EPA Region 2

Make Materials Management Count: Tools and Techniques
June 24, 2009

EPA Regions 1 and 2 hosted the Northeast Forum on Climate-Waste Connections, a series of free web-based training sessions and discussions with experts and practitioners from the Northeast and beyond. The goal was to advance the discussion about materials management and the climate connection in practical ways that will help communities integrate waste reduction and recycling into climate plans. The goals of these training sessions were:

- Bring attention to the climate impacts from managing solid waste and recycling
- Identify issues that would benefit from regional and national collaboration
- Provide tools and assistance for incorporating materials management into climate action plans

Make Materials Management Count: Tools and Techniques

- GHG Inventories: Understanding Role of Materials
- We Manage What We Measure: EPA's Waste Reduction Model
- ICLEI Approach for Measuring Waste Management
- "Recycle or Die" Keene, New Hampshire

Beginning of Transcription:

Adolph Everett: Introductions. Sara, are you ready?

Sara Hartwell: I am.

Terri Goldberg: Ok great, Sara. Before you start, you had a question you wanted to ask everybody. So I just want you to poll, and maybe get some modification to this language; you wanted to ask, and we would like people to vote, would you like to read it Sara?

Sara Hartwell: Yes, but I can't see the question.

Terri Goldberg: I'm sorry, that's true. So the question is, in your job, are you tasked with the quantification, and it really should be the quantification of climate benefits, of a materials management program. So if people could quickly answer that; Sara you could introduce yourself and then we'll close the poll in a minute.

Sara Hartwell: Hi, my name is Sara Hartwell, I work at EPA here in DC in the Office of Resource Conservation and Recovery along with a colleague Jennifer Beatty, she and I manage EPA's Waste Reduction Model. That's the tool we are going to talk about today. It is a decision tool that was intended for waste management professionals to estimate the benefits of a number of waste management alternatives. We are not so fond of the word waste anymore, so we like to refer to it as materials management alternatives.

Terri Goldberg: Sara, you got the poll ready?

Sara Hartwell: I do, so the results are, about 78% of the people listening voted and about 45% are tasked with the job, so it's about half and half.

This is what WARM is, the Waste Reduction Model. It is a life cycle perspective tool and it reflects the impacts that...we are way too many slides ahead. Let me see if I can do something better here. So it is a life cycle perspective tool that reflects the impacts from managing materials, the impacts that occur upstream, and that is before you acquire the product, and downstream, which is after you have discarded it. So that's the perspective that looks upstream from where you have the thing. It's a relative tool which means it doesn't provide an estimate of the impacts of just recycling, say. It's recycling rather than doing something else; so recycling instead of landfilling. It's important to know that it is always a relative tool. The third thing that's important to know is that WARM was not intended for use in inventories and it is not an inventory tool, it should not be used that way. The context of this tool, it's a waste management tool and what is waste? In this case, waste is everything that you have that you used and are now getting ready to get rid of; packaging, newspapers, construction demolition, which is a topic we talk about a lot. It is everything that we discard.

So we said it is a life cycle tool, what is a life cycle? The simplified version, it is important to recognize this is a very simplified version, but it is down into five processes in the life cycle. Raw material extraction, so either extracting or harvesting trees, extracting oil. Processing those raw materials into some manufacturing input, so making paper, making a product out of that manufacturing input, so making corrugated cardboard, or making aluminum cans. Using that product and then we have end of life. Products that either discards and are managed as either recyclables or waste.

The waste reduction model considers raw material extraction, processing, manufacturing and end of life. We do not consider the use phase of products in the

model and that's because the use phase we assume will be the same regardless of whether the product is made out of virgin or recycled input. So the product impact should be the same and they are a wash.

This is a nice graphic that we use over and over, but sort of gives you a picture of what the product life cycle looks like. You can see where recycling fits into here. You have raw material extraction and its energy used in raw material extraction phase. Of course you know that there are green house gas emissions associated with the production of that energy. We account for those in our life cycle inventory. During the acquisition stage, there are also some non-process energy-related green house gases. That is particularly true with aluminum, say, where there are some very potent perfluorocarbons associated. Recycling, you are producing another input and you're skipping that raw material extraction stage and that's where most of the benefits of recycling come from.

We talk about green house gases and just to be clear, in our model and many other models, we express the green house gas benefits in terms of CO2 or carbon. There are in fact many green house gases associated with the products and the life cycle of our products, CO2, methane, there is a bunch of them. Each green house gas has a different impact on global warming. We refer to that as the global warming potential, it's the potency, essentially is the right word, of that chemical to influence global warming by trapping heat.

The global warming potential is a relative scale. It was developed by the International Panel on Climate Change. What it does is it assigns a number to each one of the green house gases that reflects its potency as a green house gas. We use those numbers to normalize everything to CO2, which has a global warming potential of one. Because of that we are able to express all of the benefits as one green house gas, in this case CO2, which sort of levels the playing field rather than having to enumerate them all. We express that is CO2 with a little "e" on the end that stands for equivalent.

The upstream benefits of managing materials is you avoid the energy production needed for extracting those raw materials by source reduction and recycling. We know that using, there is, by the way, an assumption in the model that products will be replaced. So if I am discarding, in this case recycling an aluminum can, there is an assumption in the model that I am going to produce another aluminum can to replace it. That replacement is an important part. The replacement of those discarded materials requires energy to go through all the life cycle stages. We know that manufacturing products out of recycled input requires a lot less energy than starting with virgin products. It differs by material, aluminum is a great case. Aluminum requires significantly less energy to make a can out of recycled aluminum than it does starting with virgin input, something on the order of 95%, plus or minus a couple percent depending on whose data you are looking at, energy reduction and starting with a

recycled input rather than raw materials, and that is where the benefit comes from upstream.

There also are some carbon sequestration benefits. In this case, trees through the growth process; sequester carbon out of the atmosphere. They are actually pulling CO2 in and giving off oxygen. That sequestration process, it is relative to the growth pattern of the tree but none the less when we are using paper products as inputs, recycled inputs make more paper products; we are leaving trees standing for a longer period of time to sequester carbon. There is a very complex model that's intended as a carbon sequestration model that comes out of the US Forest Service and we use that to estimate those benefits.

Then we know that when we compost organic materials and use that compost as an amendment to soil that we are storing carbon in that soil and that too is an upstream link. There are some downstream links as well. We know when we are recycling rather than landfilling, to track raw materials, things that would decompose, that we are avoiding methane emissions from landfills and when we recycle rather than send all waste to central waste energy facilities, we are avoiding some CO2 emissions that come from waste combustion.

So now we know what the benefits are and where they occurred. Now, how do we calculate them? We use the waste reduction model. We now have a short URL for it, epa.gov/warm. As I said earlier, it was designed specifically for waste management professionals to understand and evaluate green house gas implications of waste management decisions as a decision making tool. As with all models, it is important to know what the intended use of the model was. As you use it further and further afield from the intended use, it gets less and less reliable and appropriate.

We talked about it being a life cycle approach. It incorporates the full range of effects to the entire life cycle of all the materials that we look at. We'll talk about that list of materials in a minute. It is based on life cycle inventory data. In the case of the data in this model, it's US or North America-based life cycle data. It does include landfilling and transportation assumptions in the model. We use the accounting methods by the Intergovernmental Panel on Climate Change. They are an international standard setting organization for the climate change work and they sort of write the rules on this process.

What the waste reduction model does is it does both green house gas and energy impacts for five different waste impact scenarios. Landfilling, recycling, incineration, in this case it is incineration with energy capture, source reduction and composting. It is important to note that in the case of landfilling and composting, which are the ones where materials degrade in those areas, we reflect the degradation profile of the material every time. Composting, carbon storage for example, is measured after a

period of ten years after the composted material has been applied to soil. Landfilling, carbon storage factors and methane generation rates were developed using experiments that measured carbon that would remain un-degraded or stored over the long term in those landfills and that is factored into this model. We do look at the degradation profile of the individual materials that go into landfilling and composting. It is important to know that we look at that over a 30 year timeframe, not a one year timeframe. So the number that's expressed there looks at that 30 year profile. I know that there are other models that estimate numbers per year. We are different there.

WARM accepts user defined inputs. That means, you put numbers in like how much material you have. You can either run it online or you can run it as a downloadable Excel spreadsheet. If you run it as a downloadable Excel spreadsheet, I encourage you to go back and re-download it with some regularity, because if we update the model, make tweaks and corrections, then you want to be sure you always have the most recent version.

You will see on your screen now the list of materials that included in the waste reduction model. We have efforts underway to add to this list of materials. Both in packaging materials, as Adolph said earlier, we are also expanding our list of construction and demolition materials that we'll include in the model as well. That work is ongoing as well as some, a big effort we have looking at some of our assumptions about how organics are managed in the model based on landfilling and composting.

There is a URL here that directs you to the background documents, solid waste management and green house gases, a life cycle assessment of emissions and things. It is a great big, weighty, chewy tome. I have been reading it for years and I learn something every time I read it. I would encourage you to approach it in chunks. There have been three editions in report every time. The most recent one was in 2006. The methodology that was first developed for the waste reduction model that was published in the 1998 report is still pretty much the methodology that we use. Today we have, we revisited some of the assumptions, but by in large none, but we have updated data at multiple intervals and we are working on new data for some of the existing materials as well as adding new materials.

Here is how you use it. In step one, it enters a mass of material and this is in tons. It's important to remember it's in tons. So if you have it in pounds you need to do the math. You can do, let's go to the next page of screen shots. So you put the tons of material that you have both in the tons generated and then, this is step one so it is your baseline, so you describe here how you are in your baseline managing those materials you can put in. This is just a screenshot so it is not the entire list of materials. You can put in more than one material at a time, that's fine. You don't have to know the total tons you have from every stream. For example, if you only know how much you have that you

are recycling, you can use that information to estimate the benefits. Suppose that I recycled 50 tons of newspaper last year. I can put in 50 tons in the generation. I can estimate recycling verses landfilling by putting in that 50 tons in the landfilling and then using it in step two that we will be getting to in a minute. There are some mixed categories available if you don't have information on individual categories. There's three categories of mixed paper, there's mixed plastics, mixed metal, mixed MSW, mixed municipal solid waste and mixed recyclables.

So in step two, this is what you are going to do for your alternative. Your what if scenario or the change you've made since previous years. So in step one we put in 50 tons of newspaper and we generated 50 tons of landfill, in this case, I come in and put my 50 tons in the tons recycled column. The thing that's important to note is the amount, the mass of material you put in step two, must equal the mass of materials that you had generated in step one. If it doesn't, the model won't let you proceed any further.

Step three, this is where you are going to put in some information about the landfill that your material would have gone to if landfilling was part of your baseline or alternative scenarios in steps one and two. If you don't know information about the landfill, don't put anything in, just use the default. Many people, I might even say most people, that use the model, don't have very specific information about the landfills where their material would go. The default values that are in here, we'll see in a second, are based on national average data from other EPA programs like the landfill methane outreach program. Then you get to enter some information about waste transportation and characteristics. Again if you don't know how far away your landfill or recycling center, or waste to energy facility are, you don't have to put that in, but do know that the defaults in here and the transportation assumptions that are in the model, are assuming that it is being moved by truck. They do not assume it is being moved by rail or by sea.

Here is a screenshot of steps three and four. It comes up defaulted to the national average. If you know whether or not your landfill is collecting gas or not, whether it's flaring, this is where you get to put it in and where you get to put in additional information about distances that it's being moved.

Step 5, this is the good part. This is where your results come from. You get to select whether you like your information as carbon or CO2. Then you can select an energy output as well.

Things that I would like to tell you about carbon equivalent output and CO2 equivalent output. They are the same estimates. They are a mathematical relationship; one assumes the molecular weight of carbon is 12, the other one assumes the molecular weight of carbon dioxide as 44 and there is just a mathematical relationship. But you should know when you choose one and you want to communicate it or compare it to

other estimates or inventory numbers, that you need to look at the units for that one, cause they are still not the same. The CO2 number will always be significantly larger. Inventory data are usually in CO2 equivalents and you want to pay attention to the units that your output is in. I'll show you why in a minute.

So here is where you get to choose which one of your outputs you selected in one of the radio buttons. Here is a summary report that I ran just as an example. I was picking out aluminum cans because it is one of my favorite ones to play with. In this case, my baseline scenario I generated 100 tons of aluminum cans and I landfilled all 100 tons. In my alternative scenario, I recycled all 100 tons of aluminum cans. The total benefit from that is the sum of emissions from baseline scenario and the alternative waste management scenario, the total benefit is 1,371 metric tons of CO2 equivalents. Here is the energy benefit summary from that same scenario, 100 tons generated, 100 tons landfilled and baseline recycled and the alternative. This is why it is important to pay attention to units. The energy units in WARM are 1 million BTUs. So the total benefit here is 20,000 million BTUs. People tend to sort of miss that million part and they'll report 20,695 BTUs and that's a significant understatement of the benefit.

If you tell people 437 metric tons of CO2 benefit, you can watch them glaze over. Very few people know what 20 million BTUs means, so there are equivalencies. The energy equivalents, energy summary gives you some equivalencies. The green house gas summary does not. There is an additional calculator; it's the green house gas equivalencies calculator, also available on our website. The URL is here. It is a much longer URL, that will translate that green house gas number into something that is more meaningful to people.

Some of the benefits are expressed for the BHE, you can express them in the same terms as the energy benefits. Do not add them together. You can't because some of the BHE benefits are from the energy production. If you add them together it would be overlapping, double accounting in a way. Here is a screenshot of the equivalencies calculator.

What's the impact of recycling on how we calculate benefits in the United States? In 2007, based on the municipal solid waste characterization reports, we recycled about 1/3 of our municipal solid waste, 85 million tons. Putting in all those individual materials, running the waste reduction model, we avoided emissions of about 193 million metric tons of CO2. Again equivalent to emissions of about 35 million passenger cars, about 14%, that's the emissions of. The energy impact of that same recycling benefit was 1.3 quadrillion BTUs. Looking at Department of Energy data, we know that's equivalent roughly to the residential site energy consumption of about 13% of the residences in the United States. That site energy is energy out of the wall.

Here is my name and contact information. I am happy to talk to you and answer any questions you may have.

Adolph Everett: Great Sara, thank you. We do have a couple of questions right now maybe you can field. First, a participant had a question fairly early on in your presentation asking about what do you mean by inventories? Can you maybe add some clarification to that?

Sara Hartwell: Certainly. An inventory, there are both, there is a US national inventory that EPA does every year, there are state inventories, there are corporate inventories. Those are basically a sum of the emissions from scope one and scope two emissions, it's sort of accounting protocols but for relevant emissions, energy production, those things, they are simply a listing of it added up and people attribute them to sectors. Is that helpful? An inventory is an accounting process.

Adolph Everett: Great, and there was a related question. Can you expand on why the WARM model is not appropriate for inventories?

Sara Hartwell: Sure. The short version and I don't mean to sound flip, is that it was never intended for that. So, an inventory tends to be an annual inventory, so for that year. For many of the estimates that are in WARM, we are looking at a 30 year profile. That's one good reason. So you are looking at energy or green house gas benefits over 30 years from the point of management. Which is not relevant to the one year scenario in the inventory concept.

Adolph Everett: Ok great, thanks. We'll take one more for now. Someone had a question about your presentation when you discussed step three. Basically if you are not identifying the waste as being landfilled but sent to processing, what would be entered?

Sara Hartwell: If there were no landfilling components in here, step three becomes completely irrelevant. It's never factored into the calculations. If you didn't landfill any of the material in steps one or two.

Adolph Everett: Ok great, thanks. One final comment before we move on to the next presenter. Can you elaborate on the timeline for adding C&D to the list of materials?

Sara Hartwell: Yes, bearing in mind that most of my timelines are overly optimistic, I would hope that we would have additional C&D materials sometime this fall. That work is underway now and that is my general plan at this point.

Adolph Everett. Ok, sounds good. Thank you so very much Sara, we really appreciate that. I guess now we will move on to Courtney, if you are ready.

Courtney Forrester: Thanks everybody for inviting me to participate. My name is Courtney Forrester, as Adolph mentioned, I am the Program Officer with the ICLEI-Local Governments for Sustainability. I work primarily with our New England members. I am located in our Northeast and Mid-Atlantic office in Boston. Today I want to talk to you about the first order decay model that ICLEI uses to calculate emissions coming out of the landfills for our local government green house gas emissions inventory.

So first I'll give an overview of what I'll talk about today. If you are not familiar with ICLEI, I'll give you a little background on what we do and go over the basics of a green house gas emissions inventory; checking out calculating those emissions for solid waste, how you actually put them in your inventory and then talking more about ICLEI's tools and resources to help you in that process.

First off, ICLEI is membership association of local governments and our mission is to build, serve and drive a movement of local governments to advance deep reductions in green house gas emissions and achieve tangible improvements and local sustainability. We are, as I mentioned, an international organization and we have 15 offices in 68 countries in six continents. Bet you can guess which continent we are not on. We have over 1,200 members in the world and we have about 570 members in the United States. More than 162 are actually in our northeast and mid-Atlantic regions; which for us stands from Maine to West Virginia. But here in the US, we focus mostly on climate change mitigation programs, climate adaptation or resiliency, and sustainability performance.

As I am sure you are all aware, these are just some benefits of local climate protection. Some of the members kind of join hoping to get more of a sense in the local planning efforts. Else you can improve air quality, reduce municipal operating costs is always a big selling point. Saving money of course do that as well. Reducing traffic congestion, if you are creating [audio disturbance; inaudible] into development or reducing vehicle miles traveled. We create local jobs by putting people to work, working on these issues right in your community. Protecting that public health, air quality, and other concerns. Always creating that legacy of leadership within the community, which is really important.

We have five milestone processes for climate mitigation that we utilize. Some of our members kind of tackle this, seemingly daunting task. The first of is of course to make that commitment and for that it is really giving the local governments staff on board and elected officials a part of that as well and signing up for the program.

The first step that our members partake in is actually doing a green house gas emissions inventory. You have to figure out what you've got before you can set any targets there. The second milestone obviously is to set that target. Now you've figured

out what's happening in your community; what actually do you want to do about it, or in what period of time. The third milestone is to actually establish a local action plan; what are the policies and measures that you want to use to achieve that target. Fourth, implementing it, actually doing those policy and measures. Fifth, monitoring evaluating, as you can see it is a cycle; you want to keep that profits going and checking into everything.

Today I'm mostly going to focus on milestone one and the inventory. But I always want to point out the ICLEI has tools and resources to help our members at every stop along the way.

So green house gas inventory; as I thought Sara also mentioned too, during an assessment of energy use and associated emissions, but with less fat. When we look at a local government operations inventory, it can be kind of daunting because kind of where you set those boundaries. I kind of mention the snow globe approach; if you were to put a bubble around your municipality, or county, that's the emissions we are talking about. So obviously, some emissions may be affected through the electricity, but if you don't have that power plant inside your snow globe, then it is a little bit of a difference of how you account it. Sara touched on scope one, scope two, and scope three, that is kind of how you account for that. Since obviously the power plant is located somewhere else and a couple of governments may be using that, you kind of account for it, so there's no double accounting and you getting a true picture of what you have control over.

But again it really gives you a chance to assess your baseline. You pick out what's happening currently, and then you can send those compare alternative scenarios, whether you look to how you can take opportunities and have new measures, is really helpful for others who are not as involved in these kind of procedures to see how they can move forward. Helps you prioritize, helps you want to get the biggest carbon bang for your buck. Finding out what kind of policies and measures are really going to affect your largest sources of green house gas emissions. Of course along the way you are going to be able to see your goals in progress. As we like to say here at ICLEI, and I am sure many other places, you can effectively reduce but you don't measure.

Here are some basics on inventory. We ask that our members to report on a calendar year basis. The base year that they select, doesn't have to be the current year, it can be a year or two in the past, but it needs to be reliable, respective and complete. So say for example, you just built a new police station or a new school in your city last year. You probably don't want to do an inventory of the year prior to that, so it's not a true picture of what's actually happening in your community. You also want to make sure it is not too hot or cold of a year so there wouldn't be any extra energy with air conditioning or heating; you know really that traditional year. And a regional consistency, possibly many

of our members pick a more recent year and you want to look at that same picture to compare those inventories together. And again completeness. You obviously want to pick a year that has all the data so you can get a true picture.

Just know it's important, kind of summons that whole snow globe, is identifying things that are within the government's operational control. So if you actually own an operation, facility, or source, you are going to have abilities to make changes. We usually recommend the operational control model for doing an inventory and not a financial control model, which may look at buildings that you lease instead of ones you actually own.

I touched on the scopes a little bit earlier. The rigid kind of way the we count our energy use so it's not double counting; you are looking at what your government is creating or emitting and then also looking into what you may contribute to a more regional or global scale.

One of the primary differences actually between operation and financial control models is that in operation, you report all scope one and scope two emissions from the facilities that you are occupying, even if you don't own them. But you don't report scope one or scope two emissions for facilities that you own, but have a tenant occupying. So financial control means that you don't count scope one and scope two for facilities you are occupying but don't own, but you do count scope one and scope two for facilities that you own but don't lease. Sounds a little confusing I am sure, but we definitely have training along the way to help our members when you get into inventory. We always recommend that our members do take complete notes.

Just to touch on this, our inventory standards come from our local government operations protocol, which we have created along with several other organizations, including the California Clean Air Resources Board, the Climate Registry to have kind of an international standard for creating inventories.

There are two kind of different inventories that our members will create, one is a community and one is a government operations. The government operations is in the community inventory but obviously we like being able to see specifically what the government is contributing to that report out separately. You can see the sectors that we ask our members to collect data on. On the community side, residential, commercial, industrial, including solid waste. The government operations is a little more detailed. The actual buildings, looking at specific vehicle fleet, traffic lights and signals, water, sewer, and waste water processes, such ports or airports that the government owns. Again solid wastes generated by the operations of the governments. They also employ commute and other equipment we look at as well.

This is a software screenshot of the software that our members use to conduct their inventories. The CACP, Clean Air and Client Protection software was released in May of 2009, it's updated over our previous version. It allows you to conduct an inventory of energy use and associated green house gas emissions. However the software tool is only as good as the data that you get so it is really important to make sure that you are collecting data and having a good sense of where all the emissions are coming from.

Here's a local government operations protocol that I touched on. Again, this was created with the California Climate Action Registry and the California Air Resources Board, which we call the protocol. It really details the best in class practices for conducting those green house gas emissions. You can compare them from community to community. It is comprehensive in a lot of source and reporting procedures. They are actually working on the community protocol. So if you remember from a couple of screens back, there is the community inventory and the local government inventory. Right now we have a protocol for the local government inventory and we are working on finishing the community side, which hopes to be completed in mid to late 2010.

So when you are actually looking at calculating emissions from solid waste, we did just hear about EPA's WARM model which as Sara mentioned is a little bit of a different tool to use, but some people have used it before. As she mentioned the limitations associated with that for inventory. The preferred decay model that we use in our software is based on the intergovernmental panel on climate changes, waste reporting models. It actually looks at emissions from a landfill, which in the landfill, the work has been added this year so both history and current, if it is still in operation. It requires data for every year that landfill has been in operation, so from the opening until the close. And say if you live in a community where they own the landfill and it's already been closed, there are obviously still emissions associated with that. Even if you are not adding waste to it the year you are doing your inventory, you still need to use the historical data.

The WARM tool, it's just the emissions for waste dispose of in a given year for that [audio disturbance; inaudible] significant numbers as opposed to inventorying. It requires data on waste generated from your actual inventory year. So you can just see it sort of came out of little bit of a different model altogether. As we have discussed, I am sure you already know the methane generated at solid waste disposal sites is really determined by the quantity and I would say the composition of wastes, the moisture content, the pH, and the actual waste management practices, how the landfill is being operated. In general, methane production increases with higher organic content and higher moisture content in landfills and the tool takes into account the different moisture or rainfall for your region.

The first order decay model is less likely to over or underestimate the methane emissions. It really requires that historical data and the decay rates. There is a time delay before methane emissions begin and methane emissions can actually continue to occur for several decades after waste disposal. So as I mentioned it is important to have historical data even if your landfill isn't in operation of the year you do your inventory. Methane is highest the first few years after deposition and decreases as the available carbon is consumed.

So when we are actually doing the inventory, we have the spreadsheet which we started to develop. It's in its final stages now. This is based on the California Clean Air Resources Board calculator and we've kind of taken it and made it more a natural approach. But these are the data points that you would enter into the tool. So you don't need to do fancy calculus, although you could if you want. All the calculations are embedded into the tool, you just plug in your numbers and it outputs it for you. It will be in an Excel spreadsheet on that. As we kind of touched on some of the data points you will need, the total amount of waste collected each year since the landfill was opened. Obviously the opening and closing years.

Waste characterization. Only if you know the percentage, if you've done the waste either using regional estimates, figuring out exactly so you can determine the emissions based on the organic content, but there are defaults available. The annual rainfall for the moisture percentage of methane collected, if it is collected, we consider in this tool the comprehensive landfill gas capture and the non-collected. It is considered comprehensive if the landfill system is verified under EPA's new source performance standard (NSPF) or a system more stringent than NSPF, that's what we say for comprehensive in that it collects all the methane. On the destruction efficiency of methane based upon the system, so kind of what's happening with turbines, any sort of other way of methane being used.

The collection efficiency also is tracked in our system. Again, if you don't have those specific to your landfill, there are defaults; surface covered by and not covered by the landfill gas collection system. Again, to know how much of the methane is being captured or not.

On the incineration side, it's important to note and the information I am referring to is, if your local government owns or operates the landfill or in this case the incineration plant, these are the data that you would actually put into your inventory. If you send it off to a landfill outside of your jurisdiction's boundaries, you don't need to report in this much detail and I don't have this much information. But this is for if you actually own and operate or have owned and operated your landfill within your jurisdictional boundaries.

So looking at incineration, a little bit less data to collect, you don't need all the decay and moisture rates but obviously the actual tonnage of the waste generated, percent of waste overall that is incinerated because there may be some that is landfilled and goes different places. Again the composition; and we do have defaults on this. Obviously defining these data points, in short, if you don't have them yourself, if you're not operating yourself, obviously the collectors, your contractor or the operator of your incinerator may have these records. Some of these records, data points, you can also put in as a scope three emissions on your inventory. So there's a [audio disturbance; inaudible] for the waste but if it's not in your boundaries, you would need to account for it as directly.

So we do have some tools to help our members along the way. We have some how to guidebooks. We have an outreach and communications guidebook that's available to everybody. It really helps members figure out how to communicate to their residents about issues surrounding green house gas emissions, reducing energy usage, and just being more mindful of conservation. The next two guidebooks are members only. So if you're an ICLEI member or want to be one you have access to that. Recycling and solid waste really walks you through from how to program to I have one, how do I make it better and a whole bunch of resources and assistance in between. Another materials conservation one would be the environmentally preferable purchasing, which actually helps municipalities identify how they want to set up a plan in the municipal operations.

Also want to mention our star community index program. This is new program that ICLEI has started and it is looking to create it as a globally recognized green standard system for cities. It is mostly based on the idea of the US Green Building Council and their LEED certified buildings and how they're [audio disturbance; inaudible] are along the way. But a little bit separate. They want to look to creating sustainability actions so environment, economy and social equity. How communities can be more sustainable moving forward and what are some goals and targets they should be looking at to accomplish those. So right now there's technical advisory committees working in nine different areas in those three sectors of environment, economy and equity. They are really designing what they want these kind of checkpoints and goals to be so that our communities can strive to be more sustainable.

There's my contact information. Again I am in our northeast office but I can also direct you to our contacts in different regional offices. You can also check out our website. If anyone has any questions, I am happy to answer those now.

Adolph Everett: Courtney thank you very much. Yes we do have a couple of questions maybe you could field now. The first is, about how many of your members have gotten past milestone three and can you just talk about examples of members who may be at the milestone five stage and what kind of successes have there been.

Courtney Forrester: Sure. That's an excellent question. We do have a handful of them if I don't have my statistics up right now, so I am going to have to ask our membership team for, but we do have a lot of members who have moved on to the implementation phase. We have had a lot of growth in the past three years. A lot of our members are just kind of starting out and doing their inventory piece, which can obviously be cumbersome if they're just getting their feet wet, but once they get going it's not as bad as they originally thought. But actually Keene, New Hampshire is on the phone and I know that Keene is one our Milestone Five Communities. But five communities, Burlington, Vermont, Seattle, Washington, a whole host of them that have really taken a lead on developing climate action plans and implement them in their own communities. We have a handful, more than a handful I should say, a whole host of them on our website, sample action plans for our members to look at to get inspiration as they are moving forward. But I forgot the second part of the question.

Adolph Everett: Just about milestone five and any successes there too.

Courtney Forrester: Sure and as I mentioned, Burlington, Vermont is really starting to redo their inventory now. They are looking at, since they've done their last inventory, how they accomplished it and what they move forward. They really use that as a planning tool in their government to figure out, because it's kind of measuring your emissions and measuring energy usage and usually there is a lot of money attached with that. They've really been able to identify opportunities for them to be more sustainable.

Adolph Everett: Ok thanks. Next question we have. Did you say that communities should not count emissions from electricity generated outside a community, basically outside the snow globe as you described?

Courtney Forrester: That's like setting a scope two emissions, you still put it into your inventory, you just mark it as a different scope. That way if you were to add up, to roll up out of scope one, that is just specific in that snow globe. But the scope two, there is energy associated with it if you have two neighboring communities and they are both using the same power plant, they could both count as scope one and there can be kind of double counting and who is doing what. If we turn to scope two, kind of account for that in the right kind of basket, if you will. You still account for it, but you realize you have a little less control. You have control because you can turn your lights on and off, but you can't control necessarily all the power sources.

Adolph Everett: Ok great. We have another question. Is ICLEI looking forward to using life cycle analysis information that communities could use to make comment friendly, i.e., low carbon emission footprint purchasing of materials, by community or things like DPW type materials or cleaning materials, office supplies. Can you elaborate on that?

Courtney Forrester: Sure. It's an excellent question. Actually we are working on a new tool called CAPPA, and I am going to forget the acronym, some of these CA acronyms. But it's a Clean Air Planning and Protecting Assistance. What it is going to be, we have it in the early stages now, but they are modifying it to be more comprehensive and to take into more accounts but it's really a planning tool. So you can kind of plug in, hey, I want to switch to you know more porous concrete in public works or I am going to have everyone switch to 100% recycled paper in municipal operations. So whatever it is, you can kind of plug those in, see the associated energy savings and maybe also money if you were to put in those criteria to see what those changes would do for you. It will allow you to compare scenarios and to also look at what communities have done that and where successes lie.

Adolph Everett: Ok great, thanks. We'll take one more right now. Do you have models for communities in which all of their municipal solid waste is being incinerated at waste energy facilities in lieu of being disposed of at landfills?

Courtney Forrester: So is some of these 100% at energy facilities?

Adolph Everett: I think that is what the question is, yes.

Courtney Forrester: Ok, yeah, there's actually is quite a few. I mean I'll speak from personal experience from my previous job in Mass. A 100% of the solid waste not including recycling obviously, went to an incinerator. So I am not sure what the question else was on that. How to account for it or what not?

Adolph Everett: Yeah, I think because I think most of your discussion at the disposal end focused on landfills if they were, this community was, you know basically a single waste energy facility. Would that be something that could be counted...

Courtney Forrester: Sorry about that, yes so as I mentioned a tool that we developed, it's a first order decay model. You normally don't have any decay in a waste energy plant because it is getting burned pretty quick. So that tool doesn't really apply to that. But if you do have incineration, whether it's in you community or if it goes elsewhere, we still obviously ask for the amount of waste and still the composition; because obviously the burning, knowing the contents if you burn it, different things burn at higher BTUs and they release different energy and emissions, as we all know. So the tool is not as comprehensive for the incineration side because you don't need to know all the decay factors, you don't need all those data points. You still have the guidance, but the Excel spreadsheet that I mentioned focuses on the landfills because it is such a complicated calculation.

Adolph Everett: Right. Thank you so much for clarifying Courtney and thanks for the great presentation. David, if you are ready we will move on to you.

David Allaway: This is David Allaway and I would like to thank you for the invitation to speak. Sara has demonstrated the green house benefits of recycling and Courtney has given us a great overview of inventories. I am going to talk more about green house gas inventories at the state and local level; how conventional inventory methodologies unintentionally are creating perverse disincentives that discourage prevention and recycling; and close with a few efforts underway to make communities feel inventories more useful and complete in this regard.

Many of you saw the slide in Josh Stolaroff's presentation in the first webinar. It shows green house gas emissions at the national level as they are traditionally portrayed. Where materials fall into this is not entirely obvious and it doesn't take a rocket scientist to look at this chart and conclude that the three most important sources of emissions are electricity generation, transportation, and industry. Now that's the conventional view and here is a systems based view that EPA is developing. These are the same emissions you just saw; they've just been classified differently. Here you see the materials management, the provisions of goods and food is tremendously important, more so than buildings and more so than the transportation of people.

Forty-two percent of the nations green house gas inventory are as a result of producing, transporting, and disposing of "stuff". Now most of these emissions are in resource extracting and manufacturing. Freight transport contributes only about 8%, disposal contributes only about 2%. So a key message for those of you who work in the "waste" community, materials are hugely important and disposal is not. Materials management is where we need to focus. Waste management, less so. To achieve the big reductions in green house gas emissions we have to focus upstream on manufacturing. Fortunately, recycling has some upstream benefits. Waste prevention even more so. It is a mistake, however, to frame waste prevention and recycling as primarily disposal avoidance schemes. The moment you do that, you signal for the larger green house gas communities that you and your programs are at best, bit players that are largely irrelevant because they are only focusing on a small sliver of emissions. Yes there are steps that we can and should take to reduce disposal-based emissions, related emissions. But we have to focus on the bigger picture.

Now mind you, these emissions shown here are only domestic emissions. They include emissions associated with all the "stuff" produced in the United States, including goods that we export. What's not shown here are emissions associated with production in other countries of the goods that we import and consume. Subtracting the emissions associated with exporting goods and adding the emissions associated with imported goods shifts the frame of reference for a production-based inventory to a consumption-based inventory. Two researchers at Carnegie Mellon, Scott Matthews and Chris Weber, recently did just this. They found that in 2004, these net invited emissions in trade (imports minus exports) added anywhere between 3 to 21% to the traditional

production-based US green house gas inventory. These added emissions are almost entirely associated with goods. So from a consumption perspective, materials are even more important than EPA's pie chart here would suggest.

So that is an introduction. Let's talk about inventories and the state and local community level. Courtney said you don't reduce what you don't measure. If that's true, then we're in trouble. Because our failure to measure emissions associated with materials, which you will see, is a major short-coming.

So let's remember how inventories are traditionally used. Local governments and state governments use these inventories to achieve three objectives: to evaluate how they contribute to emissions; and by extension, how those emissions can be reduced. Also they use these inventories to track progress at reducing emissions over time. And finally, they use these inventories to communicate to the public, how the community contributes to green house gas emissions. So it's important that community inventories allow us to meet these three objectives.

I'll mention a fourth objective. At the international level, the Kyoto Protocol requires all nations to conduct national accounts using a consistent framework; so as to allow all national inventories to be summed into a global total without double counting. That's helpful, but since the US doesn't conduct a similar summation of state inventories and states don't sum local inventories, this kind of rigid consistency is not a prerequisite for community inventories.

So communities feel inventories can be conducted at three levels. The traditional approach is the geographic approach or production-based inventory. That's what Courtney was referring to where you draw a snow globe around the boundaries of your community and you look at all the emissions that physically originate there. On the west coast at least that's been replaced by what's called a hybrid inventory. A hybrid inventory is the traditional production-based inventory but it includes the emissions associated with electricity consumed in the community. Even if the coal and natural gas burned to generate the electricity physically originates some place else. And then the third approach is to do a consumption-based inventory.

So what's happening at least here on the west coast for conventional green house gas accounting is it's hybrid approach, where you draw a boundary, you know a line around your community. You count all the emissions resulting from production activities. You count the emissions associated with the consumption of fuels for heating and transportation. You count the emissions associated with the consumption of electricity even if the coal or natural gas is burned offsite. And sometimes you count the emissions resulting from waste disposal.

So what does this mean for the materials conservation programs? Just as a reminder, this chart here is showing the green house gas emissions over the life cycle for different kinds of materials in the waste stream. The blue line is showing upstream or production related impacts. The maroon and the green bars are showing landfill related emissions depending on whether you count or don't count carbon storage in the landfill. The moral of this story is that basically upstream emissions are typically many times larger than downstream emissions. Those upstream emissions typically occur in some other community unless your community only buys products that are made in your community.

In the conventional green house gas accounting process, production and consumption accounting of emissions are mixed together. So this means that energy conservation because the impacts of energy consumed are fully counted, the benefits of energy conservation and the benefits of using green, low carbon sources of energy are fully counted and therefore incentivized.

On the materials side, since most of the emissions are upstream and those upstream emissions are rarely ever counted, they are not acknowledged, they are not recognized and the potential to reduce those emissions often goes unnoticed. So for example, curbside recycling requires collection vehicles and those collection vehicles have transportation emissions that typically get counted in the community green house gas inventory. Now when curbside recyclables are collected and go to market, we estimate that the life cycle green house gas benefits upstream are about 40 times greater than the emissions from the collection fleet. Curbside recycling is a fantastic investment in green house gas reductions, but you wouldn't know that from traditional inventories because those upstream emissions go uncounted and undocumented.

So this can have very significant impacts when communities or institutions are conducting green house gas inventories. Here on this graph we see the traditional green house gas inventory for the University of California at Berkley and you see it's dominated by energy consumption. On the right is the green house gas footprints for the University of California at Berkley. These are the emissions resulting from all consumption activities at the university and you see that the traditional inventory doesn't even account for half of the university's green house gas footprint. Goods and services contribute an additional 28%.

From the northeast here is an example of Stony Field Farm. For many years they focused their efforts on reducing green house gas emissions associated with facility energy use because they believed it was all about energy and they achieved some great reductions. Then they realized that they had distribution and packaging impacts and only recently did they look upstream into their supply chain and discovered that the green house gas emissions associated with milk production are much larger than any of

the other emissions. So they might achieve greater green house gas benefits and do so more cost effectively by looking at the materials they use and their supply chain.

A couple of other limitations. Conventional accounts are insensitive to what are called rebound effects. This is where you participate, you engage in a conservation-like activit, like you drive less or you buy less electricity. Then you use the savings and you spend it some way that increases emissions some place else. It's important we have a complete picture of emissions so we are not playing the game of whack-a-mole.

The conventional accounting approach also rewards leakage. Leakage is where a manufacturing facility closes down shop and moves some place else and causes the emissions to go with them. We'll give you an example of that here. This is a green house gas inventory, traditional inventory for the United Kingdom using the inventory protocol required by the UN Framework Convention on Climate Change. Between 1992 and 2004, the UK's emissions appear to have fallen by 4 1/2% showing that that country is on track to meet its Kyoto reduction targets. However, when emissions resulting from consumption were recently estimated, it was found that the UK's contribution to emissions actually rose 18% during the same period. How did this happen? Well, between 1992 and 2004, the traditional accounting fell in part because some domestic manufacturing was moved overseas, the emissions went with it but since they weren't physically originating inside the UK anymore, they were no longer being counted. Worse, because most developing countries have fuel mixes that are more carbon intensive than most industrialized countries, this shift in production actually increased emissions. Even worse, this shift in production was accompanied by the decline in prices for consumer goods which meant that UK consumers bought even more of these more carbon intensive products. That's how these emissions increased. That is not a path for sustainability and it isn't how to reduce emissions.

So I would like to mention two projects here in the United States. First, an effort here in Oregon to develop a consumption-based green house gas inventory for the state. Second, a workgroup of staff from state and local governments up and down the west coast and EPA Regions 9 and 10 to bring recycling accounting and consumption accounting into the main stream of inventory protocols.

Here in Oregon we're attempting to develop an estimate of the green house gases resulting from consumption here in the states. This is intended to compliment, not replace Oregon's traditional hybrid production-based green house gas inventory. We are doing this for several reasons. One is that our state's environmental quality commission thinks that efforts to reduce green house gas emissions and more broadly the public and the public's confidence in our efforts will be significantly improved with a more comprehensive perspective. Ultimately consumption-based accounting looks at

the root causes of emissions. It will also shed much more light on the world, most of us on this call play in, the world of materials management.

So we have several key questions that we are hoping to answer. I won't read these all, you can read them yourself. We want to know how materials contribute to emissions. Which materials contribute the most, both on an absolute basis and also per dollar spent. We would like to know if we can estimate where these emissions occur. So that we can understand how much of the emissions are currently covered under our conventional inventory and how much are occurring elsewhere. How do the consumption and traditional inventories compare against each other? How do materials-related emissions intensities compare; that is what are the emissions associated with producing a ton of any given product in the US verses in other countries with different fuel mixes. Perhaps most importantly we would like to create a model, this will be challenging, but we would like to create a model that can be readily replicated and extended so that other communities, both in Oregon and elsewhere, can similarly estimate their emissions associated from community-level consumption.

The tool we are developing, it's a very early version. It only works for the year 2005, so to extend this to other years would require some additional effort.

Now to conduct this analysis, we're using a methodology called input/output life cycle analysis or IOLCA. I'll give you a very quick overview of how this works. It actually has its roots in the work of Wassily Leontief who is an economist who won the Nobel Prize in economics in 1973 for this work. Input/output analysis is a characterization of all the inter-industry flows associated with satisfying a unit of final consumption. So for example, if I spent $20,000 on a car, the car manufacturer spends $2,500 on an engine; these numbers are completely made up by the way. That engine supplier in turn spends money on steel, aluminum, attorneys, other things that are part of the second tier supply chain. The steel manufacturer in turn spends money on iron ore and coal and perhaps some steel. That's the third tier of the supply chain; and on and on.

So input/output life cycle analysis builds on this concept by converting these loads of money into green house gas emissions. So for example, if we know the steel industry and its X units of CO2 for every one dollar of economic output, we can multiply this by the amount of economic output the steel industry produces in the course of satisfying the consumption of an automobile. This approach can be repeated for all other acts of consumption to provide an estimate of upstream emissions resulting from all consumption in a community. The results aren't particularly precise, but they are much better than nothing.

We've contracted this analysis out to a firm in New England, the US Center of the Stockholm Environment Institute. What we are doing is we are building this model

based on in-plan, which is a very popular and commonly used economic modeling tool. It provides estimates of consumption data at the community and state level. We take that data and we multiply it by these green house gas coefficients that are weighted to account for different emission intensities in different parts of the world. We then add into this the use phase and its life emissions and we actually hope to have draft results out in July. So if you are interested in that drop me an email and I'll send you the notification.

I want to mention the second project here, which is the inventory workgroup of the West Coast Forum on Climate Materials and Waste. We are hoping to bring recycling and consumption accounting into the main stream of community inventory protocols so that local and state governments benefit from these perspectives. Our initial effort is focused on CARB, the California Air Resources Board. Now CARB has already adopted a local government operations protocol. Courtney mentioned this and next up is to develop a protocol for inventory emissions at the community level. We have a number of issues with the local government operations protocol. We think it fell fairly short in its treatment of materials and we are hoping to avoid that happening again with the community protocol.

I mention ICLEI here because the CARB protocol will likely become the de facto national standards in part because ICLEI had expressed interest in using whatever protocol CARB develops. So our workgroup, which is made up of state and local government programs across the west coast have three requests of CARB. First, we think in a community inventory, disposal emissions should be assigned to the community that generates the waste, not the community that hosts the disposal facility. Second, we think a good community protocol should provide credits, not in the tradable sense, but acknowledgment as it benefits of recycling. Finally, consumption related emissions should be included on a supplemental basis or at least the existence of these emissions should be acknowledged.

We have a letter that has been drafted and we're holding on to this letter waiting for CARB to announce their plans. The letter will be signed by state and local governments and we can send this out to you if you're interested. They did say they would be interested in knowing what other state and local governments outside of California think about their protocol, as they hope it will become a national standard. I just learned yesterday that CARB is delaying implementation of this project and will not be kicking the project off, won't even be starting it until September at the very earliest. So we do have some time to continue to work on our positions and trying to develop methodologies that could integrate into the community protocols.

I'll just mention a couple of issues that often come up here in the context of recycling and consumption-based accounting. Remember I mentioned the three objectives of the

community green house gas inventory; evaluate options for reducing emissions, track progress over time, and communicate to the public. Consumption-based accounting meets the first and third objectives very well. The second objective, not so well because the data is not particularly precise. A consumption-based accounting will supplement the conventional inventory but not replace it. We don't want to do away with the traditional inventory; we just want to make it better by adding an additional frame of reference.

Consumption data is model data. Nobody knows how much chicken people in Boston actually buy. We just estimate it. Unlike some of the actual electricity consumption data, for example. Admittedly, some of the information is less directly actionable for local governments and the methodology is complex. So this isn't easy. We are taking the first stab at it. We hope to generate something that will be useful and contribute to the ultimate goal which is to reduce green house gas emissions.

I am getting a signal here from the organizers that we're running short on time. I am actually going to end my presentation here. There are a few more slides you can look at on the EPA Region 2 website and if you would like to take the line back, I would be happy to answer some questions. Thank you.

Adolph Everett: Thank you. I think we have time just for a couple of questions. One had to do with a slide earlier in your presentation. We had the pie chart and I think in one slice you have residential and another electricity production. Can you just comment on how is that separated when residences are up to using electricity?

David Allaway: In this traditional green house gas accounting here, residential emissions are primarily residential natural gas and heating oil used for heating. The electricity sector is all electricity used by households, used by industry, used by retail stores. That's really one of the reasons why the conventional green house gas inventory isn't particularly useful. It tells you which sectors, you know smoke stacks, are emitting the emissions but it doesn't actually tell you the root causes.

Adolph Everett: Ok great. We'll take one more question at this time. I think it it also pertains to information earlier in your presentation. Is this basically, is it, could this be inperpreted as disincentive to buy it locally, perhaps locally manufactured goods would have higher emissions.

David Allaway: It might depend on where local is. In the case of the United States as a whole, using the US average, it appears the US has lower green house gas intensities than most countries we import goods from. For example, China, not to pick on China, but they're a major training partner of ours. The energy mix used by industry, not commercial or households, but industry in China emits 41% more carbon dioxide per BTU of energy then the energy mix used by industry in the United States on average.

So all other things being equal, products made in the United States will have lower green house gas intensities than products made in China. Now Norway and France are on the other side of the spectrum. Their green house gas intensities are going to be even lower, but we don't buy a lot of stuff from Norway and France; maybe we should. So this is a double edge sword but on average, I'd say that this line of thinking actually supports my local initiatives. I'll mention that it has very little to do with freight transportation because when you do LTAs, typically the movement of goods contribute surprisingly little to the green house gas emissions embedded in products. It's the production of those products and the energy used in the manufacturing that dominates the equation.

Adolph Everett: Ok great David thank you so much for your presentation and for clarifying. Just as a reminder, we will address all questions so please continue to submit them. You will get a response if we don't cover it at the end of the call. We will move on last but not least to Duncan. Are you ready?

Duncan Watson: Yes I am. Thanks for having me today. As I've been sitting here listening to this discussion, I'm reminded of two things that one, I really appreciate the higher order of thinking that's going on to tackle these global issues, but I am also glad that I am doing what I am doing. Because when I was finishing up my masters degree in environmental science, I thought that for sure I was going to be working for some public policy institute doing this kind of work. Circumstances got me to apply for a job with the City of Keene as the Solid Waste Manager and actually and ultimately as the Assistant Director of Public Works. They still have my hand firmly in solid waste and what I discovered, it's very satisfying work working in the area where I work because my community of 23,000 people is like a living laboratory. I get to do things all the time and tweak the controls and see the effects of what it is that we do in this community. That is incredibly satisfying but I am glad that we have, I guess, both ways going. Both at the higher level and where the rubber meets the road here.

Terri Goldberg: I am sorry, I just wanted to let everyone know that I put out the poll with the question that you asked Duncan, which is one thing you are going to get to in your talk, but if people see the poll, it says do educational efforts in your community make the connection between materials management and green house gases and you could select one. So if you could please vote.

Duncan Watson: Great. That would be interesting to see what people are doing from an educational standpoint. That was a focus of mine during my graduate studies as my thesis was proving that there was a direct link between investing in education programs and the effect of this other recycling program corresponding to that investment.

I am the Assistant Director of Public Works for the City of Keene, New Hampshire. We are the live free or die state and we take that motto very seriously unfortunately sometimes. But we have a population of 23,000 people, we increase to 60,000 during the day time. We are located in the southwest corner of New Hampshire and we are the economic hub of the county. For those of you who don't know where we are, I am going to put up a map here if this slide changes. Here we go. So we are basically on the borders of Vermont and Massachusetts, to our west and to our south. Keene is right in the middle of the county. We have one fortune 500 company that is headquartered in Keene. We have other industries that are also based in Keene.

Problems with the slides and the poll.

So, picture of where we are in relationship to other places. This is a picture of our materials recovery facility. Directly in the foreground there is our materials recovery facility, better known as the recycling center. We process comingled materials that are delivered from commercial and residential customers. Off to the left there is our transfer station where we process the solid waste that gets transferred to either a waste energy facility or a landfill quite some distance away. We have both hand sorting and mechanized sorting. We sort through most of the common materials, numbers one and two plastic, glass, steel and aluminum cans. Then we also have a fiber processing portion of the operation, both corrugated cardboard and mixed fibers.

Back in April of 2000, the city joined the Cities for Environment Protection campaign administered by ICLEI which is a referenced earlier in the presentation. The city was one of the first communities to join up with this program and we concluded our local action plan in 2004. My involvement particularly with the climate action plan was just providing data to the person who was assembling the action plan and since then I have joined our local climate action committee. But we are also in the process right now of updating information to provide an update that will be completed sometime this year.

One of the difficulties that we find, I think somebody referred to the eyes glazing over factor earlier, is that when we talk about climate change, it is really, really hard to engage people because it's an overwhelming topic more often then not. There's a lot of information out there and there's also a lot of disinformation out there. There's many vocal people saying that climate change isn't happening as much as there are people saying it. I think there are certainly more people who are saying that there are effects from climate change then there are not but they are equally vocal.

A lot of people simply can't identify with what it means. They are not engaging us on a daily basis. They don't know how they themselves can make a difference. So one of the things we have tried in Keene is to change the dialog a little bit and this is a fairly new effort on our part or actually my part. But I've always thought that global warming is a

misleading name for what was going on. I frankly think that global climate change is kind of boring. So I am attempting to coin a new phrase which is called caffeinated climate because I think people can identify with how they are when they are on caffeine, and basically that's what's going on with our weather. Hot is hotter and cold is colder and rain is rainier. For those of the younger generation who are frequent Red Bull consumers or people who drink lots of coffee, they certainly can identify with that term and that seems to be catching on a little bit, at least in the local area and hopefully further than that because I think it is an effective term. Henry Lovins has another term for it called global weirdness, which I also like that term as well but I think caffeinated climate captures what we are talking about.

But again often times this message gets lost in what we are trying to convey, which is the importance of materials management and its effects on climate change. That doesn't always resonate. So when those other fail, we basically talk about money and money is something a lot of people can identify with.

But just for a little perspective on our operation, we had a landfill; I arrived in the city of Keene in 1992 and we had an active landfill that had been active since 1973. We were in the processing of filling that landfill up and we were needing to do something else with our waste. So we simultaneously while operating the landfill constructed a materials recovery facility back in 1994. Concurrent with that, we constructed a landfill gas energy system to power our recycling center off the grid. When we closed the landfill in 1999, we opened a transfer station up and the cost to get rid of our waste increased dramatically. Because of the planning that we had done, there was no power up here to power our recycling center, no three phase power. So we basically constructed a landfill gas energy system and put our system on our own power and that has been a huge PR boon to the City of Keene in terms of getting people to see a real world example of taking something that had previously been considered useless and it was quite a bit of a nuisance, you know the methane emissions from a landfill and turning it into something positive, which we certainly did. Even though we've saved hundreds of thousands of dollars in energy costs over the lifetime of this operation, the publicity we got from it and people's pride in our operation has been immeasurable.

But from just a data crunching standpoint, we've done 173 million pounds of material process at our recycling center. I know that there are plenty of materials recovery facilities out there that do this kind of tonnage in a year or two, but you know we are a very rural area. But from a New Hampshire perspective, we're the largest municipally operated materials recovery facility in the state, which I guess only tells you how small our state really is. We have processed enough material to fill up 4,325 tractor trailers of material; and again, ho hum, that doesn't really mean much to anybody. It means something to me, I mean I can get my hands around that because I can see these tractor trailers everyday. But when I talk to people, we're talking about money.

We've saved approximately 9 million dollars in disposal costs over the lifetime of our materials recovery facility. We've generated over 3 million dollars in revenue. One of the things that I have discovered over my years here is that you can never underestimate the lengths people will go to save a nickel. One of the things that we've had great success with, and I will tell you that of all the tools in my toolbox with regard to materials management, the best tool is the whole concept of fairness, or pay as you throw or unit based pricing. Because obviously this is not, recycling isn't free, disposing of waste isn't free, but if you sort of explain in the concept that you pay in proportion to what you generate, most people can understand the fairness of that concept and will buy into that. Despite the fact that even though that is the single best tool that I've ever seen for both reducing waste generation and increasing recycling, many many communities still resist that for reasons I have a difficult time understanding.

One of the things that I find fascinating is that and I was one of these people not too long ago. When I was in graduate school I was living in a community or the sea coast of New Hampshire and I was absolutely determined to recycle truly everything that came into my life. I remember the town that I lived in did not have a recycling center. So I had to collect all my stuff and bring it to a nearby town to get rid of it. The place I brought it to basically had an open drop off center with no attendant there. As I started unloading my stuff, I was putting paper where the paper goes and the plastic where the plastic goes, and I remember very specifically taking out the light bulb out of my recycling bin and looking at it and thinking, hmmm I wonder where this goes? I ended up throwing it into the glass pile because of course the light bulb was made out of glass and that's where I put it. Well, little did I realize that I more than likely ruined that 20 ton load of glass that they were going to send out by my throwing a light bulb in there as it was a material that was not compatible with the glass food and beverage containers that were going in there.

But we get a lot of that here. I had a woman actually come up to me really concerned because she was determined to recycle her used SOS pad and her coat hangers. I had to explain to her that I didn't lose any sleep over the used SOS pads or the coat hangers that she was concerned about. Even though I applauded her determination and efforts, there just certain realities and practicalities to recycling that make recycling either work or not work. The practical aspect of it is that technically anything can be recycled as long as it is generated in sufficient quantity to allow it to be processed, stored, and then ultimately shipped to market in such a way that you can make that cost effective. There's a lot of materials that are out there in the waste stream that aren't generated in sufficient quantities, particularly for a rural recycling facility such as ours. So we have to focus on what we really can do and what can we put our efforts into to get the best return. That's really the core of what we do here.

The thing I've been focused on, which has a huge impact and we do make this relationship between recycling and climate change at every turn that we can possibly do, but the thing I lose sleep over is paper. I go over to the transfer station every day and look inside there and I see lots of paper every single day. We did a waste analysis and determined we were disposing some where in the order of 8,000 tons of paper through the transfer station. This was simply because the private collection system which delivers materials to us, they just pick up whatever is in that dumpster and bring it up here and they dump it out on the floor and of course this paper is mixed with all kinds of other things. But paper is one of the predominant things that's going out, it represents 8,000 of the 32,000 tons that we're sending out to the transfer station. It represents not only a lot of money in disposal costs, but it represents quite a bit of revenue.

It was something that was shocking to me but it was where we started to focus our efforts in terms of ok, we really want to get the message out there, what are we going to do? We can get people to relate to the idea of recycling paper much easier than we can a used SOS pad or a coat hanger.

One of the things we've been really trying hard to do is saying not only to our decision makers in town, but also the community, what we are really doing here is a business and we need to run it as a smart business. This smart business just happens to have some really great environmental benefits. I think that when we show people what it is that we do in terms of the efforts to divert waste as much as possible and the revenues that we receive for those products and the avoided disposal costs that we achieve, that really gets people to get on board and feel like that have a connection with what it is we are doing.

Over the years we've had what I would guess term shot-gun approach to public education. As I said before, when I was doing my thesis in grad school, there was a clear link between an investment in education and success in recycling programs. Although I wasn't able to statistically quantify that at the time I was doing my study because back in 1992, the recycling data was sketchy at best but all the big arrows were pointing in that direction and I've seen that myself first hand in the program that we run here. But even despite that clear link, despite the fact that we are leaders in what we do here in New Hampshire and have been recognized for our educational efforts around the state and around the region that still doesn't prevent us from having our education budget effectively slashed so that there's not much we can do if it requires money.

Some of the things that we did that really did work and if you are considering educational efforts in terms of ok, I want to invest some money in education and how will this make a return, the two things that worked really well were things that were somewhat practical. One of them was a calendar that we produced for a number of

years that basically had basic recycling information on every single month in addition to focusing on a topic area. We certainly made relationships back when we were first doing this to climate change, although that data at that point, we started our calendar project back in 1994 and went up through the year 2000 before the funding for this project was cancelled. Then we also went from there to refrigerator magnets and again it was just providing information about the program and how people could make a difference. We do now mostly school and community group presentations because that only involves my time and doesn't involve any expenditures of monies to do that. But if you do have any kind of a budget, the cost for the calendar was something on the order of 50 cents to produce a calendar for a resident and for a return on the dollar that was a great thing. We had people who were always asking us about when the next calendar was going to come out and really appreciating the information they got from it.

What I do now in my presentations when I talk to people about materials management is I always bring an aluminum can filled three quarters full of water. At some point during my presentation I pour that out on the ground and I just tell people that look, what I had just done here is poured the equivalent of gasoline on the ground here because that's the energy you are wasting by not recycling this aluminum can. Again this is one of those things where beyond the higher level thinking that we were talking about earlier, this is the way for people to really make a relationship between what it is that we are trying to do here, which is the hierarchy of solid waste management.

I don't have a slide on this but we do have a fairly active compost program as well. One of things I am regretting is I haven't tracked this in particular but we have for years sold back our compost bins to our residence at a subsidized cost. I made a case to the city council several years ago to allow me to buy a stock of compost bins that I would sell at a reduced cost to Keene residents and we've sold hundreds and hundreds of them and unfortunately I haven't tracked the numbers of sales over the years necessarily and certainly there would be a fairly significant impact from this effort. But we are going to be trying to do a pilot program this year where we are going to be doing something which is called the green cone program. I got the idea I believe from Montpelier, Vermont which is taking composting to the next step where people can put meat and bones and things of that into their compost and successfully compost that even in their backyard without risking problems with critters, odors and what not. So we will have to see how that succeeds.

I've listed a couple of resources on that last page. I will apologize in advance for the City of Keene's website in terms of information that is on there about the Keene's recycling program because we just switched over to a new website about a week and a half ago and all the graphics, pictures and a lot of the information didn't get transferred over from the old website so we are rebuilding that.

With regard to a model that we are using, there is one that we are actually actively using right now that was developed by the Northeast Recycling Council. They have an environmental benefits calculator that's similar to some of the other things that we saw earlier in the presentations. I haven't completed the data entry yet but it looks to be a useful tool in terms of helping to translate the data of what it is that we do to specific climate data and the success or lack of success in our programs. The City of Keene is by no means a perfect community with regard to what we do. We still have room to grow and things that we can still do. But I think that by in large people do feel like their efforts do make a difference and that's the thing more than anything we are trying to get them to feel like. That this problem that we are all facing on a global scale can be tackled at a local level and it happens one bottle, one can, one piece of paper at a time.

Adolph Everett: Thanks Duncan. We have time for a couple of questions. You mentioned that you are using the NERC environmental benefits calculator, is that the primary tool you are using or are you using any of the tools that were described in the ICLEI presentation?

Duncan Watson: Well I know that the tools that have been described in the ICLEI presentation are being done through the planning department so I have not entered data into that model at this point. But what I am going to be doing as a result of her today and what I have already done is I am going to be looking at the WARM model and the ICLEI model more carefully and seeing how the data compares with what I have been entering into the NERC model. Then compare them so I can sort of see what the differences are in the data that's being gathered and the results of that data. I think that there's some great resources out there obviously for getting at quantifying what it is that is going on through materials management. I'm excited to see what the results are.

Adolph Everett: Great. Then along the lines of quantifying, you mentioned some of the educational programs, public awareness type programs, have you been able to maybe kind of make that link between the education programs and to the benefits of your recycling program?

Duncan Watson: Well I mean I guess yes because we were able to very closely track the educational efforts and initiatives that we were taking and see the results in terms of the quantity of material. Now I will say that as a scientist that's probably not a great way of measuring things because there are other factors at play for which I don't have control over the variables of it. I don't control the collection of waste at the curbside and I also don't control who brings me stuff from what community. We have a facility that is open to anybody in the county whether it's for recycling or trash and the only thing that prevents you from bringing trash here is not having your checkbook. But some communities right now send me their recycling but not their trash and some send me their trash but not their recycling. So it is hard to make an absolute definite correlation

but what we do see is when we do education initiatives and long term ones, we see a steady rise in the material that we receive in the facility. There's also always factors that come into play like when the markets went up to $200 a ton for fibers, a lot of amateurs starting getting into the business of marketing, brokering and marketing fiber products and we saw a huge drop off in the fiber materials that were brought to our facility. Now that things have corrected themselves a bit, we've seen a fairly significant spike in the materials that we are receiving because a lot of these places that were in business are not in business any longer.

Adolph Everett: Ok great thanks Duncan. Terri, are we able to make the other panelists available in case they may be able to field a couple of questions?

Terri Goldberg: Yeah I think we can and I have a couple of resources that I just wanted to quickly go through while we un-mute all the other panelists. I just wanted to mention that we have another webinar coming up on July 23 about working together. More information about what's going on, on the west coast forum and will talk a little more in-depth about some of the workgroups and the work they are doing as well as some of the cutting edge work that happening on the east coast as well. So I hope you join us on the 23rd. If you missed our webinar previously or if you would like more information, Region 2's sustainability green communities' website has a lot of great information that you could tap into. That's where you will be able to find postings of previous webinars including this one. It takes a week or so for us to put it up but it will be there. Regions 9 and 10 did a great series on this topic so if you would like more detailed information and would like to hear other presentations on this topic, you can find resources there. All these resources will be again posted on the sustainable communities' website. I also wanted to bring your attention to another webinar on July 9th that Regions 9 and 10 are hosting. If you liked what you heard about the WARM or a user of WARM and want more detailed, in-depth information, they will be renting an hour and a half webinar just on the WARM model designed for users. So it's sort of more advanced information about the WARM model. Lastly I wanted to let everybody know, I am sure people have heard about this, but EPA has just put out a grant program for climate showcase communities with 10 million dollars worth of grant funding. Here is where you could find the requests for proposals and grants are due July 22. Here are places that you can get more information and we'll post these slides very soon. So I am going to turn it back to you Adolph and we can finish off. We have a few more minutes for questions.

Adolph Everett: Ok thanks Terri and we are almost out of time. I thought it would be good to just have a couple. Sara are you there?

Sara Hartwell: I am

Adolph Everett: Ok great. We got one question concerning are there any plans to add clothing as a category to the WARM model?

Sara Hartwell: No, there are not.

Adolph Everett: Ok. Question for Courtney. What is the purpose of determining the landfill data using the first order decay model? Is this only for jurisdictions that have operational or financial control of a landfill?

Courtney Forrester: Correct. If you have operational control of a landfilled mess, the tools that you would use, otherwise you enter them as a scope three emission and it would be a more basic calculation. Obviously you could do the estimates unless you are able to actually data from the landfill, it would be entered as a scope three because it is kind of more of a quasi informational scope. I mean it's still obviously relevant. You can use the default values, estimates that we talked about if you don't own it yourself.

Adolph Everett: Ok great. We are almost out of time so unfortunately we are going to have to end there as far as questions. But again we will respond to all questions received. At this time I just want to thank all the participants for your presentations today. They were really great. We appreciate the time you have put into this and we thank the audience for all you thoughtful and thought provoking questions. I would also just like to thank the, not only the speakers but the steering committee that made these series of webinars possible. We just wanted to thank you for your assistance in planning this second webinar and again our next session will focus on working together reducing green house gases to materials management and that will be on Thursday, July 23. We really hope you can participate. As a final reminder, please don't forget to give us feedback on today's session. We will be compiling all of your questions and writing responses to them as well as compiling the responses that you give on this to the survey. This helps us to provide additional information. Helps us refine our efforts for the next presentation. So again I just want to thank you for everything and for your time.