate countywide by 2020, and by 2030, to achieve zero waste of resources that have economic value for reuse, resale and recycling.

King County includes many operational strategies in their plan to ensure that their purchasing practices will help to minimize GHG emissions. The County works to reduce wasted food through their Food: Too Good to Waste program and develops markets for reuse and recycling through their LinkUp program. The County also helps sponsor local repair events where people can bring small household items, personal electronics and clothing that need fixing. King County is also pursuing efforts with reducing environmental impacts from construction and demolition through recycling and reuse market exploration.

## **Slide 32.**

In summary, the main concepts we discussed today are the connections between consuming materials and products and greenhouse gas emissions. We found that over the lifecycle of most products, the production phase of that product causes the most greenhouse gas emissions. We learned how "materials management" strategies can reduce greenhouse gases more effectively than just focusing on

# **Materials Management and Climate Change Presentation Talking Points**

*Final 4/17 /18*

“waste management”. We discussed the benefits and limitations of recycling, reuse and reduction strategies, and opportunities to consume less and share more.

We provided links to tools that can aid in reducing food waste, climate friendly purchasing, and climate action planning. We have a website with detailed information, examples, and strategies for state and local governments to reduce material-related greenhouse gas emissions. There are so many opportunities to reduce GHG in in house or in your communities. Please contact us to learn more! Thanks so much for your attention.

## **Slide 33.**

If you have any additional ideas or feedback, please feel free to contact me

## **Hidden Slide 34 – optional**

This presentation, and the toolkits mentioned in it, are products of the West Coast Climate and Materials Management Forum. The Forum is a collaboration of state and local governments that are developing ways to advance sustainable materials management practices. The agencies listed on this slide comprise the leadership team, but the Forum contains hundreds of members who have participated in developing the toolkits, presenting the work at webinars and meetings, or just attending webinars. Lots more information is available on the website.

## **Hidden Slide 35 - optional**

EPA Sector Based GHG Inventory from 2015 – to show emission make up have not changed significantly from 2006 examples used in slide 8