Understanding Your Waste Stream to Develop Methane Reduction Strategies

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Carlos Silva Filho:

Hello, everybody. Good afternoon, good morning, good evening, depending on from where you are joining. Welcome to this GMI (Global Methane Initiative) Biogas Subcommittee Workshop Series. Today, we will discuss Understanding Your Waste Stream to Develop Methane Reduction Strategies. It's the third webinar under this series. I'm Carlos Silva Filho. I'm currently the president of the International Solid Waste Association. And I'm honored to moderate this afternoon's webinar. And thank you very much for joining us for this afternoon when for sure we'll have very interesting presentations and discussions with our guest speakers. So today, we will have a panel talking about GMI, methane GMI and GMI tools by Klara Zimmerman from the U.S. EPA (Environmental Protection Agency). Then we have a waste characterization by Sandra Mazo-Nix from Abt Associates. A case study from Canada presented by Hussein Zaki. And a case study from Wisconsin presented by Casey Krausensky. So, I'm happy to hand it over to Katherine Rush before we just jump into our speakers. So, thank you very much.

Katherine Rush:

Thanks, Carlos. Thank you all for joining. Before we start, I'm just going to go over a few webinar software tips. So first, there are two ways to connect with the audio today. You can either listen to your computer speakers or you can use the number that is posted on the slide. All participant lines will be muted for the duration of the webinar, regardless of the audio method that you choose.

OK, so for today, we'll be using three panels for the webinar. These are the participant panel, Slido, and the question-and-answer (Q&A) panel. All of these can be found on the right-hand side of your screen. And you may need to click the arrow next to the desired panel to expand and see all the content. If for some reason one of them does not appear, you can navigate to the bottom right of your screen and click on whatever you are missing.

So, we will be asking a few poll questions during today's webinar. The Slido panel will appear when we open the first poll. You can simply select your desired answer and hit send. And then at the end, we will also have a few feedback questions. And we appreciate your feedback, and we use it to inform future webinar planning.

And then lastly, throughout the duration of the webinar, you can enter questions into the Q&A panel. When submitting questions, please select all panelists from the dropdown menu before hitting send, as this will assure that all the speakers can see your question. These questions will be moderated at the end of the webinar during the Q&A session. The final materials from today will be posted to the GMI website. And with that, I will pass it over to Klara from the EPA.

Klara Zimmerman:

Thank you, Carlos and Katherine. I appreciate it. So, Carlos went over the agenda and I will move into our intro to the Global Methane Initiative and the Biogas Toolkit. So, I'll start just with an overview on methane. So, since the Industrial Revolution, global atmospheric methane concentrations have sharply

risen. And as you can see in the graph on the right, like carbon dioxide, methane is a greenhouse gas (GHG) that traps heat in the atmosphere, rather than letting it escape, which causes an overall rise in temperature. And methane also contributes to formation of tropospheric ozone, also known as ground level ozone, which is an air pollutant and a greenhouse gas. So, methane is considered a short-lived climate pollutant that only remains in the atmosphere for 12 years, which is a much shorter time than carbon dioxide. This means cutting methane now is a really important opportunity to immediately slow the rate of climate change, and capturing the methane and converting it into clean energy can also enhance energy security.

So, in response to that opportunity, the Global Methane Initiative was formed. We're actually celebrating the 20th anniversary this year and GMI is an international public private partnership focused on advancing cost-effective methane mitigation projects and reducing barriers to recovery and use of methane as an energy source. So, we accomplished this mission by providing technical support to deploy methane to energy projects around the world. And GMI works in three key sectors, biogas, which includes municipal solid waste (MSW), agriculture, and wastewater, as well as coal mines and oil and gas. The U.S. EPA is a founding member of GMI, and we provide in-kind support to develop tools and resources for GMI, which is why I'm speaking today.

So, in terms of those sectors, municipal solid waste is the third largest source of global methane emissions caused by human activity and contributes to roughly 12% of all emissions. In the municipal solid waste sector, methane is primarily generated through the decomposition of organic waste like food waste and green waste in oxygen free or anaerobic environments like dump sites and landfills. And if you've been with us for the other webinars in the series, we've covered this, but food and green waste make up about 44% of the global waste stream according to the World Bank. And because that waste generation is expected to increase by more than 3 times by 2050, reducing methane in the waste sector is a really key opportunity to mitigate climate change, but also to deliver co-benefits like better air quality and improve human health by improving solid waste management.

So, EPA's Biogas Toolkit houses resources that were created as part of our work on methane mitigation through GMI and other programs. And the toolkit includes many resources which are helpful for municipal solid waste decision makers interested in methane abatement. It's for educating all stakeholders on the appropriate steps in project development and aims to improve project success and reduce risks, etc. So, on the next slide, we'll learn more about some of these tools in the toolkit. These are the Global Methane Initiative developed tools and all of these are Excel-based tools that were developed separately and serve as standalone tools, but they're related in their shared goal to mitigate methane emissions through the abatement recovery and use of methane. So, this presentation will focus on the new GMI Waste Characterization Handbook and Tool to understand waste stream compositions and how that data can be used as inputs for the other tools presented here, like the Solid Waste Emissions Estimation Tool, or SWEET, Anaerobic Digestion (AD) Screening Tool, Organics Economics, and our Landfill Gas Screen.

Sandra from Abt is going to talk a little bit more about this, but just as a quick overview, the GMI Waste Characterization Handbook provides information for city decision makers and solid waste professionals to plan and conduct a waste characterization study. So, the handbook includes recommended activities and resources to plan an appropriate type of study for your specific site conditions and field activities to collect the data and analyze that data to make informed decisions. And then the accompanying tool can streamline data entry and help easily analyze the composition. The recommendations are based on GMI

and its partners' real-world experiences, such as a waste characterization conducted in Gurugram, India by the U.S. EPA, which I will talk a little bit more about. We have a few mini case studies in this webinar today. So, it's the first one.

So, in 2019, the Municipal Corporation of Gurugram, India worked with a team of experts from EPA to conduct a waste characterization study. That study was designed to capture detailed information on the type of waste received at the Bandhwari Landfill, which receives waste from the twin cities of Gurugram and Faridabad in India. The city had plans to develop a waste-to-energy facility, and the landfill study was designed to help evaluate that energy potential. The study showed that 32% of the waste disposed at the landfill was organic, and that demonstrated the need for organics treatment was more important than an incineration project. The fraction of waste that could be combusted in the proposed waste-to-energy facility was quite low. And as a result, the city is asking bulk waste generators, like high-rise residential buildings, to manage their own organic waste. So, accurate local data from the study helped the city avoid investing in a waste treatment facility that would lack the sufficient feedstocks. And as an additional outcome from this, the people trained in waste characterization conducted multiple other waste characterizations, including performing more detailed characterization studies. GIZ conducted studies at Kanpur and Port Blair that resulted in waste management action plans for those cities. And I will turn it over to Sandra.

Sandra Mazo-Nix:

Thank you so much, Klara. Hello, everybody. My name is Sandra Mazo-Nix, and I'm an experienced environmental manager with over 16 years of experience in municipal solid waste management, climate change, and greenhouse mitigation. I hold an MS (Master of Science) degree in environmental science and policy from George Mason University and a BS (Bachelor of Science) from management engineering from the National University of Columbia. My current role is serving as solid waste management senior associate at Abt Global, and I have also worked as program manager at CCAC, the Climate and Clean Air Coalition. But let's go ahead and get started talking about waste characterizations. While many of you might be familiar with waste characterization, we would like to offer a brief overview about what are waste characterizations, and then I also will introduce the Waste Characterization Handbook and Excel Tool that Klara was talking about.

But before we get started, we have some poll questions for you. So, if you can please answer those.

Katherine Rush:

Yeah, so we will do this one at a time. I've just launched the first question. If you don't see it appear, you can click on apps in the lower right-hand corner of your screen and then Slido. So yeah, we'll just wait a second for the first question to be answered. And then we'll move to the second.

Sandra Mazo-Nix:

Okay, the first question basically is to let us know what is your primary industry or field of work.

Katherine Rush:

And we have 21 votes right now, and it looks like 62% of people say academic researcher or NGO, 26% say federal employee, and 12% say state.

Sandra Mazo-Nix:

Okay, and then so we have a lot of people working with NGOs, and can you please launch the second question just to know what would be the current knowledge level of waste characterization.

Katherine Rush:

Yep, that question is live. Okay, right now we have 28 votes. 3% say 1, no knowledge, 20% say 2, 45%, 3, 23%, 4, and 10% say 5, expert knowledge.

Sandra Mazo-Nix:

Oh, wow. We've got all kinds of experts and we're glad you're here and we hope that you can learn something from this presentation. Well, let's go ahead and talk a little bit then about municipal solid waste and why is it necessary to do waste characterizations. As most of you know, waste can vary significantly by country, region, and local demographics. As one example, the chart on this slide illustrates global waste composition and how it varies by income level. As you can see, as the income level increases, food waste as a share of MSW decreases, and while the other materials like paper and glass increase. This is important to know what is being generated and what is going to landfills or disposal sites, because basically, like Klara mentioned, uncontrolled decomposition of organic waste basically contributes to methane emissions. So, it is important to know what is going to be generated so we can take the effective solid waste management strategies to mitigate methane. One thing that is important is that accurate data on waste stream is crucial to planning successful municipal solid waste strategies and understanding the effectiveness of existing programs. However, most of the time we see that their data that is accurate and current is very much lacking. So, this is an important thing to keep in mind.

So, waste characterization studies provide high-quality waste stream data that can inform MSW strategy choice to support methane mitigation, especially when considering new programs or projects. So, what are waste characterizations? Basic waste characterization is a systemic approach to understand the composition and proportion of each material or product in the waste stream, for example, the amount of plastics, the amount of organics. And developing waste management projects without a clear understanding of the waste stream and its composition can lead to numerous problems, ranging from suboptimal operations to project failure.

Waste characterization studies provide real-time information about the types and quantities of materials that are being disposed at a certain location, which can then be used to estimate the waste generation from neighborhoods, cities, or actually entire regions. This data actually is very useful to facility operators, government officials, and researchers and can have different uses. So, I'll discuss these uses in the next slide. Waste characterization can also help assess the trends of the waste generation being done over time, and this actually can also inform policy, technologies, and communications with the public.

So, there are numerous applications to the waste characterization data. In many cases, the studies are used to design programs and policies to divert waste materials from disposal, but there are other uses as well. One key use is to establish baseline waste management conditions, and this is necessary to understand and to measure the progress and effectiveness of existing solid waste programs, as well as

providing information on the current waste management systems, such as diversion and disposal conditions, which can then be used to establish goals for reducing and diverting waste.

A key use for the waste characterization from the baseline is basically to provide data points to model the landfill gas emissions if the waste characterization is being done at the landfill. Also, the data can be used to develop reduction and diversion strategies. So, you can use the data to identify what is the largest material streams and then use that information to focus the diversion efforts for the most cost-effective measures. You can also use it to select the appropriate technologies that you are going to be using for waste treatment. So it could be, like, if you're going to decide that you're going to divert organics, then you're going to see whether it will be better to use composting in case maybe you are only diverting yard waste, or maybe if you're doing a bigger project when it includes food waste, then you might be considering using anaerobic digestion. This is also important for project sizing and capacity planning for when choosing a technology.

Likewise, you can use the data to understand the contamination of your waste streams. So, if you have already separated waste streams, then you can see, for example, if you have an organics waste stream, then you can see what is the level of contamination, how the program is working. Likewise, if you also have a recycle deposit, you can also see how if there's contamination in that stream and how much is it and what you can do about it. And lastly, you can also use that information to, like I said, evaluate and improve programs. And you can also use the information to compare between facilities and also to see how a city or region is basically doing compared to the national.

Now, let's talk a little bit about the different types of waste characterization studies. One is waste generation versus the collective. So, the waste generation study, you can have those done basically at the household level, maybe at the industry, at the commerce or institutions. So, there are diverse methodologies to do this type of waste characterization. Likewise, you can do waste characterization at the waste collection sites. For example, at the transfer stations, at the landfill, at the incineration plants, or at the treatment facilities, for example, at a composting or an aerobic digestion plant. And you can also have waste characterizations done where waste is being accumulated, for example, at beaches, waterways, or mangroves. And here in the picture, you can see a picture of an accumulation of plastic waste, or it could be other types in a waste stream.

Another type of waste characterization basically can be done by materials. So, you can actually just do a waste characterization of the organics that are being disposed or the plastics. And then in that, you can actually maybe see how many of them are packaging versus single use. And like we mentioned earlier, also to see what are the contaminants in a waste characterization.

Another waste characterization type of study is by product brands. And there are several examples out there. For example, in a country, they want to see how much of the waste is basically from imported materials or imported brands. And they're also being used to establish EPR, extended producer responsibility program. So, those are very important as well.

So, talking a little bit more about the Waste Characterization Handbook and Excel Tool that has been developed by GMI. So, the handbook provides information for city decision makers and solid waste professionals to plan and conduct a waste characterization study. The handbook includes recommended activities and resources to help city and solid waste professionals plan an appropriate type of study for their specific site conditions, conduct field activities to collect the data, and analyze the data to help make informed solid waste planning decisions. The Waste Characterization Tool, which is an Excel-based

tool, streamlines data entry and analyzes the composition of different waste streams identifying the study.

So, the handbook guides the reader into three main steps to do a waste characterization. In each step, the handbook recommends the necessary tasks that need to be done. So, in the planning step, the handbook discusses the importance of setting the goals and objectives to establish the reason for the study and the desired outcomes. Likewise, the handbook describes the considerations necessary to design the study, like establishing who has control of the waste material, the sectors generating the waste, the location and time to conduct the study, what are the potential costs, and identify other key stakeholders, like, for example, the formal or informal sector waste workers. This step also goes over the main aspects of developing the sampling plan and creating a staffing plan.

In the field activities step, the handbook goes into the main tasks, such as training the staff, gathering the necessary equipment for sampling, also setting up the sampling and the sorting sites, conducting the waste sampling, so doing the sampling per se, and sorting and weighing the waste material, which is basically where you're going to see what materials are being generated or disposed. For this step, the handbook also provides sample templates and communication materials that can be used during the field activities. And these communication materials also will be used with the site facility. The tool can be used for the data entry of sampling, so you can use the Excel tool during this step. And lastly, for the data and results step, the handbook explains how to conduct the data analysis, including calculating the percent composition and guides on how to interpret the data and determine the results and incorporate the results into waste management activities.

So, this slide basically shows the cover of the tool, and then each of the tabs will correspond to the different steps of the handbook. This slide basically shows an example of what you can see in the results tab, where it can show you what is the waste by composition, by each date that it was done in the sampling, and then also by the different waste generators if you chose to do it by waste generator. And then you also get some graphics on what basically the results are going to look like.

Like Klara mentioned, basically, this information could be used with other GMI resources, so the data of the tool can be used on SWEET to estimate the baseline emissions. And then you can use that information for the proposed scenarios and see what would be the best measures to take. Also, you can use the data and the Anaerobic Digestion Screening Tool to understand if a specific organic fixer could support an AD project, and also utilize the Landfill Gas Screening Tool to see how much gas a site may produce and if the supply could support landfill gas energy projects.

In summary, the data generated by a waste characterization study provides accurate, local, and timely information that is extremely valuable to solid waste management operations as they evaluate alternative strategies and assess their feasibility, understand their emissions, and more. So, the guideline is a great tool to basically do that, to walk you through all the steps necessary and all the tasks that need to be done. It includes templates to use, so it will make it easier. It also includes some letters and memos, templates to communicate with the site and with people. And that's it for me. I'll turn it over to Hussein.

Hussein Zaki:

Thanks, Sandra. Hi, everyone. My name is Hussein Zaki. I'm a project engineer with Environment and Climate Change Canada, which is the environmental department in the Government of Canada. And

today we'll show you a bit around the work we've been doing on waste characterization nationally. And typically, when we have conducted this work in the past, the waste management duties sort of fall on the subnational entities here in Canada, the provinces and so on. So as a federal government, we deal with any waste characterization work past the stage where the waste audits have been conducted.

So really getting the data from those waste audits and waste audit reports that have been conducted locally in Canada and using that data for our own purposes.

So, our work started off as a necessity to support two ongoing programs here at Environment and Climate Change Canada. The first one is the national inventory reporting that Canada has to do every year to the UN (United Nations) as part of declaring all the sources of GHG emissions. And part of that is estimating the methane and GHG emissions associated with the disposal of solid waste in Canada. And so, in order for these assessments to happen, we needed to sort of explore the composition of the different waste streams here in Canada that are disposed in those landfills to be able to support the modeling of the methane generation.

And the second reason why we started this waste characterization work as well is what Sandra spoke a bit about in terms of supporting diversion policies and so on. So, our group, the Waste Reduction and Management Division, we're responsible for putting in place policies that support the diversion of the solid waste away from the landfill to other uses. And supporting these municipalities, we also need to understand sort of the composition of how much of the biodegradable materials end up in the landfills, how much of it can be diverted away from the landfills, and the infrastructure that is required to process this diverted waste. As a federal government, we try to explore these metrics in order to be able to properly set up funding programs and put policies in place.

So, as a national entity, as the Government of Canada, we needed sort of a national number of the composition of the residual waste stream or the garbage waste stream, what we call the blue box or the recycling stream, and then there's a biodegradable/organic waste stream. So, in order to get a metric for these three streams, we needed to sort of gather as many studies that were done locally at the municipal level in Canada as possible and aggregate them to a national level to be able to get that national profile. And to do that, considering how expensive these waste audits are, when they are conducted, how much they cost, we are a bit short on the resources to actually conduct these audits, or even get in an agreement with a municipality where we would purchase the data and so on. So, what we rely on is the voluntary submissions of those municipal waste audits by those municipalities. So that entails building a relationship between the federal government here at Environment and Climate Change Canada and some municipal contacts at the city level, at the regional level in Canada, to be able to respond with them and be able to receive any waste audit or waste characterization reports that they've conducted in the past year.

So, typically, municipalities send us different reports that they've conducted for different years, so the years don't really align. So, Toronto, which is a city in Canada, could be sending us a waste audit report that they did in 2021. Ottawa and Montreal and so on could be sending us audits that they did in other years. So, our challenge here is to really grab all those municipal audits together, be able to standardize this data so we can aggregate it or sum it into a national profile that we need for our work. And so, this is sort of an overview of the National Waste Characterization Program that we have here in place that serves these objectives.

Now in terms of the actual process that we go through once we receive maybe, let's say, a municipal waste audit, is that we first review which sectors this waste audit covers. So, we have three sectors of interest here in Canada that we look at, which is the residential sector, mainly single-family households, multi-residential apartment buildings, and so on. So that's the residential sector here. The second sector is the ICI, Industrial, Commercial, and Institutional sector. So, we try to collect waste characterization or waste audit reports specifically done on commercial businesses, offices and so on.

Now there's a lot less of those compared to the residential one because most of the audits that we receive from municipalities here in Canada, these are samples that were taken from a sample of houses in the municipality. So, typically, they just cover the residential sector. Very few audits actually include also the auditing of commercial businesses and so on. So, we sometimes have to resort to other means to get audits that were conducted in the private sector because they're not always willing to share it based on or depending on their performance. But we try to maybe work with engineering companies here or consulting companies here in Canada that usually conduct these audits for these businesses and try to work out an agreement where confidentiality of the organization or the business can remain confidential and then its data only used in the aggregation process. So, any data or any reports that we publish later on can be only pre-published at the national level and does not contain any confidential information.

And I'll also mention on the previous slide -- so our program, whenever we do these data calls, every two years or three years we do this data call out to all the municipal contacts that we have here in Canada. And with the partnership of a federal, I guess coalition or Canadian municipal association that helps us usually in reaching out to those municipalities in Canada and encouraging them to submit their data. When we do this call out and we have gathered sufficient data, we publish a national and provincial level report. So, the latest report that we had published was in 2020, and it's called the National Waste Characterization Study, and it essentially contains, and I'll show you a sample of the results in the next slide. But it contains a profile for each province here in Canada based on the audits that were collected. And all the data is usually aggregated, like I said, to a higher level so that the confidentiality of a business or a specific city is never shown in the report. And so right now we've been doing this call out for data over the last three years again, and hopefully we have a target of publishing an updated report that contains this data in 2024, later this year. So, we're running through the data right now, trying to analyze it and clean it up.

So back to the process. So, once we've received a municipal waste audit that has been conducted on the field, we extract its information and data. So typically, they're in a PDF format that we just get, so it takes a bit of time to extract it to an Excel template that we've set up. And sometimes it's not only the percentage composition, quantitative figures that you want to extract, but there's a lot of other metadata or side data from that report that is of use to us that we extracted from these audit reports, such as whether this municipality had a green or organics material collection program in place that could influence the amount of food and yard waste or green waste that ends up in its garbage stream and so on. So, we try to collect as much information as possible on each of those municipalities that do send us their data. And once we've extracted all of this data into an Excel file for each report, one of the biggest challenges that we've seen is that here in Canada, when municipalities conduct waste audits, they are not using a standardized list of material categories typically. So, each municipality has a different list of material categories, and some municipalities go into a lot more detail in their report. So, we have very active provinces, such as British Columbia and Quebec and so on, that do actually have cities that audit the different types of plastics. In their audit report, they mention a percentage composition for each

specific resin, for single-use plastics, and so on. So, these are really the very rich audit reports, but there are other reports that we've received from municipalities that just has “plastics”, for example, as one category, and it's not further broken down. So, in order to be able to harmonize all these audit reports together, we create what we call -- based on the item, the material categories that we see across those audits, we build a specific standardized structure that we reassign all the material categories that we see in the report to our own Environment and Climate Change Canada structure that we've developed in-house.

And that structure just looks like a three-level category structure. So, the first one, for example, could be the paper category. So that's the primary level category. And then underneath that, the paper category can be broken into, let's say, cardboard, box board, and so on. And whatever information we see in those audits, we reassign to the structure. So, then we're able to compare apples to apples and sum up the data to a national level indicator. So really, the whole objective of this is to get something that looks like this. So, I'll skip to the next page.

And you can see here, this is one graph that was taken out of our last report. And the objective here is to have these three sectors beside each other. So, the residential, commercial, and the construction sector. And for each sector to be able to develop a bar chart or a pie chart that shows the breakdown of the different material categories. That was our first report that we published. So, the material categories were very aggregated or primary level. So paper was not further broken down into the types of paper, plastics, and so on. But, in the future reports, including maybe this year's, and the next reports that we publish, we plan to explore these categories into more detail and try to really break them down with the data that we get from those municipalities. So, I'll stop here to make sure I don't go over time, and I'll pass it to the next speaker or Carlos.

Carlos Silva Fliho:

Thank you. Thank you, Hussein, thank you very much for this great presentation. So now I'll hand it over to Casey Krausensky to tell us the Wisconsin experience. Thank you very much.

Casey Krausensky:

My name is Casey Krausensky. I'm with the Wisconsin Department of Natural Resources. I'm the Solid Waste Coordinator. And in 2020 and 2021, we conducted our third statewide waste characterization study. And I think we have a pretty diverse audience, so I'm just going to give a little bit of Wisconsin background. It's a midsize population state and in land area, 5.9 million people. We do have a mandatory recycling law that according to a survey we did a little bit after the characterization study, actually 86% of our residents are at least somewhat committed to following. We have a mandatory yard waste diversion law as well as a mandatory electronics recycling law, but we don't have any food waste diversion requirements in the state. According to the same citizen survey, 81% of our residents are currently putting the majority of their food waste either down the drain or sending it to a landfill as garbage, while 18.5% are composting the majority of their food waste, either through a backyard compost or a collection or a drop off program.

So, as I mentioned, in 2020 and 2021, we conducted our third statewide waste characterization study. So, one of the questions is why did we take the time and money to do that? And also, it was hired out with a consulting firm. The state didn't actually do it ourselves. But the goals were to identify the biggest

problems with what is going to landfills from the state. And that could be a couple of different things, whether it's space or as focused on here, because of the materials creating a large greenhouse gas emission. Or just because they're difficult and unsafe for landfills to manage, some sort of hazard. We wanted to get information to identify the easiest fixes to see what materials that we maybe haven't really educated on before, or that have easy diversion solutions already in place. Because we had conducted a couple of waste characterization studies in the past, we were able to also use this study to see what past laws of our electronics ban happened between our last characterization study and this characterization study.

So, we were able to see really how effective that was, and the same with other education campaigns that we had. Also, people who are in the waste industry, food waste is well known to be a big problem. But when communicating outside of the industry, especially with legislators or others just in other areas of the Department of Natural Resources, it is really helpful to have actual data to back up just the idea that food waste is a large methane contributor or a large greenhouse gas contributor. So, it's good to have the actual data to put behind that. Also, the Department is following the national goal of reducing statewide food waste 50% by 2030 over 2020 numbers. So, to see how we're doing on that goal, we definitely need to have 2020 numbers to start with, so we need to do it to collect baseline data. Because we've done a few studies, we can see trends developing over time, including the fact that we saw food waste is the largest material on the rise of what's going to Wisconsin landfills as far as the MSW stream. And then I don't think I knew, or our program knew, how much awareness it would bring to the waste industry and what we're throwing away in Wisconsin, but conducting this study, it had great photos, great interest from all sorts of residents. And so, we had tons of media requests, print media, TV, radio, and it's really done great things for just making people realize that we can make an impact with waste.

So, some of the study considerations and planning we included is we're trying to conduct a statewide representative study. And so, we ended up doing grab samples, 200-pound grab samples at 15 different landfills across the state, which represents about 70% of the municipal solid waste disposed of in the state goes to those 15 landfills. The majority of them were somewhat larger landfills to be representative that way, but because of rural and urban differences in our state, we also needed to make sure we included some smaller landfills. And similar to what Hussein was just talking about, we did collect data from three different sectors, well, four actually, but the MSW stream was three sectors. And that is single family residential, we broke out multi-family residential, as we found usually different types of education is needed between those two groups. And then also the ICI sector, the Industrial Commercial Institutional.

I know it sounds ridiculous, we actually requested 85 different sort categories for our study. We tried to use standardized terms for all of our plastics that we got from, I think, more recycling. We also tried to retain most of the categories we had used in past studies so we could see trends over time. But the primary thing we're trying to do is to break down materials, both by our regulations and by disposal options. So, we did do different grades of plastic because different grades of plastic have different abilities to find markets for them. And we did separate out different construction and demolition waste because some we allow to be used as fill materials and some we don't. So, knowing what were actually divertible from the landfill, it was important to get that level of category. And a new category split that we did for this study that ended up being incredibly important is we broke out food waste into two categories, one of which was food scraps, what you might think of as going to the landfill, bones, cores, peels, things like that, and what we call wasted food, which is food that was previously edible.

And I think even though the program knew food waste was going to be an issue and the large amount going to landfills, I think we were all pretty shocked to discover that of the food waste going to Wisconsin landfills, over 70% of it was previously edible food. So, not material that has to be thrown away by any means and can be hopefully reduced. And, actually, that category of wasted food was our largest category by weight of all of the municipal solid waste materials. I also just noted, we tried to avoid seasonality when designing our study by having two different sample seasons. Wisconsin has pretty different fluctuations across seasons. We were probably able to do that, but if anyone else remembers 2020 and 2021, we did hit COVID instead. So, we know that our study is a snapshot in time, of that time.

So, analyzing the results that we got. I'm definitely interested to go back and put some more data into the tool that Sandra was mentioning today. What I used at the time was EPA's WARM (Waste Reduction Model) model to find the greenhouse gas emission reduction potential. This first bar here is just a line from that WARM model that shows what the greenhouse gas mitigation potential is for source reducing all of the previously edible food waste and composting the food scraps, which is over 2 million metric tons of CO2 (carbon dioxide) equivalents. The WARM model also nicely fits that into some more user-friendly comparisons. And so, it is the equivalent of taking almost 600,000 passenger vehicles off the road for a single year. We used some data from our study as well as some of our modeling results to make this infographic page. You can see some of the standout numbers are that organics make up over 30% of everything that we're putting in the landfill and wasted food was the single largest category and the food scraps was actually third. So, to combine they're over 20% by weight of the municipal solid waste that we're land filling.

And then this is a bar chart comparing to some of the larger or broader categories to our previous study, about 10 years previous, 11 years. And you can see that the amount of organics going to the landfill has just shot up astronomically. If you want to see the executive summary, or all the details of our waste sort, you can go to dnr.wi.gov and just search “waste sort”.

So, what are we doing with the results that hopefully will help with methane or greenhouse gas emissions? We made a residential food waste reduction page. We just are launching a statewide food waste evaluation that will give us both a lot of missing data that we have on where food waste is being generated and capacity we have for alternative management as well as action items on how to help with that. We created a new program position to focus full time on food waste, to focus on creating an education campaign as well as implementing the actions from the evaluation. And then, as a waste program, we traditionally work with landfills, transportation, compost facilities, anaerobic digesters, but we realized we really need to be getting more into the reduction realm to be properly making the biggest greenhouse gas emission reductions that we can. Because then we're also reducing the emissions needed for transportation, fertilizer, for refrigeration, for packaging, for manufacturing and processing all these materials, not just avoiding the landfill emissions at the end. But these organizations don't really have a reason to talk to our waste program right now, so we're going to be contracting a non-regulatory firm to do the outreach with places like grocery stores or restaurants or farms who are interested in what they can do.

And then we hope to get funding for a food waste specific characterization study in 2026. And I know we're close to time, so I'll just throw out my contact information if people have follow-up. Thanks.

Carlos Silva Fliho:

Thank you very much, Casey. Thank you very much for this comprehensive presentation about this statewide characterization. So, after the four excellent presentations from Klara, Sandra, Hussein, and Casey, we do have some time for questions. Please submit your question on the Q&A panel if you have any. We do have one, a more technical one, from Tobias Koch: "When using CDM (Clean Development Mechanism) methodology for methane emission calculation, what humidity do you assume for dry waste, as this makes a huge difference?" So, I don't know, maybe Klara or Sandra, I think it's more related to the tool, if you can answer that.

Sandra Mazo-Nix:

Yeah, I'll step in. And this is actually more related to the SWEET tool. The Waste Characterization Tool does not have anything on the humidity for dry waste, basically, because what we're doing with the handbook in the tool is basically seeing the components of the waste. So, it will be organic, plastic, wood. So, what are the components of the waste? So, we don't deal with the humidity of it for this tool. The one that does take that into account is the Solid Waste Emission Estimation Tool, the SWEET tool, where basically we do follow…the tool does have the assumptions. So, if you download the SWEET tool, you can go to the assumptions tab, and you can see what are the assumptions that we have, that the tool is using for the estimation of methane and other greenhouse gases. And reviewing the tool has to do a lot with the local conditions. So, what are the climatic emissions? So, if there's a lot of humidity in a specific area, you have to change the amount of humidity that certain organic waste has. So, for example, wood or leaves or food waste, it's going to vary accordingly. So, I would recommend just downloading the SWEET tool and kind of going through the assumptions tab to really see what is the humidity content that was assumed for different types of waste.

Carlos Silva Fliho:

Thank you, Sandra. Thank you very much. And I don't see any other questions in the Q&A. We still have one minute left. But I do have one question. So, after all these very good presentations regarding waste characterization, and the one of the challenges we saw from this side when we were preparing this Global Waste Management Outlook 2024, is the lack of data. So how do we raise awareness that measuring waste is important to tackle methane? So, I think our speakers can comment briefly on that, because I think this is very important that we really raise awareness on measuring waste and supporting decision making.

Casey Krausensky:

I would say for Wisconsin, it really helped us to get the actual greenhouse gas equivalent numbers, to get us talking to climate initiative programs in the state, not just staying in our waste program silo. Having the actual numbers drew a lot of attention to the impact that waste could have.

Carlos Silva Fliho:

Thank you. Thank you, Casey. Anyone else? Yeah, Hussein, please.

Hussein Zaki:

On our side, it's a bit similar to having GHG being the sort of main driver in a lot of our asks in terms of resources and budget to raise this awareness and encourage the conduction of waste audit reports. But I think at the municipal level, from what we've observed, they're really sort of not focused maybe on the GHGs directly.

But for them, I think they need to be driven towards the diversion of waste considering -- or maybe at least here in Canada -- the landfill space available for the disposal of this waste is shrinking every day. So, the municipalities are aware of this, and they are aware that in order to properly optimize the usage of the remaining landfill space, they need to sort of take out a lot of the biodegradable portion of it. So, in order to do that, they're driven to sort of measure the composition of this waste. So, a lot of different factors, but yeah, very, very similar objective.

Klara Zimmerman:

Thanks, and I can just add that GMI is focused on capturing and using biogas as an energy source. And so, another way to look at it is, how are you then using those organics? For example, in composting, or in anaerobic digestion, and in AD, it can be used for fuel, for electricity, etc. And then obviously on the plastic side, there's some value in recovering those materials as well. So, you have that flip side of characterizing it, and what can you use the diverted portions for.

Sandra Mazo-Nix:

Yeah, I would just add that it's very important to take into account that to do better waste management, it's important to do the valorization of it. So that could be a motivation. So, if you understand your waste stream, you can see what is the biggest streams there are, and then if you can valorize them, then you can have some potential revenue for those.

Carlos Silva Fliho:

Thank you. Thank you very much. Thank you all, the speakers, for the excellent presentations. Thank you for the comments. It's like, sure that we have a lot still to progress, but good initiatives already on the ground. We learned from Canada, from Wisconsin, and GMI, and with the tools which are available. Thank you all the attendees for joining us. We are like three minutes over time, but I think it was a very, very fruitful webinar. Thank you for letting me moderate this this afternoon and looking forward to seeing you all in a future opportunity. So, take care, and thank you very much.